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The Structure and Short-Term Development of Finnish Industries in the 1920s and 1930s

An Input-output Approach

Jari Kauppila

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My interest in input-output methodology started while I was working on the compilation of regional input-output tables at Statistics Finland in 1998. As a recent graduate I was lucky to have a more experienced colleague, Juha Piispala, with whom to share many interesting discussions. During the project I also met other people involved in input-output methodology. I would especially like to mention Professor Emeritus, Doctor Osmo Forssell, who was acting as the scientific leader of the project, and Doctor Ilkka Susiluoto and Doctor Ilmo Mäenpää, both of them experienced researchers in the area. They all shared an enthusiastic interest in the subject and encouraged us to keep up the extensive work of compiling regional input-output tables.

I have been fascinated ever since with the methodology and its potential. As I had been working with the Nordic historical national accounts project since 1996 I was interested in applying the input-output approach to economic history. The Nordic working group, which had been meeting regularly and to which I was introduced by Professor Riitta Hjerppe, was a forum in which a young student could enjoy conversation and the exchange of ideas with more experienced researchers from other Nordic countries. The way the group quickly accepted me as a full member gave me the impetus to further explore what historical national accounts could offer.

These two research groups have had a big impact on my thinking, and on my idea of analysing the structure and interdependencies of Finnish industries with the help of a historical input-output table. I also soon found out that there were few similar studies in the field of economic history in other countries, which gave me further encouragement to start the process of compiling the input-output tables for the year 1928.

I would like to thank Professor Riitta Hjerppe for her continuing support and encouragement, as well as for introducing the Nordic group to this young student. I am also grateful to Professor Emeritus Osmo Forssell, Doctor Ilkka Susiluoto, and Doctor Ilmo Mäenpää, Docent Pirkko Aulin-Ahmavaara, Doctor Sakari Heikkinen, Assistant Professor Jari Eloranta and Seppo Varjonen, who have all given valuable comments on the work at hand. I also gratefully acknowledge the support of my colleagues at the Ministry of Transport and Communication finance unit, and the Director of Finance Marja Heikkinen-Jarnola. Lively discussions with Mikko Myrskylä helped me to formulate many of the conclusions in this study. I am also greatly indebted to Joan Nordlund for her skilful and patient work with my English.

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Abstract

The aim of the study was to offer new insights into the structure and short-term development of Finnish industries during the 1920s and 1930s. The research was carried out through the construction of an input-output table describing the Finnish economy in 1928. This basic data was then expanded into an input-output model. New data was used in order to identify structural interdependencies and the key industries, as well as their impact on the economic development during the Great Depression of the 1930s. Attention was also given to import dependency and the impact of tariffs on consumer prices.

The new data made it possible to identify the key industries in the Finnish economy in the year in question: agriculture, forestry, the production of food, the manufacture of wood and paper products, and construction. It could be argued that food production is perhaps the most neglected area in Finnish economic history, despite its great impact on the economy.

Exports were more capital-intensive than imports. Even though caution should be exercised in terms of drawing conclusions about this interpretation, it was possible to quantify labour and capital input by industry in some detail.

The input-output model was then used in order to estimate the impact of changes on final demand in the three key industries, namely the manufacture of wood products, the manufacture of paper products, and construction, covering the years 1928-1932. It was estimated that the sudden fall in house construction had a total negative impact of nearly 13 percent on the economy, which was greater than the impact caused by the decrease in the export of wood products. The role of private consumption was also found to be highly significant. The downturn in wood export, for example, caused an initial impact of -4 percent on the economy, while including household consumption in the model reduced total output by 10 percent.

The results also confirmed conclusions from previous studies on the tariff policy in Finland. Food production was the most protected sector, while domestic-market industries were among the losers. These industries were not able to benefit from the increased protection during the depression: on the contrary, it was shown that the tariffs were only able to slow down the fall in consumer prices.

The study incorporates all the related statistical tables describing the Finnish economy in 1928, including supply and use tables, input-output tables, input coefficients, Leontief inverse matrices, and capital and labour coefficients.

Keywords: economic history, the Great Depression of the 1930s, economic structure, interdependency of industries, input-output, supply and use tables

Tiivistelmä

Tutkimuksen tavoitteena on tuottaa uutta tietoa Suomen kansantalouden rakenteesta ja lyhyen aikavälin kehityksestä 1920- ja 1930-luvulla. Tutkimus toteutettiin laatimalla kansantaloutta kuvaava panos-tuotostaulu vuodelle 1928 sekä sen laajennus, panos-tuotosmalli. Aineiston avulla kuvataan kansantalouden rakenteellisia riippuvuuksia, tuotannon avaintoimialoja sekä näiden vaikutusta kansantalouteen. Lisäksi tutkimuksessa tarkastellaan kansantalouden tuontiriippuvuutta sekä tuontitullien vaikutusta hintoihin 1930-luvun laman aikana.

Tutkimuksen perusteella voitiin identifioida Suomen kansantalouden avaintoimialat vuonna 1928: maatalous, metsätalous, elintarviketeollisuus, puuteollisuus, paperiteollisuus ja rakennustoiminta. Erityisesti elintarviketeollisuuden vahva rooli kansantaloudessa oli kenties yllättävää, erityisesti kun huomioidaan kuinka vähän toimiala on saanut huomiota osakseen taloushistorian tutkimuksessa.

Tutkimus osoitti, että Suomen vienti oli pääomavaltaisempaa kuin tuonti. Vaikka tämän tuloksen tulkinta on varauksellinen, tutkimus pystyi osoittamaan ja kvantifioimaan toimialojen työ- ja pääomapanoksen osuuden tuotoksesta yksityiskohtaisesti.

Panos-tuotosmallilla arvioitiin puuteollisuuden, paperiteollisuuden ja rakennustoiminnan ajanjaksona 1928-32 tapahtuneen loppukäytön muutoksen vaikutusta kansantalouteen. Merkittävä havainto on, että rakennustoiminnan loppukäytön muutoksella oli erittäin suuri kasvua vähentävä vaikutus koko kansantaloudessa. Talonrakennusinvestointien romahtaminen aiheutti lähes 13 prosentin tuotannon laskun kansantaloudessa. Vaikutus oli jopa suurempi kuin puuteollisuuden viennin romahtamisen. Tulokset osoittavat toisaalta, että yksityisen kulutuksen merkitys kansantaloudelle oli erittäin vahva. Esimerkiksi puuteollisuuden viennin romahtaminen aiheutti yli 4 % tuotannon vähenemisen mutta huomioitaessa mallissa myös yksityisen kulutuksen väheneminen, oli kokonaisvaikutus yli 10 %. Yksityisen kulutuksen huomioiminen mallissa siis yli kaksinkertaisti toimialojen vaikutukset kansantalouteen.

Tulokset vahvistivat aiemmissa tutkimuksissa esitettyjä johtopäätöksiä tullipolitiikasta ja osoittivat maatalouteen läheisesti liittyvän elintarviketeollisuuden olleen eniten suojeltu toimiala kansantaloudessa. Muut kotimarkkinoiden toimialat eivät kuitenkaan hyötyneet tullipolitiikasta lamakauden aikana. Panos-tuotoshintamallilla osoitettiin, ettei tullipolitiikka ollut niin onnistunutta kuin aikalaistutkimuksissa väitettiin, vaan tullit korkeintaan pystyivät hidastamaan hintojen alenemista.

Tutkimuksen liitteenä esitetään kaikki keskeiset Suomen kansantaloutta vuonna 1928 kuvaavat tilastolliset taulukot, mukaan lukien käyttö- ja tarjontataulukot, panos-tuotostaulukot, panoskertoimet, Leontiefin käänteismatriisi sekä työ- ja pääomapanoskertoimet.

Avainsanat: taloushistoria, 1930-luvun lama, talouden rakenne, toimialojen väliset riippuvuudet, panos-tuotos, käyttö- ja tarjontataulukot

Contents

Acknowledgements 3

Abstract 4

Tiivistelmä 5

1 Introduction 9

1.1 Starting point 9

1.2 Aim and focus 12

1.3 Methodology 14

1.4 Structure 17

2 The Finnish economy during the interwar period 19

2.1 Growth, depression, recovery 19

2.2 Previous studies on the Great Depression in Finland 33

2.3 Research questions 40

3 On concepts, methods and theories 43

3.1 Concepts 43

3.2 Historical national accounts 47

3.3 National accounts and the input-output approach 52

3.3.1 Supply and use tables 52

3.3.2 From supply and use to symmetric input-output 54

3.4 Foundations of input-output analysis 56

3.4.1 Basic equations 56

3.4.2 Closing the model in relation to households 59

3.4.3 The price model 62

3.4.4 Linkages 62

3.4.5 The effective rate of protection 66

3.5 Limitations 67

3.6 Input-output and economic history 71

4 Input-output tables describing the Finnish economy in 1928 76

4.1 The approach and the classifications 76

4.2 Overview of methods and sources 78

4.2.1 Supply and use by industry 78

4.2.2 Foreign trade 82

4.2.3 Final-demand components 83

4.2.4 Value added and its components 84

4.2.5 Price components 85

4.2.6 Manual balancing 87
4.2.7 Symmetric input-output tables. 88
4.3 An improved estimate of the GDP in 1928 89

5 Structural interdependencies in 1928 97
5.1 Identifying the key industries 97
5.2 Import dependency. 110
5.3 Factor proportions and trade structure 119

6 Short-term impacts of the Finnish depression 127
6.1 The impact of the key industries on the economy 127
6.2 Effective protection and prices 136

7 Conclusions 147

Sources 158

Appendix 1. Industrial classification (parallel to product classification) 171

Appendix 2. Methods and sources 172

Appendix 3. Statistical tables 227
Table 1. Supply table for 1928 at basic prices, including transformation into purchasers' prices (FIM 1,000,000 at current prices). 228
Table 2. Use table for 1928 at purchasers' prices (FIM 1,000,000 at current prices) 234
Table 3. Use table for domestic products in 1928 at basic prices (FIM 1,000,000 at current prices) 240
Table 4. Use table for imports in 1928 at basic prices (FIM 1,000,000 at current prices) 246
Table 5. Input-output table for 1928 at basic prices (FIM 1,000,000 at current prices) 252
Table 6. Input coefficients for 1928 258
Table 7. Inverse matrix for 1928 264
Table 8. Labour input and labour-input coefficients for 1928. 269
Table 9. Capital input and capital input coefficients for 1928. 270

1 Introduction

1.1 Starting point

The industrial structure of national output and productive resources is one of the key aspects of an economic growth. Industries differ from each other in terms of their use of raw materials, production technologies, capital or labor intensity, and final products they produce. Indeed, any industry can be defined by these characteristics. Therefore, a study looking at the industrial structure offers the opportunity to identify factors behind economic change.[1]

The structure and interdependency of industries are important factors when studying any economy. Each industry is interrelated to other industries. At the same time, all industries share common productive resources and they complement and compete in the same markets for finished goods. Therefore, each industry has also unique production-supply and output-demand structures that constitute for economic growth differently. A change in the industry structure for any given industry causes different impact on the economy.

No study on the inter-war economy can avoid the Great Depression of the 1930s, which was an unprecedented crisis on a global scale in terms of its intensity and duration. Its impact was felt in all industrialised countries. It has been estimated that the world's industrial production fell by 36 percent during 1929–1932. The average unemployment rate in Europe has been estimated at 15.8%,[2] and it is therefore not surprising that the phenomenon has been the subject of extensive study. There has recently been increased interest in the analysis of economic crises stemming from the economic depression of the 1990s. The latest study on the Great Depression in Finland, for example, focused on a comparative analysis of the two phenomena.[3] International interest in the subject has been far more comprehensive, however, and studies have focused on international trade, domestic consumption, national developments, operations of the gold standard, and many more aspects.[4]

The industrial structure has been the main focus also in the international studies on the Great Depression of the 1930s. The traditional explanation of the Great Depression of the 1930s accentuates the importance of structural imbalances within the domestic economy (between supply and use) or between countries (in foreign trade). These imbalances have been traditionally regarded as driving forces behind the depression, caused by the disturbance to international trade during the First World War as well as changes in demand.[5] These changes

1 On industrial structure and economic growth, see Kuznets (1966).
2 Feinstein et al (1997), pp. 11, 105.
3 See Kalela et al (2001).
4 For a comprehensive account of the Great Depression in Europe, see for example Feinstein et al (1997).
5 Feinstein et al (1997), pp. 14–17, 28–32.

in economic structure have been a frequently recurring theme in the research on the Great Depression. More precisely, they could be described in four variant hypotheses.[6]

First, changes in the composition of production increasingly made economies vulnerable to cyclical disturbances. The way this transformation took place is still a matter of some controversy. In the United Kingdom it has been expressed in terms of the decline of the "old industries" such as textiles, and iron and steel, and the rise of the "new industries" such as chemicals and motor vehicles.[7] Yet others have rather stressed the direction of change, such as the increased importance of consumer durables as a consequence of higher living standards, especially in the United States. Some studies, again, have emphasised the role of the primary sector, specifically when the disruption in Eastern European grain production caused a shift towards the production of grain, meat and dairy products in other countries. Rises in interest rates and the return of Eastern European countries to the free market caused serious problems for farmers, resulting in a partly protectionist tariff policy for many years to come.[8]

Secondly, changes in the operation of labour markets caused deterioration in terms of flexibility and adaptability. During the downswings, for example, collective bargaining is said to have restricted the downward flexibility of wages. This, in turn, had a negative impact on the economy as prices tended to fall and wages to remain as high as during periods of growth. On the other hand, there is only little evidence that labour-market flexibility decreased during the interwar period in any other country than the United States.[9]

Thirdly, the operation of the international monetary system, and especially of the gold standard, made economies more vulnerable to external shocks. In addition, it limited the possibilities of reacting to disturbances in the balance of payments. The inter-war system was further weakened by domestic policies that prevented domestic credit from rising and falling with international reserves. The combined impact of concurrent shifts in economic policy in the United States and abroad, and the gold standard as the connection between them, and the effect of U.S. and foreign economic policies on the level of activity have been offered in explanation of the onset of the Great Depression.[10]

Finally, the pattern of international settlements that had its roots in World War I caused deterioration in the competitive position of European exports. The First World War had transformed the United States from a net foreign debtor to a net foreign creditor. This, according to some studies, in turn led to a situation of too much financing and too little adjustment.[11]

6 This division is presented in Eichengreen (1992a).
7 See, for example, von Tunzelmann (1982).
8 Eichengreen (1992a), pp. 214–215.
9 Ibid., p. 217.
10 For an extensive study on the gold standard and the Great Depression, see Eichengreen (1992b); On the Great Depression in the United States, see for example Bordo et al (1998).
11 Eichengreen (1992a), pp. 219–220.

All of the above reasons could have been the driving force behind the Great Depression of the 1930s in Finland, too. These factors should not be treated separately, however, but as Eichengreen argues, "...treat the gold standard as one of a range of factors contributing to the Great Depression..."[12] They should thus all be related to one another.

The Great Depression has also motivated analytical effort in Finland, but despite the wide interest in the subject, only a limited number of studies are available. One of the most prominent sources comprises the contemporary studies conducted by Bruno Suviranta from the 1930s.[13] His analysis and views have been regarded as "ahead of his time"[14]. He gave an account on the development of the Finnish economy prior to the depression, and attempted to reach a definitive conclusion about its causes. Of other contemporary sources, the monthly bulletin of the Bank of Finland provides important statistics as well as contemporary analysis of the economic situation in the country. In addition, *The Agricultural Depression in Finland during the Years 1928–1935* by K. T. Jutila & J. H. Konttinen also provides a detailed account of the policies adopted in order to protect agricultural production at the time.[15]

Other older studies on the Great Depression include those conducted by Klaus Waris and Veikko Halme.[16] Waris carried out comprehensive research on consumers' incomes, consumption and savings during the various Finnish trade cycles between the years 1926 and 1938, while Halme studied exports as a factor in Finnish trade cycles in 1870–1939, focusing extensively on the onset and causes of the Great Depression from the perspective of foreign trade.

The major financial newspapers during the 1920s and 1930s also provided analysis of the crisis, reflecting contemporary expectations regarding economic development. These papers also published arguments on the causes of the depression, as well as important statistical information. Two economics magazines in particular, both of which published monthly reviews on the economic situation and featured authors from a broad spectrum of economics in Finland, should be mentioned.

Finnish Trade was a bulletin for Finnish trade, industry, agriculture and finance, published monthly by the Finnish Central Chamber of Commerce, the Export Association of Finland, the Central Association of Finnish Woodworking Industries, the Central Union of Agricultural Producers, and the Federation of Finnish Industries. It therefore reflected the general opinions and views of Finnish industry and other economic actors of the time. *Mercator*, in turn, was a weekly magazine for Finnish economy and trade, covering a wide variety of economic issues and statistics. It also included an economic review every month, as

12 Eichengreen (1992b), p. 20.
13 Suviranta (1931a); Suviranta (1931b).
14 Hjerppe (2004), p. 13.
15 Jutila & Konttinen (1936). Jutila was the Minister of Agriculture during the Depression, and therefore one should be cautious about the conclusions he drew.
16 Waris (1945); Halme (1955).

well as semi-annual reviews of the state of trade. It employed a wide variety of authors commenting on current issues, including the depression.

More recent studies on the Great Depression include those conducted by Jorma Kalela, Riitta Hjerppe, and Sakari Heikkinen & Antti Kuusterä.[17] Kalela's work is a research plan rather than a study, but includes a comprehensive survey of literature on the depression as well as some critical analysis of the conclusions drawn in previous studies. Hjerppe's studies, on the other hand, take a national-accounts view, and she also compares her results with those of international studies. She offers the most comprehensive view on the Great Depression from the macroeconomic perspective. Heikkinen & Kuusterä, in turn, have contributed to the latest research project on the comparative analysis of the depressions of the 1990s and 1930s.

The above account of studies analysing the Great Depression of the 1930s in Finland is naturally not fully comprehensive. Other studies have touched on the subject, but they focus more on specific issues, such as forestry. The ones mentioned above include more comprehensive accounts of developments in the economy, and provided a starting point for this analysis of economic developments during the 1920s and 1930s in Chapter 2. The focus in the Finnish analysis has been particularly on the importance of foreign trade, however, and some important issues may well have been left off the research agenda.

1.2 Aim and focus

The aim of this study is to provide new data on the structure and short-term dynamics of the Finnish economy during the period. Input-output tables describing the Finnish economy in 1928 are constructed using the so-called supply-and-use approach. New data is used to challenge some of the assumptions made and conclusions drawn in earlier studies. Supply and use tables, as well as input-output tables as such, already provide a cross-section of the interdependencies of industries in Finland in 1928. The input-output framework is further extended to produce a more elaborate model that will provide a more thorough picture of the impact of changes in the final demand of some of the key industries in the economy. Questions of import dependency, tariffs and prices are also explored in the light of the new data. The results are compared, when possible, to similar analyses carried out in other countries. Thus, the study provides a more thorough analysis of the interdependency of industries in 1928, as well as of its contribution to the depression in Finland. A further aim is simply to provide data from which other researchers will be able draw their conclusions.

The research will provide new information on the interdependencies of industries in Finland at the dawn of the Great Depression of the 1930s. It will challenge traditional explanations through an approach that has not been used in research on Finnish economic history so far. Conclusions are drawn on the usability of the

17 Kalela (1987); Hjerppe (1989); Hjerppe (2004); Heikkinen & Kuusterä (2001).

input-output approach in economic history in general, with an emphasis on the methodological problems, and especially on reliability. The aim is to provide new methodological approaches to the use of input-output analysis in economic history, to develop the methodology for estimating the reliability of the results obtained, and to produce a new revised estimate of the gross domestic product for the year 1928. Chapter two sets out the research questions in more detail.

The focus of the study is two-fold. In the first place it concentrates on the construction and reliability of the first historical input-output table for Finland describing the Finnish economy in 1928, and this basic data set is then used as a starting point for an analysis carried out on the structure of the Finnish economy as well as causes and consequences of the Great Depression of the 1930s in Finland.

As mentioned, the initial focus is on the reliability of the input-output table. All new data should include an estimate of the reliability of the results obtained. Too often the reliability of new statistics is described in general terms such as "reliable enough", and there is a lack of methodology, and no opportunity to quantify the reliability. This issue is addressed through the introduction of a method for estimating the reliability of the new data. New data is important in other ways, too. Quite often studies fall short on quantification, and an attempt is made here to make up for this by providing data for the use of other researchers as well.

The focus of the analysis is on the interconnection between industries and foreign trade. As a small open economy, Finland has historically been quickly affected by changes in the world economy. A study covering the Finnish depression without taking into account the changes in exports and imports would inevitably be incomplete. However, this study will concentrate on the development of real economy. Monetary factors will not be studied at this context.

Companies basically use three kinds of inputs in their production processes: raw materials, labour and capital. There are significant structural differences between different industries, which may partly explain the different developments and are therefore worth studying. Moreover, companies are closely connected to each other in the economy in that a reduction in the output of one industry is felt in the production of another, for example. The relationship between labour and capital and foreign trade was formalised by Eli Heckscher and Bertil Ohlin in their analysis. According to them, different relative factor prices generate different relative commodity prices in autarky. Therefore, each country will export the products it can produce less expensively. In a two-country situation, with identical technology, constant returns to scale and a given factor-intensity relationship between the final products, the country with abundant capital will be able to produce relatively more of the capital-intensive products while the country with abundant labour will be able to produce relatively more of the labour-intensive products. This is one of the main conclusions of the Heckscher and Ohlin analysis, and is commonly referred to as the Hecksher-Ohlin theorem. The premise is that a country exports commodities that use its relatively abundant factors of produc-

tion relatively intensively, and import commodities that use its relatively scarce factors of production relatively intensively.[18]

A better understanding of these interdependencies will shed new light on the scale and direction of the distributed effects on the economy during the depression. This study will concentrate on these interdependencies on the basis of the main research questions built up in the Chapter two. Furthermore, government policies affecting foreign trade, especially customs policies, in a small open economy like Finland may significantly affect developments. It is therefore important to understand what role the Finnish tariff policy had in the economic development in the 1920s and the 1930s. The role of the public sector in general is not analysed in this study, however, although its importance is acknowledged.[19]

1.3 Methodology

"The Cliometrics revolution is dead."[20] This statement by A. J. Field is from his article on the future of economic history. He meant that the ideas of more technically oriented economic history (under which the "new economic history" or "cliometrics" was organised) no longer inspired younger researchers.

Cliometricians emphasised the use of statistical sources and causal explanation rather than simple descriptions. Most discussion in economic history before the 1950s remained primarily qualitative, while numerical information was used for illustrative purposes. Cliometrics attempted to combine theory and fact, and instead of using verbal metaphors and general phrases, cliometricians were eager to ask questions such as "how much?", "how large?", and "how representative?".[21]

Cliometrics brought in quantification of the impact, interrelations and directions of change. Even though the new economic history relied heavily on economic methodology, the best contribution of cliometrics has been considered to be the studies filling empty economic boxes with quantitative facts.[22] As a result, statistics and mathematics came to be widely employed by the new economic historians.[23] However, cliometrics should be considered as a part of economic-history research in which the analytical approach based on the economics methodology is emphasised.

While quantitative economic history has become an integral part of this research, especially in the United States, it is still of limited interest in Finland. Until recently, one of the only Finnish contributions was the compilation of the historical national accounts in the 1980s. However, some of this deficiency has

18 Appleyard & Field (1998), p. 134.
19 On the role of the public sector, see Eloranta & Kauppila (2006) and Eloranta & Kauppila (2007), for example.
20 Field (1987), p.1.
21 Fogel (1966), p. 652; McCloskey (1978), p. 18.
22 McCloskey (1978), p. 19.
23 For further readings on cliometrics and studies under new economic history see, for example, Rawski et al (1996); Field (1987); McCloskey (1978); Fogel (1975); Fogel (1966).

been remedied recently with new publications that take a look at Finnish economic history from a cliometric perspective.[24]

Methodologically this study combines historical national accounts with input-output tables and related economic analysis. This is not a new approach. Since the system of national accounts recommendations was introduced, many of the input-output tables have been compiled according to the supply-and-use approach. Moreover, the current compilation process of the Finnish national accounts is based on the construction of supply and use tables, as recommended under national accounting methodology. As a result, Statistics Finland publishes annual supply and use tables as well as input-output tables. Input-output methodology has also been applied in economic history. Questions such as the impact of technical improvements in transport on economic development, the impact of tariffs on resource allocation, sources of change in the distribution of incomes, and the contribution of war to industrialisation have already been studied using an approach identical or similar to the input-output framework.

Input-output analysis was introduced in 1936 by Wassily Leontief as a theoretical framework and an applied economics tool in his publication of the first input-output tables for the United States for 1919. The introduction of this methodology meant that students of economics no longer needed to base their analysis upon assumed numerical setups, but were instead able to draw conclusions on national production, consumption and distribution from actual statistical information.[25] Quantification of developments proved valuable.

Supply and use tables are an essential part of the system of national accounts that is integrated into the national accounting structure. An input-output model built around a symmetric input-output coefficient matrix can be derived from the system of national accounts (SNA) framework of supply and use. The SNA, again, is an essential part of the compilation process, as it provides a comprehensive framework in which statistical data on transactions between establishments is presented. It also forms a basis for reliability estimation, providing a means to overcome problems of data reliability with its systematic approach to table construction.

There are only very limited numbers of input-output tables available that have been constructed especially for the purposes of economic history, however. This is not surprising, as the amount of high-quality statistical data required in constructing historical input-output tables is immense, and thus the construction of the tables is very labour-intensive, especially if the aim is to produce reliable and accurate figures. In addition, perhaps the seeming complexity of and the lack of knowledge about national accounting structures often create barriers for researchers against employing input-output methods in economic history. Most importantly, there is still clearly the question of motivation. Even historical national accounts are labour-intensive to compile, but they are still widely used.

24 For further readings on cliometrics in Finland, see especially Jalava et al (2007) and Ojala et al (2006).

25 Kohli (2001), p. 192; Leontief (1951), p. 9.

If the construction of input-output tables was motivated by factors other than economic analysis, more economic historians might be working on the compilation. One major motivating strategy might be the compilation of supply and use tables, which already provide valuable information on the economy, and more importantly, can be used for sensitivity and reliability analysis of the historical national accounts. Furthermore, input-output tables, once constructed, provide a good basis on which to build general equilibrium models and social accounting matrices.

Historical national accounts can be exploited in the construction of input-output tables, and are available in many countries. A Nordic project is underway to produce a uniform framework for Nordic historical national accounts, and this will form a solid base for comparative studies of the economic performance of the countries concerned. There has not so far been any attempt in Finland to construct historical input-output tables, despite the existence of the historical national accounts data. Furthermore, regardless of the clear benefits of the supply-and-use approach, it has not been adopted so far in the compilation of historical input-output tables. This is thus a first attempt at such a task, and one of the outcomes of the study will be to put the supply-and-use based input-output approach to the test.

Input-output analysis has a lot to offer economic history. Its virtues are in its operational simplicity and the high level of disaggregating it makes possible in the analysis of any issue. Problems of table construction can be overcome partly with the use of more sophisticated methods (supply and use tables), and by referring to research conducted in other areas of economic history, especially historical national accounts.

Historical national accounts (HNA) have already proved to be an efficient and important method in the quantification of economic developments. They have been used in many studies focused on reconsidering the process of industrialisation, social-history developments and economic analysis. They have also contributed to other areas of research as valuable background information in terms of the quantification of important components.

As Robert William Fogel put it, simple quantification will not transform history into a science.[26] Its most significant benefit comes from the fact that it expands the amount of data from which historians can draw their results. The use of more economics-oriented methods may also bring unexpected dangers, however. Reliability is of crucial importance in calculations of economic statistics and historical national accounts. Ever since the increase in the use of quantification in the new economic history, criticism has been aimed at the use of inaccurate data. The cliometricians are to blame for this to some extent. Constant re-construction of historical national accounts series, for example, together with new conclusions on the timing of industrialisation, have made it easy to come up

26 Fogel (1975), p. 349.

with doubts about the reliability of the calculations. The question of reliability is always present when it is a question of working with historical data.

It is therefore important that any new statistical data includes assessment of the reliability of the calculations. This significantly increases the usability of new estimates and gives other users more confidence in terms of how strongly they can rely on them when drawing their conclusions. It also reduces the need for further revision of the estimates if it can be demonstrated that the calculations could be considered reliable enough to encourage other researchers to concentrate on the points that require the most revision.[27] Reliability estimations, if correctly applied, may also clip the wings of critics questioning the use of more technically oriented economic history.

This study follows the tradition of cliometrics, in which one of the most promising but still very seldom used methods is that of input-output, and it draws heavily on new statistics and data provided by the input-output table constructed. Quantitative facts are brought into the discussion on the interdependencies of industries in Finland in the 1920s and the 1930s.

1.4 Structure

Chapter two of the study reviews the growth and structural change in Finland during the inter-war period using existing data and statistics on gross domestic product, foreign trade, consumption, wages and tariffs. It also reviews and summarises the main conclusions drawn in Finnish research on the Great Depression, on the basis of which it builds up the main research questions.

Methodological matters are explored in Chapter three, which reviews the theory and use of historical national accounts, especially in Finland. The possibility of estimating the reliability of historical national accounts is discussed, and the foundations of input-output methodology reviewed, with an emphasis on the theory of supply and use. The potential of these tables for both statistical and analytical use is also discussed, and their application in economic history is reviewed.

The fourth chapter presents the methodology and main sources used in the construction of the first Finnish historical input-output tables describing the Finnish economy in 1928. In addition, it also forms the basis for an appraisal of supply-and-use-based input-output tables as a means of analysing the reliability of the calculations – estimated in relation to existing historical national accounts estimates. More importantly, it gives an estimate of the level of confidence for the constructed tables, and presents a new revised estimate of the gross domestic product in Finland in 1928.

Chapters five and six form the main analysis of the study. In Chapter five the constructed input-output table is applied in an analysis of the structure of the Finnish economy at the dawn of the depression. The analysis is carried out from

27 Feinstein & Thomas (2001), pp. 3–4.

both the supply and demand sides of the economy with a view to identifying the key industries. These are defined based on their relative size, or on their linkages and interdependencies in terms of other industries. Import dependency is analysed in detail, and industries are analysed in terms of their labour and capital intensity – thereby addressing the question of the relative advantages of industries as well as of the Finnish economy as a whole.

Chapter six brings short-term developments into the discussion. The constructed input-output table is extended into a static input-output model analysing the impact of key industries identified earlier on economic development. The result is a more thorough analysis of the interdependency of industries in the Finnish economy, as well as of the possible factors involved in the outcome of the crises. Furthermore, the roles of domestic market industries, export industries and private consumption are compared, and that of tariffs in the depression analysed using the concept of the effective rate of protection. An input-output-based price model is used to identify the impact of tariffs on consumer prices.

The final chapter, seven, summarises the results obtained from the analysis of the Finnish economy. The research questions elaborated on in Chapter two are answered based on these results. The chapter also reviews the shortfalls of the methodology used, and discusses possible extensions of the input-output model and a future research agenda.

The appendices include detailed descriptions of the methods and sources used by each industry in the construction of the Finnish input-output table for the year 1928. They also incorporate all the related statistical tables, including supply and use tables, input-output tables, input coefficients, Leontief inverse matrix, and capital and labour coefficients describing the Finnish economy in 1928.

2 The Finnish economy during the interwar period

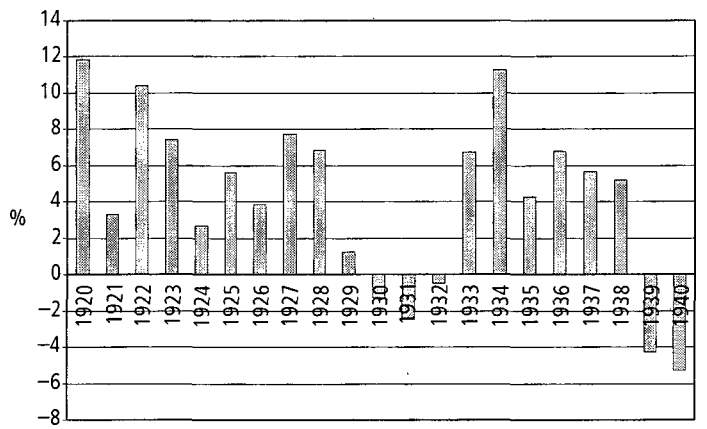
2.1 Growth, depression, recovery

The Bolshevik revolution in 1917, the Finnish declaration of independence in December 1917, and the onset of a four-month Civil War in 1918 cut off Russian imports of cereals to Finland. As a result, Finland had great difficulties in obtaining vital foodstuffs. In addition, the chaotic conditions in Russia deprived the Finnish export industries of their important market. Great difficulties also arose from the depreciation of the Finnish currency.

By the middle of the 1920s, however, the situation had changed and the Finnish economy had made progress. The pre Finnish Civil War GDP level was achieved by 1922. This was also noted in the Finnish Trade magazine, praising the economic development and arguing that "economic conditions have entirely changed, and within a comparatively short period independent Finland has made tremendous strides towards financial stability and economic prosperity."[28]

In fact, the inter-war period was a time of rapid economic growth in Finland. Between 1920 and 1938, the annual average GDP growth rate was nearly five percent, and the annual growth rate exceeded six percent during the years 1920–1928 (Figure 1). This was high even by international standards. The beginning of the

Figure 1. Annual growth in the real gross domestic product in Finland, 1920–1940 (%)



Source: Hjerppe (1996).

28 Hjerppe (1989). Reference from Finnish Trade, No. 11, 30.11.1927.

1920s was thus a time of outstanding expansion in economic activity. This situation changed after 1928, however: the economy first stagnated and finally went into depression from 1929 until 1933. The relatively fast post-depression recovery soon put it back on the growth track of the 1920s, measured by GDP.

The Great Depression took the Finnish economy by surprise. Both agriculture and manufacturing had made great progress in the 1920s. Wood products were the most important export item and the balance of trade continued to grow. Even the financial position of the Finnish state was still considered "thoroughly sound and satisfactory"[29] at the end of 1927. The first signs of the depression started to show in early 1928, and by midsummer it was obvious that economic growth had come to a temporary halt. Contemporary analysts noted the worsening credit situation and the decline in the export of wood products instating that "a setback may be expected" [30].

Members of the Finnish Sawmill Association agreed to restrict production by 10 percent in May 1928 in response to overproduction and falling prices. The volume of exports continued to decline, however, while imports increased as a consequence of the wealth accumulated during the economic growth, leading to an increase in private consumption. The economic boom still continued in the form of expanding house construction, further increasing the need for imports. The bad harvest of 1928 further worsened the economic situation.[31]

While the first signs of the Great Depression were visible in 1928, it really began in 1929 if measured by the gross domestic product, which was still a year earlier than in many European countries. The decline in real GDP was quite moderate compared with most countries, however. According to Riitta Hjerppe's calculations of the arithmetical average GDP development in twelve European countries, the decline in Europe was about six percent. It declined by only four percent in Finland during the same period, and remained below the 1929 level only for three years.[32]

According to Hjerppe, the Finnish depression also seemed mild due to the fact that it affected different industries at different times. On the evidence of her estimated contrafactual GDP for Finland for the Great Depression, if the peaks and troughs of the different sectors had coincided, the decline in GDP would have been triple the actual figure (12 percent).[33]

Of all industries, agriculture and forestry had pre-depression production peaks as early as in 1927. With the collapse of sawn goods prices and the crop failure of 1928, there was a decrease in agriculture and forestry production. However, recovery had already started in the agriculture sector when other

29 Finnish Trade, No. 11, 30.11.1927.
30 Mercator, No. 26, 30.6.1928.
31 Suviranta (1931b), p. 15.
32 Hjerppe (2004a), pp. 15–17. The Great Depression is typically thought to have started in 1929 when industrial production in the United States began to fall. The Finnish case clearly demonstrates that this only worsened the already critical position of the country. See also Eichengreen (1992), p. 222
33 Hjerppe (2004a), pp. 17–18.

industries came to a standstill: the depression lasted only for two years and the pre-depression level of production was passed in 1930. Recovery in forestry was much slower: the industry reached the 1927 level only in 1936. The manufacturing industry, in turn, expanded rapidly until 1929. The production level then fell for four years until the pre-depression level was again passed in 1934. Manufacturing production decreased by about 15 percent during the depression. The relatively small decrease in manufacturing was mainly due to positive developments in the paper industry (Table 1).[34]

The depression in the house construction was severe. House construction experienced rapid growth in 1928, the volume increasing by over 40 percent from the previous year, but the bubble burst in 1929 and output nearly halved during the depression years. The industry did not recover before the Second World War, and was still below the pre-depression level of production at the end of the 1930s. Land and water construction continued its growth mainly due to the government-sponsored work that was specifically aimed at major infrastructure investments, but also because of other basic investments that were required by the new state. Services, on the other hand, were far less affected by the depression, and public-service activities increased during the whole period.[35] Transport was naturally affected, as demand for transported goods declined. Of the services, banks were hit the hardest: the depression was deep and late, and there was a decline in volume from 1932 to 1937.[36]

Table 1. Volume index of production by industry, 1926–1936 (1926=100)

Industries	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Agriculture	100	106	99	102	113	115	118	118	129	131	131
Forestry	100	111	108	100	89	83	82	93	108	105	111
Hunting and fishing	100	98	100	111	119	141	136	150	143	139	167
Manufacturing	100	110	127	133	121	111	113	123	147	163	183
House construction	100	107	149	116	94	77	90	75	92	108	122
Land and water construction	100	116	125	140	164	178	211	224	225	225	227
Trade	100	107	113	126	125	128	124	131	135	146	170
Banking and insurance	100	110	124	132	135	133	118	116	115	114	109
Housing	100	103	108	110	112	113	115	116	118	120	122
Transport	100	109	122	121	118	112	110	122	140	148	161
Public services	100	95	107	115	118	125	130	135	137	136	138
Private services	100	104	105	105	105	109	102	106	111	118	131

Source: Hjerppe (1996).

34 Hjerppe et al (1976), pp. 40–44.

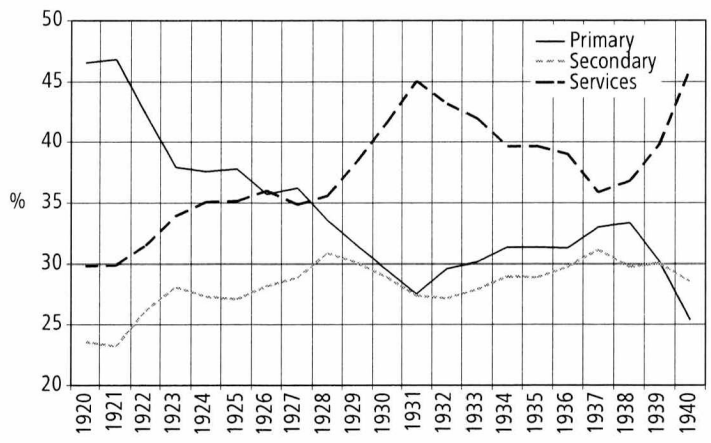
35 In case of private services, the volume index of production suffers from the lack of more detailed data and therefore the results do not fully reflect annual economic fluctuations.

36 Kohi (1977), pp. 24–27; Pihkala (1974), pp. 257–275.; Hjerppe (2004a), p. 17.

It is argued that the 1920s and the post-depression 1930s marked a return to the old, long-term growth path.[37] This is true in the case of the annual GDP growth rate, which was again at a record high, 6.6% on average, in 1933–1938. It should be noted, however, that even though the growth continued after the depression, a significant development, one of structural change, was taking place in the economy (Figure 2).

The structure of the Finnish economy was still very much agrarian in the 1920s, although the situation was changing slowly. Manufacturing industry was emerging strongly, gaining ground from the late 19th century onwards, and was favoured during the first decades of independence. Primary production still accounted for nearly half of the gross domestic production in Finland at the beginning of the 1920s, although manufacturing and services were increasing their shares very rapidly. As a result, services passed agriculture in GDP percentage at the end of the 1920s, although primary production was still the largest source of employment.[38] The Great Depression of the 1930s revised the process of structural change. Its effects were felt first in primary production, especially forestry, with a decline in GDP share. When the GDP share of manufacturing started to fall, the decline in the primary sector was stopped. However, it was secondary production, and especially construction, that suffered the most: GDP share fell from 1928 until 1932, after a long period of growth.

Figure 2. GDP share of primary production, secondary production and services, 1920–1940 (%)



Source: Hjerppe (1996).

37 Heikkinen & Kuusterä (2001), p. 26.
38 Hjerppe (1989), p. 65.

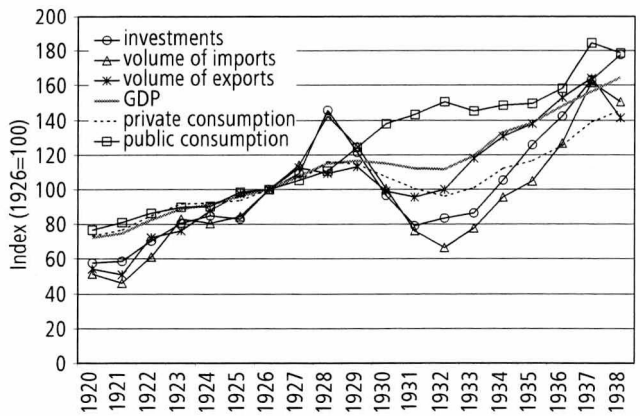
Services' share, on the other hand, continued to grow. The GDP percentage share fell from 1932 until the start of the Second World War, but the sector nevertheless maintained its number one position in terms of size throughout the depression. In terms of GDP share, primary production remained the second largest sector while secondary production accounted for less than 30 percent almost over the whole period. The Great Depression halted the growth in secondary production for a long period of time.

The interwar period has been characterised as a transition period towards a high-investment-ratio regime in Finland.[39] Investments expanded during the early 1920s, peaking in 1928 with the boom in construction activity. The depression brought this development to a halt, but the growth in investments continued again afterwards. It is worth noting that the 1928 level was only exceeded in 1937 (Figure 3).

Private consumption reacted strongly to the depression: the volume of private consumption fell by 17 percent between 1928 and 1932, while GDP fell only by a few percentage points. Interestingly enough, the ratios were usually the reverse in other countries: consumption fell less than GDP.[40]

The start of the Depression was consequently felt strongly in both investments and private consumption, which also recovered relatively slowly compared with exports and GDP. The volume of exports fell from 1929 onwards, recovering rapidly as early as in 1933, however. This is not very surprising, as the

Figure 3. Volume index of gross fixed capital formation, exports, imports, GDP, private consumption, and public consumption in Finland, 1920–1938 (1926=100)



Source: Hjerppe (1996).

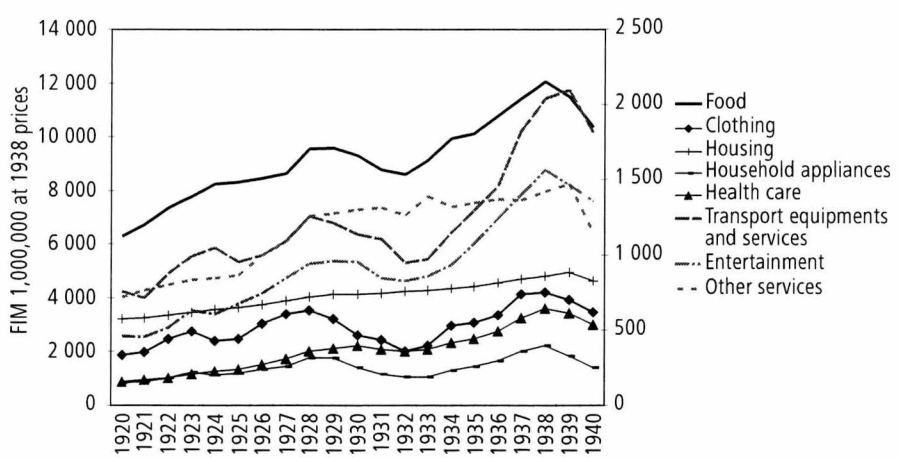
39 Heikkinen & Kuusterä (2001), p. 28.
40 Hjerppe (1996); Heikkinen & Kuusterä (2001), p. 33.

relationship between GDP and exports was generally strong. Veikko Halme calculated that the correlation coefficient between GDP and exports was as high as 0.97 during the years 1926–1952.[41] The volume of imports followed that of investments very closely, and fell drastically from 1928 onwards, and recovery was even slower than in the case of investments. Public consumption, in turn, continued its growth during the whole period. This increase was partly due to support from the government in order to ease the economic downswing.

Despite the great fall in the volume of private consumption during the depression, the composition of household expenditure did not change dramatically during the interwar period. The share of necessity products, such as food, clothes, housing and health care, of total private consumption decreased slightly from 84 percent to 78 percent in 1920–1940. This is not surprising as the income elasticity of necessity products is generally low. The consumption of luxury goods increased to some extent, from 16 to 22 percent of GDP during the same period.[42]

According to the Eino Laurila's study, clothing and transport equipment and services were the first to be affected by the depression, reaching their pre-depression consumption peaks in 1928. The consumption of food, household appliances, and entertainment continued to grow until 1929, and private expenditure on health care until 1930. Both food and health-care consumption recovered quickly and passed their pre-depression levels in 1934. More money was again spent also on transport and entertainment after the depression. Private expenditure grew significantly towards the end of the 1930s, and it was only the

Figure 4. Private consumption, 1920–1940 (FIM 1,000,000 at 1938 prices)



Food, left axis; others, right axis
Source: Laurila (1985).

41 Halme (1955), p. 339.
42 Laurila (1985), pp. 464–599.

consumption of clothing and household appliances that remained below the pre-depression level until 1937 (Figure 4).

There was also a demand for investments in the new nation, which doubled during the interwar period compared with the first decades of the 20th century. The investment rate rose from around 10 percent of the GDP in the early 1920s to nearly 20 percent towards the end of the 1930s.[43] Most investments were directed towards the railway system, improvements in agriculture and farming, industrial establishments and power stations, as well as to improvements in postal, telegraph, port and other public services. In order to finance these investments, the government, large cities and a few companies took loans from abroad. The national debt was considered "fairly moderate", however. [44]

All foreign loans represented about 25 percent of the GDP, and total government debt still represented around 13–14 percent at the end of the 1920s. No new long-term foreign loans were available during the years of depression, but because of the decline in the gross domestic product and in the value of the Finnish currency, the relation of total foreign debt to the GDP rose to over 45 percent. This fell rapidly after 1933, however, when the devaluation of the dollar by about 40 percent depreciated the current (Finnish markka) value of the national debt.[45]

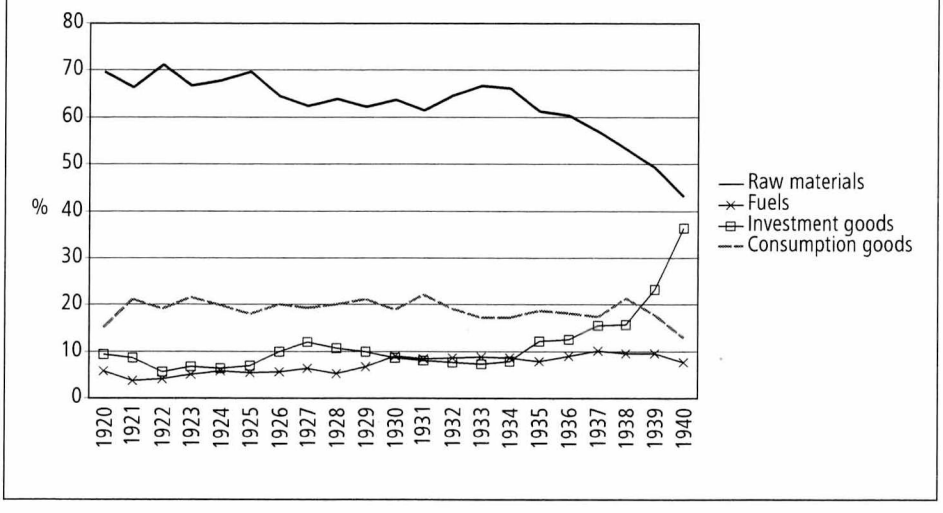
The Finnish economy was greatly dependent on foreign imports: of the products consumed by households nearly 14 percent were imported. In the case of food products, nearly 40 percent were of foreign origin. More importantly, Finland was highly dependent on foreign raw materials, semi-finished goods and investment goods: over 33 percent of manufactured products and over 50 percent of investment goods were of foreign origin.[46] The raw-material-oriented structure is evident in the fact that they comprised between 60 and 70 percent of all imports. The main groups were cereals, sugar, coffee, other food products, iron and steel products, and textiles (Figure 5).

Export developments were favourable in the early 1920s. Finland was able to replace its lost trade with Russia by establishing trade relations with Western Europe and the United States. In terms of structure, forest products were in a dominant position: 85 percent of exports comprised various forest-related products during the 1920s and 1930s. However, there was a major structural change during the depression (Figure 6).

Pulp, paper and paper products (mainly pulp) became the most important export article, with the exception of the temporary increase in the value of wood exports in 1934. This change was also coincidently noted in the economic press, where it was argued that as the production of pulp and paper increased, the output of sawmills had to be reduced if a satisfactory balance of timber supplies was

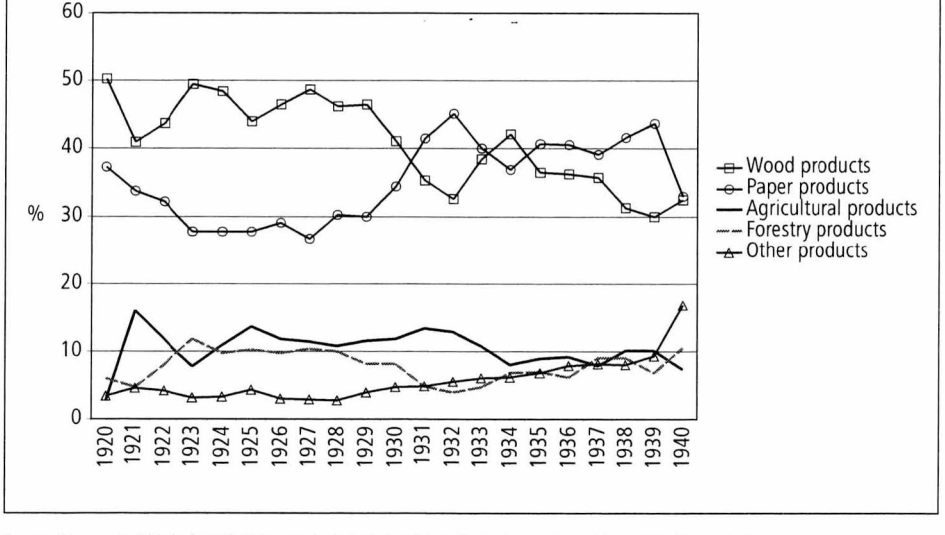
43 Hjerppe et al (1981), pp. 4–5.
44 Hjerppe (1997), p. 13; Reference from Finnish Trade, No. 11, 13.11.1927.
45 Hjerppe et al (1993), pp. 11–12; Hjerppe (1997), pp. 13–16.
46 The author's own estimate. See Chapter 5.2.

Figure 5. The structure of imports, 1920–1940 (%)



Source: Oksanen & Pihkala (1975)

Figure 6. The structure of exports, 1920–1940 (%)



Source: Oksanen & Pihkala (1975). Other products include mining, food, chemicals, metals, and textile products.

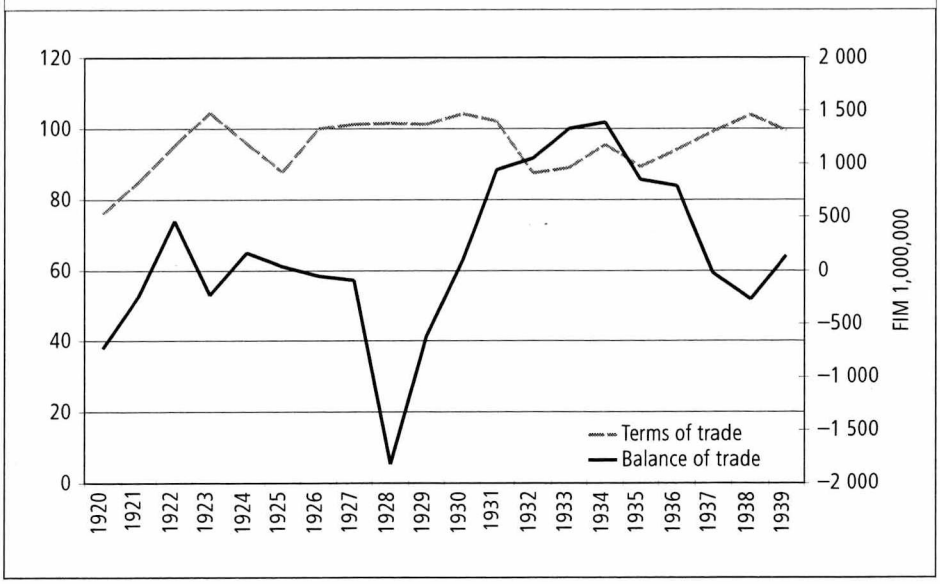
to be maintained. The centre of gravity in the woodworking industry was moving from sawing to more refined processes, the manufacture of pulp and paper.[47]

47 Mercator, No. 26, 30.6.1928; Mercator, No. 24, 15.6.1929; Mercator, No. 50, 13.12.1929.

Trade was more or less in balance before the Great Depression (Figure 7). In 1928 there was a great deficit, however, as a consequence of an increase in imports of more than 25 percent at current prices from 1927 to 1928. The level of exports remained around the 1927 level in current terms. At the same time, exports exceeded imports, which is typical of Finland in international downturns. The balance of trade became positive again after the depression. The terms of trade (the ratio of export prices to import prices) had remained stable during the early years, and world prices of forest-industry products remained relatively high compared with the import prices of agricultural and industrial products. Even though the terms of trade took a turn for the worse in 1932, the balance moved onto the surplus side.[48]

An important factor in the development of exports was the change in prices. During the years 1925–1928, which have normally been regarded as a period of growth, there were continuous problems with the export of wood and paper products. Average prices for the main export articles such as wood pulp fell by 30 percent from 1926 to 1928, and for cardboard and newsprint by 20 percent. Prices for pine batten had fallen in 1925, recovering only temporarily in 1927 (Figure 8). This downturn was mainly caused by the return of the Soviet Union to the export markets with the dumping of wood products. The economic problems in the main export country, the United Kingdom, further worsened the situation through a fall in demand. At the same time, the price for standing timber

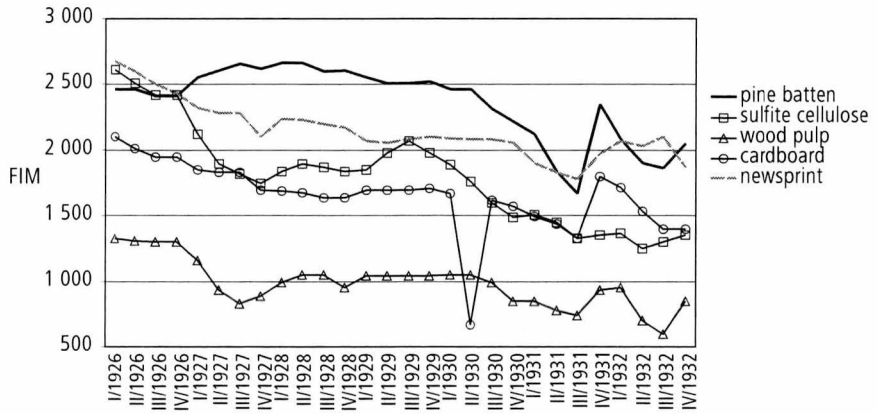
Figure 7. Balance of trade (FIM million) and terms of trade, 1920–1939



Terms of trade, left axis; balance of trade, right axis
Sources: Hjerppe (1996).

48 Hjerppe (1989), pp. 154–158.

Figure 8. Average export prices for the main export articles (FIM)



Source: Halme (1955). Pine batten FIM/std, others FIM/ton.

increased by over 60 percent from 1926 to 1927. This, together with the falling sales prices and increasing competition, resulted in a serious problem with profitability in the export industries.[49]

Paper exports were at a record high in 1928, however. Increased usage had caused increased demand, and rationalisation in the industry had further softened the effects of the depression.[50] Jorma Ahvenainen has calculated that over half of the savings in the cost of producing newsprint between 1929 and 1933 were due to technical development in the mills. Measures taken to reduce costs made it possible for paper mills not only to retain but also extend their markets.[51] Falling world prices and increased competition eventually led to a decline by 1930, however, until recovery started again in 1933.[52]

The recovery in exports was facilitated by the improving world economic situation, which boosted demand. Another important factor was the abandoning of the gold standard in the autumn of 1931. Finland had joined the standard at the beginning of 1926, but followed the example of its major trading partners, led by the United Kingdom, in leaving it. Following the floatation of the currency and the subsequent de facto devaluation, the Finnish markka was undervalued against its main trading partners, which helped to promote exports during the 1930s.[53]

49 Halme (1955), pp. 216–233.
50 Hjerppe (2004a), p. 18.
51 Ahvenainen (1976), pp. 36, 45.
52 Halme (1955), pp. 231–243.
53 Hjerppe (1989), pp. 155–156; Halme (1955), pp. 241–242.

Changes in world prices were not all that catastrophic for Finland. Even though export prices for manufactured goods fell, the price of many imported raw materials also fell. A significant downturn in export prices began in 1929, but import prices fell even further, in some cases more than export prices, with the result that the same amount of exports still financed more imports than before yet in 1929. Terms of trade, however, became worse later on. The decline in export prices was further eased by output restrictions in the industries concerned. In 1930, pulp manufacturers in Finland, Sweden and Norway agreed to reduce production by over 30 percent, and sawmill owners to reduce shipments of sawn goods by 20 percent. Furthermore, wages fell as well, further easing the economic position of industries.[54]

As wages fell, the fall in prices was a positive phenomenon from the wage earners' perspective, but the situation was far more serious for the farmers. As prices went down and demand for agricultural products (including forestry products) declined both abroad and domestically, the nominal income of farmers fell. At the same time, interest rates stayed high, causing many of them severe debt problems. As more than half of the population depended on agriculture for their income, the volume of private consumption fell. As seasonal work offered also in forestry became less, unemployment figures rose significantly.[55]

Table 2. The development of export and import prices for certain products, 1928–1934 (1928=100)

	1928	1929	1930	1931	1932	1933	1934
Export prices (fob)							
Meat	100	92	87	77	71	69	66
Butter	100	94	76	67	65	53	43
Cheese	100	91	79	74	75	72	69
Wood products	100	97	94	73	71	76	89
Pulp	100	101	97	76	77	76	79
Wood-pulp board	100	101	101	87	94	96	98
Paper	100	93	89	81	79	71	65
Import prices (cif)							
Raw materials and semi-finished goods	100	93	78	66	72	69	66
Machinery	100	106	105	96	109	118	116
Manufacturing products	100	107	100	89	93	89	77
Food products	100	92	70	55	70	65	59
Clothing	100	98	87	72	71	69	68
Agricultural inputs	100	92	77	69	78	72	67
Other products	100	102	91	81	92	88	82

Source: SVT 1 A 1929–1935.

54 Suviranta (1931a), pp. 27–28; Halme (1955), pp. 216–226.

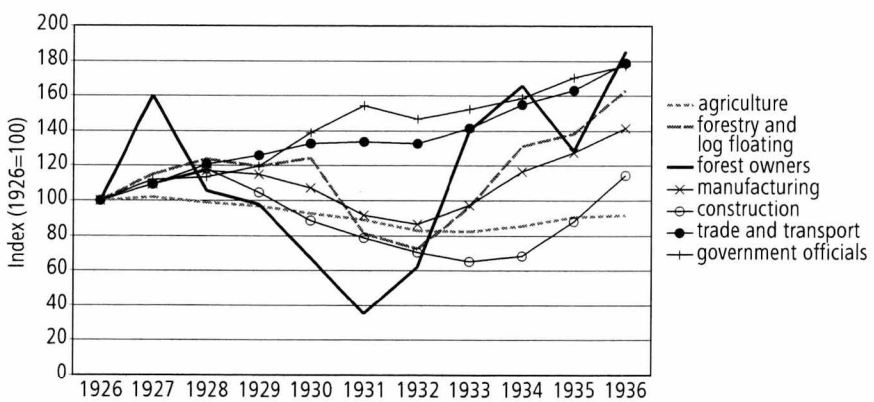
55 Hjerppe (2004a), pp. 20–21; Heikkinen & Kuusterä (2001), p. 33; On seasonal work, see KOM 2:1932, pp. 22–26.

The income of forest owners fell nearly 70 percent in nominal terms, while nominal wages fell more than 30 percent in agriculture, 37 percent in forestry, 25 percent in manufacturing, and 45 percent in construction. It was only in trade and government that income increased during the depression. However, as prices fell more than wages, real incomes did not fall as dramatically as nominal incomes, although the effects were still severe in various industries: the percentage fall in agriculture was 18, in forestry 27, in manufacturing 13 and in construction 35, while the real incomes of forest owners fell by around 65 percent. Recovery from the depression was rapid for forest owners and lumberjacks, however, as once the export industry had picked up, both wages and income in forestry grew steadily. Agricultural wages, in turn, had not recovered by 1936, and real wages in construction remained far below the pre-depression level until 1936 (Figure 9).[56]

Tariffs were an important source of government revenue during the 1920s and 1930s, accounting for around 40 percent of the total at the start of the First World War. Growth in foreign trade and higher tariffs increased this proportion to 55–60 percent, where it remained during the whole inter-war period.[57]

The Finnish tariff policy during the inter-war period affected not only government revenues but also agricultural producers and industries on the domestic market. Problems of self-sufficiency in food production and the food crisis triggered the idea of protecting domestic production against foreign competition.

Figure 9. Real income by industry or profession, 1926–1936 (1926=100)



Sources: Nominal income series Waris (1945). Series deflated by the cost-of-living index.

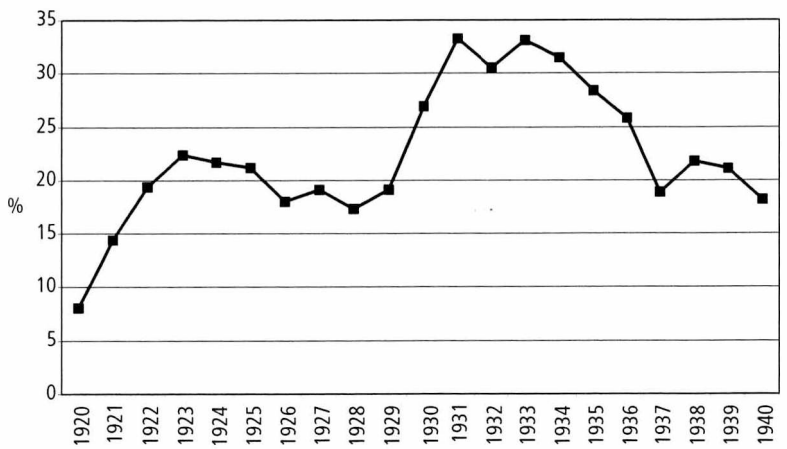
56 For more on wages in construction in Helsinki, see also Hannikainen (2004), pp. 110–131.
57 Heikkinen (1994), p. 392.

Industries producing for domestic markets also claimed the need for protection, and a new customs tariff was therefore introduced immediately after independence, in 1919, affecting as many as 961 articles. The tariffs were based on the quantity of imports during the whole period, which was somewhat problematic due to the high inflation. They were increased by 200 percent in 1920.[58]

Tariffs comprised around 10 percent of the import value immediately after the reform, and the introduction of "starred tariffs" (tähtitulli)[59] in 1921 raised the level to over 20 percent. The starred tariff system made it possible for the government to increase the customs duty on certain, mainly luxury, articles tenfold without changing the legislation. The number of articles affected was expanded in 1922, but the increase in tariffs was only fourfold. The Great Depression brought with it a protectionist nuance that partly explains the rise in the tariff level in the 1930s. However, as the volume of imports decreased, the total revenue from the customs duties also fell, which according to Juha-Antti Lamberg, confirms the protectionist nature of the tariffs in the 1930s.[60] Customs duties exceeded 30 percent of the import value in 1931–1934 (Figure 10).

Food shortages in 1917–1918, military considerations and social unrest all fuelled support for protective tariffs for agriculture in the 1920s. Grain duties were still relatively low in 1919, but were raised significantly from 1921 onwards: the tariff for rye was still 8 pennies, and for wheat 11 pennies, per kilo-

Figure 10. The proportion of customs duties of the total import value, 1920–1940 (%)



Source: SVT 1A, 1920–1940.

58 Lamberg (1999), pp. 37–38. Heikkinen (1994), pp. 382–385, 388.

59 The Council of State had the authority to raise or lower tariffs that were marked with * in the tariff list, hence the name starred tariff.

60 Lamberg (1999), p. 38.

gram in 1919, but by 1928 the figures had risen to 50 pennies and 75 pennies respectively. There was a further significant increase during the depression as the price for cash crops fell due to import of cheap grain: wheat tariffs were raised to 135 pennies per kilogram, while those for rye were based on a sliding scale varying between 75 and 125 pennies depending on the import price. In addition, tariffs for barley were raised from 75 pennies to 100 pennies per kilogram, non-branned rye flour from 90 to 145 pennies, branned rye flour from 130 to 225 pennies, rye flour from 80 to 95 pennies, barley flour from 100 to 150 pennies and wheat flour from 150 to 210 pennies. In 1931–1936 the duties on wheat exceeded the other purchasing costs, and on rye were twice the world market price.[61]

Tariffs for animal husbandry products were also raised significantly between 1928 and 1934: the duty on lard was raised from 180 pennies to 700 pennies per kilogram, on pork from 135 to 600 pennies, on margarine from 150 to 600 pennies, and on butter from 200 to 1,200 pennies.[62] In addition, both crop farming and animal husbandry were given other forms of government support in the form of soil amendments, cheap loans, export subsidies and subsidies for new settlements, for example.[63]

The most important industries producing for the domestic markets included the manufacture of food, textiles, leather goods, and metal products. There had been a tendency to protect domestic industries in the 19th century, but overall the tariffs had been considered revenue tariffs.[64] Furthermore, they were not raised significantly compared with agricultural tariffs, for example. Tobacco and certain other luxury items (coffee and sugar), in turn, attracted high tariffs (Table 3).

Table 3. Average tariffs for certain manufacturing products, 1912/13, 1923/24, and 1937/38 (% of CIF value)

	1912/13	1923/24	1937/38
Metal products	6.2	11.6	6.0
Glass products	18.8	27.3	25.8
Cotton products	10.0	11.8	24.0
Sugar	86.5	51.6	195.0
Tobacco	47.6	167.0	237.0
Coffee	22.0	81.0	86.5

Source: Lamberg (1999), p. 45.

61 Jutila & Konttinen (1936), pp. 25–26; Kalela (1987), pp.84–85; Lamberg (1999), p. 42.
62 Jutila & Konttinen (1936), pp. 38–47.
63 Kalela argues that the impact of these on agriculture was relatively insignificant (Kalela 1987, pp. 91–94). Lamberg, on the other hand, concludes that the export subsidies were quite successful (Lamberg 1999, p. 44).
64 Heikkinen (1994), pp. 263, 294.

Because the tariff system was based on the amount of goods imported, it was characteristic of it that as the world prices of products fell, the tariff level was raised automatically measured as a percentage of the import value. Thus, during a period of falling world market prices it was enough to maintain the existing levels. Despite the growth in protection, the Finnish tariff policy during the period has been considered relatively open in comparison with the policies of other European countries. The economic policy was more like automatic stabilisation. It was thought that no large-scale government intervention was needed, and instead of stimulating private consumption, the government concentrated on supporting export industries through devaluation. Domestic market industries enjoyed varying degrees of tariff protection.[65]

The year 1928 was significant in many ways in Finland. The economy was still booming in many industries after the growth period of the 1920s, but then it turned into a downswing, followed by stagnation, and finally depression. Thus, it went through nearly all of the elements of economic change in one year: growth, overheating, stagnation and depression. The Great Depression, in turn, brought the ongoing economic structural change to a standstill for over ten years, and it was only by the Second World War that the economic structure had recovered to the same level as it was at the dawn of the Great Depression of the 1930s.

2.2 *Previous studies on the Great Depression in Finland*

Even though there are studies on the Great Depression of the 1930s in Finland, the Finnish analysis has been particularly focused on the importance of foreign trade. The role of export industries and the growth of imports over exports at the end of the 1920s have both attracted widespread attention in the literature. This is very natural, of course, as Finland has long been dependent on foreign trade, and as a small open economy has quickly felt changes in the world economy.

According to the contemporary researcher Bruno Suviranta, "...real causes [of the Finnish depression] must be sought abroad..."[66]. The expansion and growth of the export industries had also spread prosperity among other industries. Increased earnings resulted in an increase in demand for all industrial products, especially those for domestic markets. The impact was particularly felt in the construction, as the production of new houses increased significantly during the 1920s. The increased consumption capacity created an increase in the import of consumable goods. The expansion in construction activity together with increased production in other manufacturing industries also increased the import

65 Lamberg (1999), p. 39; See also Lamberg's footnote 136 on the Finnish level of protection; Heikkinen & Kuusterä (2001), p. 34–35.

66 Suviranta (1931b), p. 6.

of intermediate products, and as a result, according to Suviranta, the Finnish trade balance became adverse.[67]

Under these circumstances Finland became increasingly dependent on foreign capital. The more the capital was used for productive purposes, the less the national savings satisfied the growing demand for credit. For this reason, in order to relieve the stringency in the capital markets companies raised short-term foreign loans regularly. Thus the continuation of the economic development became dependent upon the foreign capital market. Once the world depression had set in, Finland quickly became affected. Exports fell and the already critical problem of a lack of capital was aggravated as the restrictions on the central capital markets prevented the taking on of new foreign loans. This caused a reduction in available funds at home and a rise in rates of interest to the maximum.[68]

Suviranta admitted that national factors also affected the situation. Thus, the good or bad harvest, industrial development, especially in construction, and the policy of the central bank all had an impact on economic development. The bad harvest of 1928 and the monetary policy both aggravated the already critical situation. Gēnerālly, however, none of the national factors were the driving forces in this development. As Suviranta pointed out, because about 60 percent of the population still lived by agriculture and forestry, with its predominantly domestic-consumption-based form of economic life, the effects of fluctuations abroad did not penetrate very deeply. Only about 45 percent of agricultural products were sold, while the other half was used for own consumption. Otherwise, however, Suviranta argued that none of the industries suffered from the decline in exports as badly as forestry.[69]

The contemporary discussion in the economic press concentrated on the development in the balance of trade as well. The great increase in imports was seen as a result of several factors: economic development, very lively construction activity, improved standard of living, changes in customs duties, and a poor harvest.

The economic development increased industrial activity, which in turn called for more imports in the form of machinery, transport goods and raw materials for industrial investment and production. Very lively construction activity had both direct and indirect effects. It brought about an increase in demand for foreign building material, while at the same time, the income of construction workers increased, resulting in improved purchasing power. This, in turn, led to an increased demand for consumption articles, especially imported food products. Another factor behind the increase in imported food products was the speculative importation that was a consequence of altered customs duties on some consumption articles (coffee, sugar, flour). The government lowered the duty on wheaten flour, rice, coffee and sugar in 1928. Merchants had held back their purchasing at the end of 1927 in anticipation of lower duties, thus leading to an

67 Ibid., pp. 28–30; Suviranta (1931a), pp. 117–118.
68 Suviranta (1931a), pp. 96–98; Suviranta (1931b), p. 6.
69 Suviranta (1931b), pp. 6, 15–16; Suviranta (1931a), pp. 111–114.

increase in imports in 1928. The comparatively poor harvest also necessitated the import of more cereals and cattle fodder.[70]

The contemporary discussion in the newspapers also touched on the role of agriculture in the depression. Agricultural production was considered the hub of the country's economic development, and as the wages rose due to the increased forestry income, the agricultural population became accustomed to a higher standard of living. This caused an imbalance of trade, with an enormous surplus of imports, in 1928. As the balance of payments became worse, the country became involved in a financial crisis, and it was in such a position that it was overtaken by the worldwide slump.[71]

The Finnish Trade magazine also emphasised the lack of capital as a major factor behind the economic downswing. This was attributed firstly to the cautious financial policy of the state in that funds derived from taxation were invested in large infrastructure projects. The second reason for the lack of capital was more short term: the increase in imports for construction and private consumption had tied up unusually large amounts of capital. The construction activity was considered too heavily financed by the banks, which should have kept their funds at the disposal of trade and industry.[72] Similar opinions were also expressed in the Mercator magazine, although it was also pointed out that the crisis was, in fact, a continuation of earlier inflation crises that had been checked but not properly resolved through the stabilisation of the Finnish currency. This had led to rising prices for real estate and various speculations concerning real capital, especially in construction activity. The way out of the depression was considered to be a reduction in purchasing power (and in the import of consumption products) through for example the lowering of salaries. The protection of the domestic market industries and agriculture, and borrowing from abroad were also considered as options.[73]

The Bank of Finland Monthly Bulletin noted the harvest failure of 1928, but considered it only partial failure caused by the exceptional weather conditions. The construction of the Imatra power plant, in turn, was considered a significant step towards reducing imports. Many companies had previously obtained their power from steam-power stations that used foreign coal for fuel, and the new power plant was expected to have a favourable effect on the balance of trade. Furthermore, electrification was considered an important factor in the development of production, and the economic situation was not yet thought to be alarming in 1929. The Bank of Finland still argued that there was no need for concern: fresh investments in manufacturing, agriculture, and especially in housing had led to a shortage of capital, intensified by the bad harvest and a decline in

70 Mercator, No. 12, 23.3.1928; Mercator, No. 26, 30.6.1928; Mercator, No. 16, 20.4.1928; Mercator, No. 21, 25.5.1928; Finnish Trade, No. 7, 31.7.1928; Finnish Trade, No. 10, 31.10.1928; Finnish Trade, No. 11, 31.11.1928; Finnish Trade, No. 2, 28.2.1929.

71 Mercator, No. 50, 12.12.1930.

72 Finnish trade, No. 11, 31.11.1928; Finnish Trade, No. 12, 31.12.1928.

73 Mercator, No. 42, 19.10.1928; Mercator, No. 50, 13.12.1929.

exports, but this was nothing to worry about, only a limitation caused by the building activity, and import controls would soon stabilise the situation.[74]

There has been some analysis of the role of tariffs in the Great Depression in Finland. The committee reviewing tariffs in 1919 based its decisions on protective tariffs on arguments concerning the lower productivity of Finnish labour compared with foreign labour, and the lack of capital for investments. It did admit that higher tariffs might lower the standard of living, but argued that higher prices would also lead to higher wages. One of the main principles of the new tariff system was to limit the import of finished goods, and raw materials were exempt. Furthermore, the protection of agricultural production was also considered a priority because agriculture was seen as a market area for manufactured products. A better income base in agriculture was also considered positive from the manufacturing perspective because of the subsequent increase in consumption.[75]

A contemporary study on the effects of the depression on agriculture conducted by Jutila & Konttinen argued that because Finnish agriculture was a natural part of the economy for the most part, and because the indebtedness of farmers was low, the impact of world prices was relatively mild. The study accentuated the simple mechanisms that were used to control prices. Tariffs on crop farming and animal husbandry were attributed to the halt in the fall of prices for agricultural products, thus significantly reducing the impact of the general depression and low world prices on domestic markets. The tariff policy was generally successful in reducing the impact of the world depression, one indication being the halt in the fall of agricultural prices in 1934, which were 30 percent lower than in 1928. The authors also argued that the otherwise positive development in agricultural profitability was somewhat lessened by the high prices of raw materials. This was considered, in part, a result of tariff protection in manufacturing, and also of the cartel agreements in the domestic manufacturing industries.[76]

Kalela (1987) expressed disagreement with the conclusions drawn by Jutila & Konttinen, however. He argued that the protection of agricultural products through import tariffs only prevented the depression from becoming even worse. Even though the subsidisation of agriculture was the only deviation from the neoclassical economic policy of the 1920s, the protective tariffs were not sufficient to raise the domestic prices of agricultural products. They could not stop foreign dumping, and the tariff levels were therefore raised regularly. Of the political parties, the social democrats opposed the tariffs in the belief that agriculture was being protected at the expense of consumers with lower incomes. It was not only on price that tariffs had an impact. They were also considered a means of increasing self-sufficiency in agricultural production. This self-sufficiency did not benefit farmers with small farms, however. The depression in agriculture was eased by

74 Bank of Finland Monthly Bulletin, No. 1, 1929; No. 3, 1929; No. 8, 1929; No. 12, 1929.
75 KOM 15:1919.
76 Jutila & Konttinen (1936), pp. 11–15, 19, 83–84.

devaluation once Finland had abandoned the gold standard. Kalela thus argues that the expansion of the export industries was the key to recovery.[77]

Representatives of manufacturing industry for domestic market considered the protection of domestic production their priority during the 1920s. Despite their active involvement in the tariff reforms, they were not considered a success. According to the chairman of the Union of Manufacturing Industries (Teollisuusliitto), the tariff policy was formulated in the best interests of consumers, not industries, and did nothing to ease the dumping of foreign products in Finnish markets.[78] According to Kalela, protective tariffs were also aimed at the raw materials required in production for the domestic market. They were low, however, and did not provide any further protection.[79]

According to Ahvenainen and Vartiainen, protectionism dominated the Finnish tariff policy even during the 1920s. New industries such as the manufacture of rubber tyres and radios were given relatively high protection, as were domestic final goods competing with foreign imports. Food production was fully protected, while tariffs on inputs used in manufacturing production were imposed on a fiscal basis.[80]

Lamberg also concluded that Finnish manufacturing industries benefited from the protection, especially during the 1930s when the tariffs were raised on many occasions. He also analysed the winners and losers of the Finnish trade policy in a game setting. He argued that the biggest losers were consumers, especially in urban areas, and the biggest winners were agricultural producers. Domestic market industries, in turn, were also losers relative to agricultural producers: the interest groups concerned were not able to achieve the desired effects on Finnish trade policy and therefore did not win the game.[81]

The most comprehensive study on the connection between exports and economic cycles is the one conducted by Veikko Halme. According to Halme, the development of the whole Finnish economy largely depended on the business cycles of her export industries. Increasing fluctuations in export prices, increasing competition from the Soviet Union, and rising prices for standing timber were already causing serious profitability problems before the depression. Once the major trade partners were affected, Finland was fully hit. Abandoning the gold standard, which coincided with an increase in demand, again led to positive developments in the export industries that were felt in the whole economy after 1932.[82]

High prices for standing timber and the continuing growth in construction activity increased domestic purchasing power – proportionally more than the growth of exports necessitated, according to Halme. Because the downturn in consumer demand was fairly slow, imports still continued to increase when exports

77 Kalela (1987), pp. 19, 72–89, 135–136.
78 Viljanen (1931), pp. 6, 21–25.
79 Kalela (1987), p. 88.
80 Ahvenainen & Vartiainen (1982), pp. 181–182.
81 Lamberg (1999), pp. 48, 134–158.
82 Halme (1955), pp. 234–236, 313–322.

were already slacking. This led to a surplus of imports over exports and seriously affected the balance of trade. The role of consumption was more passive, however, as a force that adjusted the development of domestic products rather than exports and investments. When exports expand, the import of investment goods also expands, while the import of consumption goods only expand after long-term economic growth. However, even investments were a dependent variable in Finland, and were also dominated by developments in exports.[83]

The interplay between consumption and economic development was analysed more thoroughly in the contemporary study conducted by Klaus Waris. His main argument concerning the great slump was that income formation (wages) fell most in the export industries during the depression, followed by capital formation, and least in the domestic market industries. Thus, the export industries had significant indirect effects on the income formation of forest owners as well as of agricultural and, furthermore, construction wages. Many of the construction workers in cities were from the countryside and returned back to their agricultural livelihood once the depression had set in. According to Waris, the fact that the production of consumption goods remained relatively unchanged throughout was a result of the state monetary and tariff policy. Halme also argues that household consumption had a major role in maintaining the positive development in the domestic market industries. [84]

Even though exports started to show signs of a downturn in 1928, consumption did not react very quickly, and even continued to grow. Waris considered the period of 1926–1931 exceptional with regard to consumption, which took up nearly 80 percent of the increase in incomes. Savings, in turn, remained relatively low. The most important form of savings was in the investment of the profits that had accumulated before the depression, and once it was over, savings increased again.[85]

In her most recent study Hjerppe agrees upon the importance of the foreign-trade effects. The export industries played a major role in the economic development during the depression, but there were also domestic reasons. The tightening of the fiscal policy in particular caused strain in the money market that led to economic problems in the construction industry. In addition, the bad harvest of 1928 further increased the depth of the depression.[86]

During the 1920s and 1930s, the farmers themselves consumed a relatively large proportion of agricultural production, and only about half was sold on the market. The price effects of the depression were only felt in the half that reached the markets, and as a result the economic downswing did not affect the agricultural sector to the same extent as in construction, for example. Recent studies

83 Ibid., pp. 249–251, 281–287.
84 Waris (1945), pp. 92–93, 101–105, 207–218. Halme (1955), pp. 341–342.
85 Waris (1945), pp. 191–201, 207–213.
86 Hjerppe (2004a), pp. 28–30.

suggest, however, that agriculture was also in serious difficulties, and that the tight financial situation resulted in the enforced sale of many farms.[87]

Heikkinen & Kuusterä point out that the boom of the 1920s ended – or started to end – in 1927 when foreign sales of the country's main export article, sawn wood, reached record levels. During the following year, lower export revenue, together with the crop failure, increased imports and caused a deficit in the trade balance. The depression of the 1930s was the last time that agricultural cycles had a major impact on the business cycle. Furthermore, the export industries had direct backwards linkages to the primary sector: since the farmers owned most of the forest, fluctuations in the export industries were felt in their incomes and in the wages in the forestry sector. Activity in the overheated urban-building sector started to decrease from 1929 as a consequence of the puritan commitment to the gold standard.[88]

According to Heikkinen & Kuusterä, the trade unions and farmers' organisations were relatively weak pressure groups compared with the industrial organisations. The prices of labour and wood – the most important raw material in forest-industry-led Finland – were therefore elastic. Under these conditions adjustment to the business cycles and recovery from crisis were mostly market-based. Consumption reacted immediately to the changes in economic activity.[89] Hjerppe also concludes that price and wage flexibility was one explanatory factor in the rapid recovery after the depression. There were no sticky nominal wages to prevent firms from transferring the effects of declining demand down the production chain – to wages and raw-material prices. The recovery resulted in a notable decline in the labour-income share of manufacturing, and was also helped by the fact that Great Britain (the most important export country) avoided the deepest depression. The contribution of agriculture, and especially the focus on self-sufficiency, further fuelled the recovery.[90]

By way of conclusion, Heikkinen & Kuusterä claim that the basis for recovery lay in the devaluation of the markka (and the abandonment of the gold standard) in 1931. The recovery in manufacturing was also facilitated by industry's sound financial structure, and the low level of corporate indebtedness made it relatively easy for it to adjust to declining demand and prices. Moreover, Päivi Valkama claims, basing her arguments on her econometric model of depression, that abandoning the gold standard earlier would have further eased the effects.[91]

87 Ibid., p. 21; See also Autio (1996), p. 89.
88 Heikkinen & Kuusterä (2001), pp. 33–34.
89 Ibid., pp. 44, 49.
90 Hjerppe (2004a), pp. 28–30.
91 Heikkinen & Kuusterä (2001), p. 34–35; Valkama (1989).

2.3 Research questions

The above accounts of the economic development in Finland during the inter-war period as well as of the Depression debate in Finland are naturally not comprehensive, but they do give a general view of the arguments and issues that have predominated research so far.

One major issue that is common to all of the above arguments is the question of economic structure. The impact of the export industries on the economy as a whole is largely agreed upon. The dependency on foreign trade and its interconnection with other industries, consumption and investments is acknowledged in all the studies reviewed above, yet none of them includes a comprehensive analysis of the interconnection of these factors. Furthermore, very little is said about the interdependency of individual industries. Effects are often two-way: the impact of a decline in the export of wood, for example, is multiplied by the indirect effects, and as a consequence it is felt again in the wood-production industry. The indirect linkages are usually far greater than the direct ones, yet no analysis of these interdependencies has been carried out.

The above accounts therefore evoke questions that need to be addressed, including the following five research questions dealt with in this study. The first three questions will shed light on what were the typical features of the Finnish industries in terms of structure and interdependency. Based on that information, the last two questions will test some of the earlier conclusions on the Great Depression in Finland.

What were the key industries of the Finnish economy in the late 1920s?
Even though there are extensive studies available on the economic development in Finland during the inter-war period, there is little evidence of the interedependency as well as the relative importance of different industries. It would be therefore important to identify these linkages as well as the key industries of the Finnish economy in the late 1920s.

How dependent was the Finnish economy on imports?
The role of imports is a topic of some controversy. Previous research has pointed out the growth of imports over exports at the beginning of the depression, and has found reasons in increased welfare needs, overheated construction activity, and bad harvests. The question of imports has not been fully analysed, however. Were they directed towards private consumption or investments? Imports for private consumption have a different impact on the economy than imports for productive purposes, for example. Furthermore, can consumption patterns or production structures explain the growth in imports? Could there have been dependency on certain products simply because they were not available in Finland? There is therefore a need to quantify the role of imports in the economy, as well as to analyse possible dependency on them.

Did the structural change in exports have any long-term effects on the economy?
The structural change in the export industries calls for more detailed analysis. According to previous studies, the fact that different industries experienced depression at different times eased its effects: the growth in paper exports compensated for the decline in wood exports. Was this change in structure sufficient to fully compensate for the loss of wood exports? Was it a positive or negative phenomenon? Industries differ in production structure and, as a consequence, their effects are distributed in different ways in the economy. Furthermore, it is assumed in economic theory that in a two-country situation the country with abundant capital will be able to produce relatively more capital-intensive products while the one with abundant labour will be able to produce relatively more labour-intensive products.[92] Thus, the relative competitiveness of the country is related to its use of capital in the production of goods for export. It is therefore reasonable to question whether the structural change in Finnish exports had any positive long-term effects that have been neglected so far in the research.

What was the impact of the export industries on the Great Depression or did any other industries, i.e. the domestic market industries, play a major role in the depression?
The relative importance of the export industries requires quantification. Even the most comprehensive study on the impact of export cycles on economic development suffers from an insufficiency of statistics to allow estimation of the total impact (direct and indirect) of changes in exports on domestic output.[93] Yet it is commonly accepted that the decline and growth in the export of wood and paper products had a major role in the economic development during the Great Depression. The decreasing volume of exported wood products has been blamed for both causing the depression and for affecting the economy as a whole by lowering the production value of the export sector and the income of farmers through the backward linkages between industry and forestry and agriculture. The extent of these effects on the gross domestic product, wages, and especially on other industries, is still an open question, however. In view of the lack of quantification of causality and scale, the unanimity in the studies is somewhat surprising.

Focusing extensively on foreign trade has also excluded some important aspects of the depression from the research agenda. The role of the domestic market industries, as well as of construction, needs further analysis. The decline in the gross-fixed-capital formation of the construction was a domestic cause of the depression that also had a relatively large impact on the economy through the decrease in wages. Again, there are assessments of the importance of the construction in the wake of the depression, but quantification and analysis of its effects in relation to the export industries, for example, are missing. Furthermore, the domestic market industries have been considered mainly a secondary

92 Appleyard & Field (1998), p. 134.
93 Halme (1955), p. 342.

subject given the fact that their economic development has been largely dependent on the economic cycles of the export industries. However, as noted above, private consumption fell more than the gross domestic product during the depression. The roles of domestic consumption and of the domestic market industries therefore require a closer look. Domestic consumption also has a multiplier effect, and the domestic production that satisfies it must compete with imports. Growth in domestic consumption leads to economies of scale and specialisation in production.

What was the role of customs duties in the depression?
There are also some differences of opinion on the role of the tariff policy. The contemporary studies emphasise the impact of the protective tariffs in relieving the tight economic situation of farmers. This alleged successful policy was debated somewhat in later studies, but its impact on the development of different industries remains an open question. The question of tariffs is also closely linked to the discussion on domestic prices, and consequently on consumers. What was the impact of the change in world prices in relation to the impact of tariffs? Not enough attention has been given to their effects on domestic prices even though general conclusions have been drawn. More knowledge is required on the impact of tariffs on industries, and hence on prices, and on what makes winners and losers. A more thorough analysis would also provide information on whether the Finnish tariff policy was as successful as suggested in some studies.

An input-output approach is used in addressing these questions on the structure and interdependency of industries as well as on the short-term developments in the Great Depression. Input-output tables potentially provide new information on the interdependencies and linkages in the economy, also making it possible to fully analyse the effects of a change in the final demand for different industries. The input-output table constructed using the so-called supply-and-use approach also combines national accounts data on economic development with information on the structure of the economy. In the following chapters the focus of this study turns to the methodology of input-output tables and national accounts, and the first historical input-output table in Finland describing the year 1928 is then presented.

3 On concepts, methods and theories

3.1 Concepts

The origins of input-output methods can be traced to the *Tableau Economique* of Francois Quesnay developed during the 1750s and 1760s. Quesnay's idea was to present the circulation of products in the economy in a comprehensive and systematic way. His contribution was an integrated picture of the interconnections between two sectors of the economy (agriculture and manufacturing) displayed in a coherent way. His table cannot be considered a flexible analytical tool, however.[94]

Input-output analysis as a theoretical framework, and as an applied economics tool in a market economy, was developed by Wassily Leontief in 1936 with the construction and publication of the first input-output tables for the United States describing the years 1919 and 1929. The introduction of the input-output model marked the beginning of the analysis of interdependencies, and it provided a flexible tool that made it possible to gain significant insights into the economy and to solve intractable problems.[95]

According to Leontief, input-output analysis is a "practical extension of the classical theory of general interdependency which views the whole economy...as a single system and sets out to describe and to interpret its operation in terms of directly observable basic structural relationships".[96] It is an offshoot of classical economics, which emphasises production as a circular flow, and stresses the capacity of the economy to create a surplus above the production costs (profits) and compensation to employees.[97]

With the introduction of input-output methodology, students of economics no longer needed to base their analysis upon assumed numerical setups, and were able to draw conclusions about national production, consumption and distribution from real statistical information.[98] The most important contribution of input-output analysis, however, lies in its capability of showing that a theory can be constructed in a way that provides a window onto reality, and that permits applications that really can contribute to understanding the economy as a whole. The most important criterion for Leontief was observability. His view could be considered naturalistic in that he insisted that economic analysis should be based

94 Baumol (2000), p. 144.
95 Ibid., 149.
96 Leontief (1987), p. 860.
97 Kurz & Salvadori (2000), pp. 175–176.
98 Kohli (2001), p. 192; Leontief (1951), p. 9.

on directly observable, basic structural relationships, and not on theories of equilibrium, utility or demand that could not be directly observed.[99]

The first Finnish input-output tables were constructed by Osmo Forssell and Paavo Grönlund in 1960, and described the economy in 1956. Forssell could be considered a pioneer of input-output methodology in Finland. Since this first analysis there have been numerous studies on the subject.[100] Following the recommendations covering the system of national accounts, many of the recent input-output tables have been compiled according to the supply-and-use approach, and the current compilation process of the Finnish national accounts is based on the construction of supply and use tables. As a result, Statistics Finland publishes yearly national accounts in the form of supply and use tables, as well as input-output tables.[101]

There are only a very limited number of input-output tables available that have been constructed especially to serve the purposes of economic history, however. This study presents the first historical input-output table in Finland that combines supply and use tables with historical national accounts. These and input-output tables are described in more detail below, following a review of some of the basic concepts used.

The system of national accounts (SNA) provides a comprehensive framework in which to present statistical data on economic transactions between establishments. The SNA consists of a "coherent, consistent and integrated set of macroeconomic accounts, balance sheets and tables based on a set of internationally agreed concepts, definitions, classifications and accounting rules".[102] They structure the costs of production and income generated in the production process, the flow of goods and services produced within the national economy, and the flow of goods and services with the rest of the world in a comprehensive way,[103] and also provide the basic information for the derivation of detailed input-output tables that are extensively used for purposes of economic analysis and projection. The accounts themselves include a great deal of detailed information on production, incomes and consumption, obtained from a variety of statistical sources and studies. The way they are organised makes it possible to present the working of an economy in a condensed way. They provide a comprehensive approach to the detailed recording of the complex economic interactions that take place between different actors on markets. The SNA gives information about the levels of economic activity surrounding an economy's productive assets, and about the wealth of its inhabitants at particular points in time.

99 Kohli (2001), p. 174. Leontief received a Nobel Prize in 1973 for developing input-output methodology and various applications of it. The second Nobel Prize for input-output work was awarded to Professor Richard Stone in 1984 for integrating the framework into the system of national accounts (SNA). Syll (1999), pp. 78–80; United Nations (1999), p. 3. Leontief's tables are compiled in Leontief (1951).

100 See for example Forssell & Grönlund (1960); Tilastokeskus (1999); Tilastokeskus (2000).

101 See Tilastokeskus (2003).

102 SNA (1993), p. 1.

103 United Nations (1999), p. 23.

Supply and use tables constitute a statistical system that provides a comprehensive framework within which basic statistical data on transactions among establishments are presented with minimum manipulation. The supply table describes the supply of products in the economy through domestic production and imports, while use tables describe the use of these products by companies, individuals and the public sector, and for exports and investments. The tables are based on observed transactions, not on assumptions. The number of industries and products need not be equal on the supply and use sides, in other words the tables may be asymmetrical. They are an essential part of the system of national accounting and are often formed for statistical purposes. Nowadays, they are compiled annually at the statistical office and are an integral part of the national accounts.

Unlike supply and use tables, *symmetric input-output tables* include assumptions about the structure of the economy. They are constructed from supply and use tables using assumptions on the production technology, and are presented either industry-by-industry or product-by-product. They are also compiled for analytical purposes, and form the basis of economic analysis and general equilibrium models, for example.

The statistical unit in the production approach is the establishment, not the enterprise or any other institutional unit. *An establishment* is defined as an enterprise, or part of an enterprise, situated in a single location, and in which only one productive activity takes place or in which the principal activity accounts for most of the value added. *Industries*, in turn, are establishments that are engaged in a similar kind of activity and are, therefore, producing similar kinds of products.

The total output of an industry is measured as the total value of the goods and services produced by all of the establishments in it, including both primary and secondary products, in a given time period (basically during the year under study). Output includes both final products and work-in-progress.

The total cost of production includes intermediate consumption, wages and salaries, operating surplus (profit), the consumption of fixed capital, and taxes, minus subsidies. *Intermediate consumption* is the total value of inputs used in the production process in the same time period in which output is measured. The following inputs are included in intermediate consumption: a) raw materials and semi-finished goods including tools, for example, b) packaging, c) fuel, d) electricity for the establishment's own use, e) heating for the establishment's own use, f) repairs contracted out, g) other services contracted out, and h) other inputs (research & development, transport services, communications, marketing, office equipment, for example).

Gross value added measures the value created by production and is calculated as a margin between the total output and total intermediate consumption. The net value added is defined as gross value added minus the consumption of fixed capital. According to the production approach, the *gross domestic product* is equal to the total gross value added for all economic activities.

Final use categories (final consumption) include household consumption, government final consumption, and gross fixed-capital formation (investments).

Household consumption comprises goods and services consumed by households, while government final consumption includes collective services provided by general government for all members of a community (e.g., general administration).

Gross fixed capital formation consists of resident producers' acquisition of fixed assets less disposables (e.g., machinery). *Consumption of fixed capital* is the cost of production and is defined as the decline, during the course of the accounting period, in the current value of the stock of fixed assets owned and used by a producer as a result of physical or accidental deterioration. Thus, it is not the same as depreciation allowed for tax purposes.

There are three main valuation concepts. *The purchasers' price* is the amount paid by the purchaser, excluding any deductible value added tax, in order to take delivery of a unit of a good or service at the time and place required. It includes any transport charges paid separately by the purchaser.

The basic price, in turn, is the price receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable on that unit as a consequence of its production or sale, plus any subsidy receivable. It excludes any transport charges invoiced separately by the producer, but includes any transport margins charged by the producer on the same invoice.

The producers' price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output, minus any value added tax. It also excludes any transport charges invoiced separately by the producer.

In practice, especially in the case of transport charges, it is very difficult to determine whether charges have been paid separately or as part of the same invoice. Table 4 shows the basic relationships between the three types of price concept.

Trade and transport margins are the difference between the purchaser's price and the producer's price of a product. By definition, the *trade margin* is the difference between the actual or imputed price realised on a good purchased for resale and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of. Trade margins are valued at basic prices.

The transport margin, in turn, is the cost for the transportation of a product, paid separately by the purchaser and included in the use of the product at purchaser prices but not in the basic price of a manufacturer's output or in the trade margins of wholesalers or retail traders.

Taxes on products are taxes payable per unit of some good or service produced or transacted. They may be a specific amount of money per unit of quantity or

Table 4. The relationship between the purchaser's, the producer's, and the basic price

Purchaser's price	
	– Trade and transport margins
= Producer's price	
	– Taxes on products
	+ Subsidies on products
= Basic price	

they may be calculated as a specific percentage of the price per unit of value of goods and services produced and transacted.

Subsidies on products are subsidies payable per unit of good per service produced or imported. Basically similar definitions apply to subsidies as to taxes. Subsidies can, in addition, be calculated as the difference between a target price and the market price actually paid by the buyer. They only pertain to market output or to output for the establishment's own final use.

Table 5. Components of production

Output at basic price	
	– Intermediate consumption at purchaser's price
= Gross value added	
	= Wages
	+ Social security payments
	+ Other taxes on production
	– Production subsidies
	+ Consumption of fixed capital
	+ Operating surplus / mixed income

3.2 Historical national accounts

The international study of historical national accounts was initiated by Simon Kutznets in the 1950s. After working with the interwar accounts for the United States, he challenged researchers at the International Association for Research on Income and Wealth (IARIW) to construct historical national accounts series. Many economists met the challenge and historical accounts were constructed for the United Kingdom, Canada, France, Sweden, Denmark, Norway, West Germany and Italy soon after Kuznet threw down his challenge.[104]

One of the most significant developments in the field of historical national accounting took place through the international co-operation initiated at the IARIW that led to the adoption of the system of national accounts as the main framework for the construction of historical accounts. This eased the burden of constructing the historical accounts because common industrial classifications and concepts were used.[105]

Developments in the field of historical national accounting took place before Kuznets' proposal, however. Work on national accounts had started earlier in various countries, including Finland. The first efforts to calculate Finland's national income were made in 1922 by Jaakko Kahma. Valter Lindberg was the main developer of the national accounts from the 1920s, when he estimated figures for the years 1924, 1929, 1931 and 1928–34. Later on he published

104 Van Ark (1995), p. 8.
105 Hjerppe (1999), p. 40–41.

accounts for the years 1926–1938.[106] Lindberg's national-income concept differed somewhat from the United Nations recommendations on national accounts of 1947. Public-sector activities were defined slightly more narrowly and the national income concept did not include the consumption of fixed capital, but in all other respects Lindberg was fairly close to the concepts of national income used later on in the United Nations recommendations, and the results have been considered a fairly good attempt to grasp economic developments in Finland during the inter-war period.[107] Lindberg also documented his work extensively, which was of help in the construction of historical national accounts later on.

Work on the next generation of Finnish historical national accounts started in 1959. Young economists working mainly at Statistics Finland and the Bank of Finland started an ambitious project to compile comprehensive historical national accounts. At first, the idea was to use the Finnish application of the old 1953 United Nation system of national accounts, and certain decisions were made on the use of common methodologies concerning the calculation of volume indices, for example.[108] Some of the early decisions had to be changed, however, as the ambitious work plans were cut to some extent. Only one study, on agricultural production, was published during the 1960s.

While some of the original researchers were not able to finish their planned work, the entry of new blood added impetus to the study. The new researchers were mainly economic historians introducing archival study to the project, in contradiction of the original plan to rely only on published sources. Ten new studies were published during the 1970s, and the 1980s finally saw the completion of the project with a comprehensive final volume of the work. *The Finnish Economy 1860–1995, Growth and Structural Change (Suomen talous 1860–1985, Kasvu ja rakennemuutos)* comprised all the previous studies together with new estimates for the sectors still lacking them. It presents the value added and its components for 17 industries.[109]

The calculations in arriving at the national income were based on production, income or expenditure, depending on the statistical sources available. While the data availability was a limiting factor, the combination and supplementary use of all three accounts made up the deficiency: if data was missing from one account it was compensated by data from another, or by the simultaneous use of all other accounts, in order to arrive at the gross domestic product (Table 6).[110]

Obviously, historical national accounts have not been constructed for the sheer joy of calculating time-series data. They are considered a major tool in the empirical study of long-term economic growth and in the theory testing that goes with it.

106 Lindberg (1943).
107 Christensen et al (1995), pp. 32–35.
108 Ibid., pp. 41–42.
109 Hjerppe (1989). The full list of Growth Studies is given in the references.
110 Hjerppe (1996), p. 7–11.

Table 6. Production, income and expenditure account

Production account	Income account	Expenditure account
Value added * primary production * secondary production * services	Compensation of employees Operating surplus Consumption of fixed capital	Consumption * private * public Gross fixed capital formation * private * public Change in stocks Net exports
GDP at factor cost + Indirect taxes – Subsidies	National income – Net income from abroad	
GDP at market prices	Gross domestic income	Gross domestic expenditure

Historical national accounts give a comprehensive picture of growth and structural change in economies. They have been used in many studies focusing on the process of industrialisation, social-history developments and economic analysis. They have also contributed to other areas of research (social studies, public planning and private business) by providing important background information, and have been used as testing material for economic models. Their analytical use is even more widespread in international comparisons of living standards, wealth distribution, institutional change and demographics, for example. They have already changed and improved our understanding of industrialisation and the different phases of economic development, as well as of long-term economic developments.[111]

These accounts are not without problems, however. The available statistics are not yet sufficient in themselves, and even though the data is extensive, it is not very often in the form required by a comprehensive national accounting system. Therefore, in order to serve as national accounts, it must be reclassified, aggregated, supplemented and rearranged. The accounting classifications are also potentially problematic. The system of national accounts is not very flexible in time as it was developed principally for current accounting purposes, while historical accounts often include industries that no longer exist. Moreover, the continuity and consistency of the statistics often affects the reliability of the final time-series data. These deficiencies could lead to problems of reliability.

111 Bart van Ark gives a comprehensive description of some of the most influential studies using historical national accounts as a basis for analysis. van Ark (1995), pp. 5–8; see also Hjerppe (1999).

If data is to be used for analysis purposes it must be reliable, or at least it should be possible to measure the reliability of the calculations in some way. Without this, there is always the danger of misinterpretation: the conclusions of an analytical study could easily be based on wrong assumptions about the original construction process.

It is often the case, however, that the person who has constructed the series is able to identify problematic areas in the historical national accounts as he or she has first-hand knowledge of the areas in which the data is scant or missing. The proper presentation of estimation methods and sources is essential in order to avoid misinterpretation of the results. The documentation of the calculation methods and sources is also of vital importance when any historical data is constructed, and if the accounts are first used for analysis purposes these problematic areas can be avoided, or at least taken into account. Furthermore, as already mentioned, the use of the national accounting framework with its comprehensive and comparable guidelines for concepts and methods of estimation eliminates some of the implausbility in the calculations.[112]

The biggest problem with these accounts, however, is the lack of proper tools to measure the extent of any error. Historical time-series data may give a seemingly correct picture of economic developments, but we do not know if the result obtained is correct. One way to check the consistency of the results is to compare them with the results of other studies. Comparison with other times and other countries enables assumptions to be made on the probable variation of some factors. Therefore, in order to develop research on economic history in the future, it would be essential to widen the scope of the international statistics on a more homogenous basis. As P. K. O'Brien emphasised in the 1980s, "The most urgent task for the subject, and a precondition for building new typologies for European industrialization, is to reconstitute the data now available on a national or industry-wide basis into a form that would command respect and facilitate comparisons across countries. The task of data collection must be predicated upon some consensus about the methods to be used and definitions of indicators likely to be accepted as proxies for relative levels of development, consumption and productivity across countries."[113]

There have been increasing numbers of studies of this kind. One Nordic research project being carried out by economic historians and the statistical authorities of five countries in cooperation has been working on the comparability of Nordic historical national accounts. The purpose of the project is to harmonise the methods of studying growth in order to improve the comparability of the data.[114] This, again, will improve the reliability of the calculations by offering a uniform approach and the possibility to compare results obtained in different

112 Hjerppe (1999), pp. 43–44; van Ark (1995), pp. 8–14.

113 O'Brien (1986), pp. 331–332.

114 The findings of the project have been published in the following research papers: Krantz (1994); Eloranta (1997); Christensen (1998); Grytten (1999); Lindmark & Vikström (2001); Jonsson (2003). See also Maddison (2001).

countries. Comparisons with Nordic historical national accounts have been made for most of the industries. The question of reclassifying the sectors in the Nordic studies to match the current system of industrial classification has also been discussed, and new classifications have been proposed.[115]

In addition, in order to tackle the problems of reliability and comparability, the main priorities in historical national accounting, according to van Ark, lie in developing the data bases by improving the estimates for the output, income and expenditure categories. More attention should be paid to the construction of cross-country comparative levels of output and productivity. Some studies have been based on comparisons of physical quantities of commodities, which are weighted in terms of employment or price, while others have used purchasing-power parities on the basis of expenditure or of industry of origin.[116]

One of the most prominent directions in the future development of historical national accounts, however, is towards the construction of input-output tables for different benchmark years. Historical benchmark comparisons of output and productivity are called for in many studies. Adapting the presentation format of the input-output tables has been seen as one solution to the problem of reliability and inconsistency.[117]

Input-output tables have an important role to play in future work with historical national accounts for at least two reasons: data quality and consistency. As pointed out in the 1993 System of National Accounts (SNA), data limitations should not be used as an argument against creating input-output tables. On the contrary, the harder it is to get good data, the greater the need for creating input-output tables since the matrix formulation makes the best of the information that is available.[118]

Input-output tables alone are not enough, however. Supply-and-use methodology should also be applied in constructing these tables as it provides a means of overcoming problems of data reliability with its systematic approach. Under the current system of national accounts it is also recommended that the figures produced by the statistical offices should be based on supply and use tables.[119] The most prominent feature of the approach is its consistency in the provision of information, and it also allows for estimation of the extent to which the national account figures are in error.

The principles of input-output methodology are explored in more detail in the following section. The framework of the supply-and-use concept is introduced and its benefits and disadvantages are discussed in detail. Particular emphasis is placed on its usefulness in estimating the reliability of calculations.

115 Eloranta (1997); Hjerppe & Kauppila (1998); Larsen (1998); Kauppila & Varjonen (1999); Kauppila (1999); Kauppila & Kavonius (2001).
116 Van Ark (1995), pp. 15–16.
117 Bohlin (2003), p. 93; Hjerppe (1999), p. 51; van Ark (1995), p. 15; Vikström (2003), pp. 89–91; Jalava et al (2007), p. 14; Kauppila (2003), p. 122.
118 SNA (1993), p. 486.
119 SNA (1993).

An important distinction is also made between input-output tables on the one hand and supply and use tables on the other: the former are constructed for analytical purposes and the latter mainly for statistical purposes.

3.3 National accounts and the input-output approach

3.3.1 Supply and use tables

The central framework of the system of national accounts consists of detailed supply and use tables in the form of matrices that record the extent to which supplies of different kinds of goods and services originate from domestic industries and imports, and how these supplies are allocated between various intermediate or final uses, including exports.[120] The same classification system, concepts and definitions apply to both supply and use and input-output tables as to the other aspects of national accounting.

The supply-and-use framework includes two tables: the *supply table* and the *use table*. These two are closely linked. The supply of every product in the supply table must be equal to the use of that product in the use table (measured at the same prices). Similarly, the output of an industry must be equal to the cost of its production.[121]

The supply table describes the sources of supply of products to the economy. Total supply is separated into two different sources, domestic production and imports (see Table 7). Matrix **X** describes the production of product c (c = 1,...,k) by resident industry j (j = 1,...,n). Vector **M** describes the foreign imports of products c. The total supply of the goods at basic prices is shown in $\mathbf{Q^{(b)}}$, which equals the supply from resident producers plus imports from abroad. The total output by industry $\mathbf{Q^{(b)}}$ is a $1 \times n$ matrix and is obtained by summing up the products c produced by industries j.

Table 7. A simplified supply table

	Industries	Imports (c.i.f.)	Total product supply at basic prices	Trade and transport margins	Taxes minus subsidies	Total supply at purchasers' prices
Products	X	M	$Q^{(b)}$	TM	TX	$Q^{(p)}$
Total industry output at basic prices	$Q^{(b)}$					

The total supply at purchasers' prices $\mathbf{Q^{(p)}}$ is obtained by adding to the total supply of products at basic prices $\mathbf{Q^{(b)}}$ their trade and transport margins (**TM**) and taxes minus subsidies (**TX**). It should be noted that the trade and transport

120 Ibid.
121 United Nations (1999), p. 28.

margins are deducted from the trade and transport service industries at the same time. Therefore, the sum of the elements of vector **TM** equals zero.

The use table, in turn, describes both the cost of production in every industry as well as the use (demand) of every product (both domestic and imported). The total use of a product is separated into three parts: 1) intermediate consumption, 2) final consumption, and 3) exports (see Table 8). Matrix **U** describes the use of product c by industry j (intermediate consumption), while matrix **Y** represents the use of products according to final demand categories f (f = 1,...,t).

Table 8. A simplified use table at purchasers' prices

	Industries	Final Demand	Exports (f.o.b.)	Total use at purchasers' prices
Products	U	Y	E	$Q^{(p)}$
Gross value added	V			
Total industry output at basic prices	$Q^{(b)}$			

The final demand can be divided into household consumption, government final consumption, and gross capital formation (investments). Exports of products c are, in turn, marked **E**. The total demand at purchasers' prices by product c equals $\mathbf{Q^{(p)}}$. Matrix **V** describes the use of primary inputs h (h = 1,...,p) by industry (value-added and its components). The total use of inputs (intermediary and primary) is given by vector $\mathbf{Q^{(b)}}$, which equals the total industry output at basic prices.

The gross value added at basic prices (**V**) can be calculated as a residual, based on the total industry output at basic prices $\mathbf{Q^{(b)}}$ obtained from the supply table, and the intermediate consumption (**U**) obtained from the use table. Thus, the total value added of industry j can be expressed as,

$$(1) \quad \sum_{h=1}^{p} v_{cj} = q_j^b - \sum_{c=1}^{k} u_{cj}.$$

As mentioned above, the supply of every product equals the use of that product when measured at the same prices. Trade and transport margins are included in the value of goods at purchasers' prices, shown in matrix **U** in the use table. Consequently, in order to arrive at the same prices, trade and transport margins should be deducted from the each product and added into the use of market services.[122]

Finally, the balance of the two tables, as discussed earlier, is presented in the following two equations. In equation 2, the total output *by industry* equals the total use of inputs by industry:

$$(2) \quad \sum_{c=1}^{k} x_{cj} = \sum_{c=1}^{k} u_{cj} + \sum_{h=1}^{p} v_{cj}.$$

122 Ibid., p. 32.

In equation 3, the total supply *by product* equals the total use by product:

$$(3) \quad \sum_{j=1}^{n} x_{cj} + m_j = \sum_{j=1}^{n} z_{cj} + \sum_{j=1}^{n} y_{cj} + e_j .$$

These two principles are key elements in balancing and adjusting the system of supply and use tables. They are applied at the final stage in order to double-check the result of the compilation process. If the system is unbalanced, the statistical discrepancy describes the size of the imbalance. Thus, the product identity can be written as (if supply and use are presented at the same prices):

$$(4) \quad \sum_{j=1}^{n} x_{cj} + m_j = \sum_{j=1}^{n} z_{cj} + \sum_{j=1}^{n} y_{cj} + e_j + \varepsilon_j ,$$

where the last term is the statistical discrepancy.

Supply and use tables basically serve two purposes: statistical and analytical. They provide a framework for checking the consistency of statistics on flows of goods and services obtained from various sources – industrial surveys, household expenditure inquiries, investment surveys, foreign-trade statistics, for example. They thus serve as a coordinating framework for economic statistics, both conceptually in ensuring the consistency of the definitions and classifications used, and as an accounting framework in ensuring the numerical consistency of data drawn from different sources. The framework is therefore also appropriate for detecting weaknesses in the national accounts. As the total supply and use of individual types of goods and services have to be in balance in the economy, the tables are helpful in calculating the size of the weakness.[123]

In sum, the benefits of the supply-and-use approach in constructing input-output tables are as follows:

1) Supply and use tables require fewer assumptions than traditional input-output tables.
2) Supply and use tables are compiled using the product-by-industry approach, which is more informative than the traditional industry-by-industry approach, and is congruent with the theory of the behaviour of firms (establishments produce products and use products as intermediate consumption).
3) The supply-and-use method is congruent with SNA recommendations.[124]

3.3.2 From supply and use to symmetric input-output

Supply and use tables, as described above, are compiled using a product-by-industry approach, while input-output tables are normally presented in a symmetric framework (industry-by-industry or product-by-product), in which

123 SNA (1993); United Nations (1999).
124 SNA (1993).

the number of rows equals the number of columns. Therefore, supply and use tables must be transformed into symmetric input-output tables.

There are certain prerequisites for obtaining symmetric input-output tables. Firstly, both supply and use must be presented at basic prices. Secondly, the use of imported products and domestically produced products must be separated. It is only after these changes and calculations have been made that it is possible to continue the transformation to symmetric input-output tables.

Technically, there are several ways of transforming supply and use tables into symmetric input-output tables. However, there is still no consensus among researchers concerning the best possible method. Basically, tables can be presented either product-by-product or industry-by-industry.

The most frequently used method for deriving product-by-product tables is based on the product-technology assumption, according to which each product is produced in its own specific way, irrespective of the industry in which it is produced. Thus, it is assumed that only one technique exists for producing each product. According to the industry technology assumption, on the other hand, each industry has its own specific form of production, irrespective of the production mix. Thus, each industry has its own input structure.

The first method for deriving industry-by-industry tables, in turn, is through the assumption of a fixed product-sales structure. The basic premise is that each product has its own specific sales structure, irrespective of the industry in which it is produced. Under the assumption of a fixed industry-sales structure, in turn, each industry has it own specific sales structure irrespective of its product mix.

Of the above methods, the assumption of a fixed industry-sales structure seems to be rather unrealistic. This would apply only if all the companies were to supply all their products in the same proportions to their customers. It is therefore argued in the European system of accounts (ESA 95) that it is more plausible to assume that secondary products have different destinations than primary products.[125]

Which input-output tables are better, product-by-product or industry-by-industry? The European system of accounting recommends the product-by-product approach, even though it is admitted that it is not free of problems. It is particularly strong in the case of secondary production. Industry-by-industry tables may refer to various products as the same one may be produced by many industries. It is also pointed out in ESA 95 that product-by-product tables show more homogeneous flows than the industry-by-industry variant.[126]

Recent discussion gives a different view, however. Bent Thage, for example, argues strongly in favour of industry-by-industry tables based on the assumption of a fixed product-sales structure. His arguments are: a) this assumption does not result in negative values (industries can have negative production values according to the product-by-product approach), b) comparability with national

125 Eurostat (1996), p. 230.
126 Ibid.

accounts data is better; c) production is less resource-intensive; d) the product-by-product approach is not demonstrably superior in analytical terms.[127]

The concept of a product is also somewhat misleading. Data on production, export and intermediate usage is at best collected according to activity unit, for example. Thus, any product in the statistics is in reality a group of largely heterogeneous products. The theoretical concept of the product is thus a difficult one.[128]

In sum, there is no common agreement on the usability of the two approaches. The question of symmetric input-output tables should be considered separately each time an input-output table is constructed. Naturally, the method chosen should be used for other years as well in order to guarantee consistency.

The input-output table thus arrived at focuses on the interrelationships between industries in the economy with respect to the production and use of their products and products imported from abroad. In more practical terms, the symmetric input-output table is basically the use table of domestic products, only transferred to the industry-by-industry dimension using one of the methods mentioned above (Table 9). Thus, in the following, **Z** denotes industry *j*'s use of products *c* produced by industry *i*.

Table 9. A simplified input-output table

	Industries	Net final demand	Total output
Industries	Z	Y	$Q^{(b)}$
Value-added	V		
Total input	$Q^{(b)}$		

3.4 Foundations of input-output analysis

3.4.1 Basic equations

Both supply and use and input-output tables provide a comprehensive framework for further exploring and analysing structures of an economy, and they have been put to good use in economic analysis.

As an analytical tool, input-output tables are easily integrated into macroeconomic models in order to analyse the link between the final-demand and output levels of industries, and they also have a number of other uses.

Input-output analysis has great potential in terms of economic analysis, and has been applied in numerous studies in areas such as impact analysis, productivity and growth, technological change and energy consumption. The tables also

127 See, for example, Thage (2002), p. 16.
128 Ibid., pp. 7–8.

serve as a basis for other economic models such as social-accounting matrices as well as more refined general equilibrium models. It is not necessary to catalogue here all the input-output studies that have been carried out, but it would be more fruitful to describe the basic assumptions and concepts used.[129]

Input-output models are normally constructed from observed data covering a particular economic area. They are based on data on the flows of products from each sector of the economy to other sectors. These inter-industrial flows are measured for a particular time period, and normally in monetary terms.[130]

Mathematically, the basic input-output assumptions are as follows.[131] Denote the observed monetary flows from industry i to industry j by z_{ij}. Thus, if the economy is divided into n industries, and if the total output of industry i is denoted by X_i and the total final demand for industry i's output by Y_i, the equation can be written as

$$(5) \quad X_i = z_{i1} + z_{i2} + \ldots + z_{ii} + \ldots + z_{in} + Y_i.$$

The above equation thus describes the distribution of industry i's output. It is the sum of all of its inter-industry sales as well as of sales to final demand. Each industry has a similar equation, reflecting the sales of its output. Thus,

$$(6) \quad \begin{aligned} X_1 &= z_{11} + z_{12} + \ldots + z_{1i} + \ldots + z_{1n} + Y_1 \\ X_2 &= z_{21} + z_{22} + \ldots + z_{2i} + \ldots + z_{2n} + Y_2 \\ &\vdots \\ X_i &= z_{i1} + z_{i2} + \ldots + z_{ii} + \ldots + z_{in} + Y_i \\ &\vdots \\ X_n &= z_{n1} + z_{n2} + \ldots + z_{ni} + \ldots + z_{nn} + Y_n \end{aligned}$$

The input-output theory assumes that for one unit of every industry's output a fixed amount of input of each kind is required. Thus, the inter-industry flows from industry i to industry j depend entirely on the total output of industry j for that same period of time. These fixed-input relationships between industries are obtained by dividing the entries in the column by the total output of the consuming industry. In its mathematical form, the computation of the input coefficient matrix is thus

$$(7) \quad a_{ij} = \frac{z_{ij}}{X_j},$$

129 The structure of methodological description is based mainly on Miller & Blair (1985). On applications of input–output analysis see also Chiasini (1998); Economic Systems Research 2/2000.

130 There are recent studies on physical flows between sectors. See, for example, Mäenpää (2002).

131 For a comprehensive description of the foundations and extensions of input–output analysis, see Miller & Blair (1985).

where z_{ij} stands for the flow of input from industry i to industry j, and X_j is the total output of industry j. The corresponding output coefficients (b_{ij}) describe the proportion of industry i's total output sold to industry j. In its mathematical form

$$(8) \quad b_{ij} = \frac{z_{ij}}{X_j}.$$

Now equation 6 can be rewritten as

$$(9) \quad \begin{aligned} X_1 &= a_{11}X_1 + a_{12}X_2 + \ldots + a_{1i}X_i + \ldots + a_{1n}X_n + Y_1 \\ X_2 &= a_{21}X_1 + a_{22}X_2 + \ldots + a_{2i}X_i + \ldots + a_{2n}X_n + Y_2 \\ &\vdots \\ X_i &= a_{i1}X_1 + a_{i2}X_2 + \ldots + a_{ii}X_i + \ldots + a_{in}X_n + Y_i \\ &\vdots \\ X_n &= a_{n1}X_1 + a_{n2}X_2 + \ldots + a_{ni}X_i + \ldots + a_{nn}X_n + Y_n \end{aligned}.$$

Equation 9 can be solved in terms of X by moving all the X terms to the left-hand side. Thus,

$$(10) \quad \begin{aligned} X_1 - a_{11}X_1 - a_{12}X_2 - \ldots - a_{1i}X_i - \ldots - a_{1n}X_n &= Y_1 \\ X_2 - a_{21}X_1 - a_{22}X_2 - \ldots - a_{2i}X_i - \ldots - a_{2n}X_n &= Y_2 \\ &\vdots \\ X_i - a_{i1}X_1 - a_{i2}X_2 - \ldots - a_{ii}X_i - \ldots - a_{in}X_n &= Y_i \\ &\vdots \\ X_n - a_{n1}X_1 - a_{n2}X_2 - \ldots - a_{ni}X_i - \ldots - a_{nn}X_n &= Y_n \end{aligned}.$$

For reasons of simplicity, the above equations are often presented in matrix form. Thus,

$$A = \begin{bmatrix} a_{11} & a_{12} & \ldots & a_{1i} & \ldots & a_{1n} \\ a_{21} & a_{22} & \ldots & a_{2i} & \ldots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \ldots & a_{ni} & \ldots & a_{nn} \end{bmatrix}, X = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_2 \end{bmatrix}, Y = \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix}$$

and let I denote the n X n identity matrix. Equation 10 then can be rewritten simply as

$$(11) \quad X - AX = Y,$$

where matrix **A** stands for the input-output coefficients of the intermediate use of domestic products, **X** is the vector of output and **Y** is the net final demand. In the basic matrix,

$$
\begin{aligned}
& X - AX = Y \\
(12)\quad & (I - A)X = Y \quad , \\
& X = (I - A)^{-1}Y
\end{aligned}
$$

where $(I - A)^{-1}$ is the so-called Leontief inverse.[132] In its simple form, an input-output coefficient table represents, in each of its columns, a technique of production by which only one product is produced. Thus, it shows the type and amount of inputs required by industries in order to produce one unit of output (these are often called direct effects). The inverse matrix is used to investigate other effects (each of the products used as inputs needs to be produced and, in turn, needs other inputs). Direct and indirect inputs together are often called indirect effects.

The inverse matrix is fundamental to input-output analysis, as it shows the full impact of an exogenous increase in net final demand on all industries. It makes it possible to calculate what output levels are needed to meet certain levels of net final demand, and how the levels should change to meet changes in net final demand.[133] In its most basic form the input-output model consists of a system of linear equations, each one of which describes the distribution of an industry's product throughout the economy. This basic model is also called the *static open input-output model,* and it forms the basis of most input-output analysis.

3.4.2 Closing the model in relation to households

The principal way in which the static open input-output model is used for analytical purposes is based on the assumed changes (observed or hypothetical) in the final demand of some industries. The final-demand categories include household consumption, public consumption, gross fixed capital formation (investments) and exports. The model calculates the impact of the change on the total output of different industries and of the economy as a whole on the basis of a change (real or imagined) in demand.

The open model depends on the existence of an exogenous sector, disconnected from technologically interrelated industries. The exogenous categorisation of household consumption in particular is somewhat problematic in basic economic theory, however. An example of the problem with the household sector is given below.

Households receive income from industries as payment for labour input in production processes. At the same time, as consumers, they use their income for purchasing certain products, again produced by the industries in the economy. Now let us assume a situation in which the final demand (say export) for wood products decreases by 10 percent. The consequent decrease in the production of

132 This can be done on the technical condition that the determinant of (I–A) is non–zero; if it is zero the inverse does not hold.

133 United Nations (1999), p. 10.

the wood products is probably accompanied by a decrease in income for the households concerned, as there will be less work to be done and, as a result, lower payments. This will be reflected in household consumption as there will be less money available. In other words, the amount of household purchases depends on income, which again is related to the output of different industries.

The problem of the exogenous household sector can be solved, however, by moving the sector from the exogenous final-demand to the technically interrelated input-output coefficient table. This is known as *closing the model in relation to households*, and was introduced by Leontief in his early work.[134]

In practice, the household row and column are added to the coefficient table at the bottom and to the right respectively. The flow of money to households (wages) is shown in the last row (*(n+1)*st row), representing at the same time the labour input required for the industry to produce its products. The money flow from the households is shown in the last column of the coefficient table (*(n+1)*st column), representing the purchase of goods by the household sector. In its mathematical form the flow equation 5 now becomes

$$(13)\quad X_i = z_{i1} + z_{i2} + \ldots + z_{ii} + z_{in} + z_{i,n+1} + Y_i^*$$

where the last term represents the remaining final demand for sector *i*'s output after the closing of the model in terms of households. In addition, the total value of households' sales of labour services to other industries is presented as a new equation

$$(14)\quad X_{n+1} = z_{n+1,1} + z_{n+1,2} + \ldots + z_{n+1,i} + \ldots + z_{n+1,n} + z_{1+1,n+1} + Y_{n+1}^*.$$

The element $z_{n+1,n+1}$ represents the household purchase of labour services (such as paid household work), while the last term on the right includes payments to government employees, for example. The household input coefficients are calculated in the same way as in the open model. The value of industry *j*'s purchase of labour is divided by the total output of the industry *j*. The "household industry's" coefficients are obtained by dividing the purchase of industry *i*'s product by the total household consumption.

Thus, the *i*th equation in 9 becomes simply

$$(15)\quad X_i = a_{i1}X_1 + a_{i2}X_2 + \ldots + a_{ii}X_i + \ldots + a_{in}X_n + a_{i,n+1}X_{n+1} + Y_i^*$$

and the new equation relating household output to the total output of industries becomes

$$(16)\quad X_{n+1} = a_{n+1,1}X_1 + a_{n+1,2}X_2 + \ldots + a_{n+1,i}X_i + \ldots + a_{n+1,n}X_n + a_{n+1,n+1}X_{n+1} + Y_{n+1}^*$$

134 Miller & Blair (1985), p. 25.

Similarly, the *i*th term in equation 10 becomes

$$(17)\ -a_{i1}X_1 - a_{i2}X_2 - \ldots + (1 - a_{ii})X_i - \ldots - a_{in}X_n - a_{i,n+1}X_{n+1} = Y_i\ ^*$$

and for the household sector, rewriting equation 16 gives

$$(18) - a_{n+1,1}X_1 - a_{n+1,2}X_2 - \ldots - a_{n+1,i}X_i - \ldots - a_{n+1,n}X_n + (1 - a_{n+1,n+1})X_{n+1} = Y_{n+1}\ ^*$$

Finally, if the *(n+1 X n+1)* coefficient matrix is nonsingular, the unique solution can again be found by using an inverse matrix. Thus, if we denote the new coefficient matrix A_{new}, the *(n+1)* -element column vector of gross output X_{new}, and the *(n+1)* -element vector of final demand, including that for the output of households Y_{new}, we can rewrite the solution of the open model simply as

$$(19)\ X_{new} = (I - A_{new})^{-1}Y_{new}\ .$$

Thus, with the above model it is possible to estimate the impact of a change in the final demand on the economy as a whole as well as on individual industries. It further takes into account the relationship between industries and households in terms of income and consumption. The impact (ΔX) is then written simply as the difference between the original output and the new calculated output

$$(20)\ \Delta X = X - X_{new}\ .$$

There are also some major limitations in the model. It does not take into account the use of income for savings, taxes or fixed-capital formation (investments), for example. Thus, it is assumed that all household incomes are being used for private household consumption.[135] On the other hand, the model does not include employers' income that has also been partly used for private consumption: forest owners are a good example. Therefore, in the practical application discussed in Chapter six, the model is extended to include entrepreneurial income while savings and direct taxes are excluded. The limitations of the model are dealt with more thoroughly in Chapter 3.5. However, in general it is safe to say that the open model underestimates the impact of a change in demand while the closed model tends to overestimate it for some industries and to underestimate it for certain others. For this reason, both open and closed models are used later on in the practical applications in order to provide an estimate of the upper and lower limits of the impacts.

135 See Forssell (1985) on discussion on differences between open model and closed model. Closing the model only in relation to households has been also referred to as production-consumption model.

3.4.3 The price model

The price model can be used to determine the impact of a change in the price of exogenous inputs such as wages and profits. The general formulation of the model requires data on physical coefficients and the unit prices of inputs. In most input-output studies there are no data available on physical input-output coefficients. This problem can be overcome, however, in that the per-unit prices for each sector in the value-based input-output tables are all one Finnish mark, since the input coefficients are derived on a "per mark's worth of output" basis. Therefore, the price of a unit of output is one mark. In its mathematical form, the basic approach to the price model is as follows. The price of the output of an industry i (p_i) can be obtained from the equation

$$(21)\quad p_i = \sum_{i=1}^{n} a_{ij} \times p_i + v_i,$$

where v_i equals the input coefficient for primary input (value added). This price model has a general solution, the Leontief inverse. In its matrix form the solution is written as

$$(22)\quad P = (I - A')^{-1} V,$$

where $(I - A')^{-1}$ is a transposed Leontief matrix and V the matrix of primary input coefficients. The solution results in a column of normalised prices (P=1). Any change in the primary input coefficients (V) affects the prices of each industry.[136] The model can be used to calculate the impact of changes in wages or company earnings (profits) on consumer prices, for example. When the price model is used it is assumed that all conditions of full competition are fulfilled. Thus, firms with market power fully reflect the rising costs of primary inputs in their product prices. Higher factor prices for primary inputs cause higher product prices in competitive markets.[137]

3.4.4 Linkages

Albert O. Hirschman's model of economic development has been influential in defining and understanding the relationship between linkage effects and economic development. His theory also led to the favouring of so-called high-linkage sectors in order to achieve economic growth. According to Hirschman, development policy should attempt to enlist these linkage effects in order to maximise economic advantages.[138]

136 Miller & Blair (1985), pp. 351–357.
137 ESA 95, pp. 347, 359.
138 Yotopoulos & Nugent (1973), p. 171; Hirschman (1958), pp. 99–101.

It is possible to identify key industries through linkage analysis. In the framework of the input-output model, each industry has linkages to other industries. A particular industry may have inter-industrial linkages as a buyer of inputs (*backward linkage*) and as a provider (*forward linkage*). Thus, one way of analysing economic impact is to define and measure these linkages.

Basically, when an industry increases its production there is increased demand for inputs from other industries. Thus, if industry j increases its output, this means it will place increased demands on the industries whose products it uses as production input j. This demand is referred to as *backward linkage*, and the higher it is, the more beneficial the expansion of its production will be to the economy as a whole. An increase in the production of other industries, in turn, will result in additional output requirements in order to supply inputs for other sectors. Thus, increased output in sector j also means that there are additional amounts of product j available to be used as inputs in the sectors for their own production. The higher these *forward linkages* are, the more sensitive the production of an industry is relative to other sectors' output.[139] The concept of forward linkages is somewhat vague, however. Production rarely increases without an increase in demand. The notion of forward linkages is therefore most useful in cases of industries engaged in the production of energy, technology and machinery, for example. These are products that provide further opportunities for increased production in the form of investments, and thereby increase productivity in the economy.

Input-output tables form a starting point for measuring inter-industrial linkages. However, there are several different methods for estimating these linkages. Three of these methods are described and discussed below. The first two are normally referred to as traditional methods, and the third is called the hypothesis-extraction method.[140]

Among the first quantitative analyses of industrial interdependence were the ones Chenery and Watanabe conducted in the 1950s, which also provided operational definitions of linkage effects. Chenery and Watanabe proposed using the column sum of the input coefficient matrix in order to measure the backward linkage of a certain industry. Thus, the extent (or strength) of the backward linkages of industry j can simply be defined as

$$(23)\quad BL_j^{CW} = \sum_{i=1}^{n} \frac{z_{ij}}{X_j} = \sum_{i=1}^{n} a_{ij},$$

where BL_j^{CW} denotes the backward linkage of industry j to industry i according to the Chenery-Watanabe method. The forward linkage, in turn, is simply defined as the row sum of the output coefficient matrix. Thus, as in equation 23, the extent of the forward linkage of industry i is

139 Guo & Planting (2000), p.7.

140 The structure of the methodological description is based mainly on Andreosso–O'Callaghan & Yue (2000).

$$(24)\ FL_i^{CW} = \sum_{j=1}^{n} \frac{z_{ij}}{X_i} = \sum_{j=1}^{n} a_{ij},$$

where b_{ij} is the output coefficient of industry i to industry j.

Backward linkage according to the Chenery-Watanabe method measures the extent to which a unit increase in demand for industry j causes production increases in other industries, while forward linkage represents the extent of the output increase in the economy if the final demand of industry i increases by one unit.

However, as the Chenery-Watanabe method is based on input and output coefficients, it only includes the direct backward and forward effects of a certain industry. Some authors have favoured the Rasmussen method for studying indirect effects. Rasmussen proposed using the column (or row) sums of the Leontief inverse in order to measure inter-industrial linkages. Thus, mathematically, the backward linkage of an industry j is defined as

$$(25)\ BL_j^R = \sum_{i=1}^{n} g_{ij},$$

where g_{ij} is the element (i,j) in the Leontief input inverse $(I–A)^{-1}$. Similarly, the forward linkage of industry i is defined as

$$(26)\ FL_i^R = \sum_{i=1}^{n} g_{ij}.$$

However, Rasmussen's method has been criticised, by Jones for example, for measuring "direct plus indirect effects on supplier industries, but not on the user industries"[141] It is clear that Rasmussen's measure of forward linkage is not symmetrical to that provided for backward linkages as it measures the change in output for industry i if the final demand of each sector increases by one unit.

Jones proposed using the row sum of the Leontief *output* inverse matrix in order to measure the forward linkages. This differs from the traditional Leontief input inverse, as the former uses technical output coefficients (intermediate sales as a proportion of total sales including final demand).[142] This so-called output-based model avoids the problem of the double counting of causal linkages, and is written as

$$(27)\ FL_i^{RO} = \sum_{j=1}^{n} h_{ij},$$

where h_{ij} is element (i,j) in the Leontief output inverse $(I–B)^{-1}$.

The Rasmussen backward linkage measures the extent to which a unit change in the demand for the product of sector j causes production increases in all sectors. The output-based forward linkage, proposed by Jones, in turn measures the

141 Jones (1976), pp. 325–327.
142 Ibid., pp. 327–329.

extent to which a unit change in the primary input of sector i causes production increases in all sectors.

Basic hypothesis extraction was first introduced in the 1960s, but was somewhat overlooked until the 1980s and 1990s when it started to attract more attention.[143] The starting point is in the idea of extracting a sector hypothetically from the economic system, which makes it possible to assess the influence of this hypothetical extraction on other sectors of the economy. The extraction is simply done by deleting the row and the column of a certain industry from the input coefficient matrix A. In its mathematical form, the extraction of the kth sector is written as

$$(28)\quad \tilde{x}(k) = \left[I - \tilde{A}(k)\right]^{-1} \tilde{y}(k),$$

where $\tilde{A}(k)$ is an $(n-1) * (n-1)$ input matrix after deleting the kth sector from A, and $\tilde{y}(k)$ is a $(n-1)$ vector after deleting the kth element from vector Y. The $(n-1)$ vector $\tilde{x}(k)$ is computed according to equation 28, and it describes total output after extracting sector k. Now, as a result, all sectoral outputs should decrease. Thus, the linkage effect of the extracted sector k on total output (denoted $L(k)$) is defined as the sum of the difference between the output vector X excluding the kth element and $\tilde{X}(k)$, i.e.

$$(29)\quad L(k) = \sum_{i=1, i\neq k}^{n} \left[X_i - \tilde{X}_i(k)\right].$$

Andreosso-O'Callaghan and Yue proposed that because each of the methods mentioned above all have their own function, a combination should be applied to the study of linkages in the economy. The methods could thus be seen as "complementary to each other" [144]. The Chenery-Watanabe and Rasmussen methods are used to examine how the internal structure of the economy behaves and changes, without taking into account the level and structure of production in each sector. On the other hand, hypothesis-extraction methods are used to explore the production structure when the level of production and the structure of the final demand and primary inputs are taken into consideration. There are several critical shortcomings, however: the method cannot divide total linkages into backward and forward linkages and the idea of simply scrapping an entire sector from the economy seems to be rather excessive.[145] Many modifications have been made to the basic extraction method in attempts to overcome these shortcomings.[146] The results of a test run done for this study, however, suggest that the method only describes the size of the industry extracted, and that indirect linkages are much

143 Dietzenbacher & van der Linden (1997), pp. 235–236.

144 Andreosso-O'Callaghan & Yue (2000), p. 35.

145 Dietzenbacher & van der Linden (1997), p. 236.

146 For example, Dietzenbacher and van der Linden presented their revised extraction method in 1997. They proposed the hypothetical extraction of all the intermediate deliveries a sector buys in order to obtain backward linkages, and similarly, for forward linkages the extraction of all intermediate deliveries that a sector sells. For more a detailed description, see Dietzenbacher & van der Linden (1997), pp. 237–239.

more complex and important than direct ones. This would indicate that it is the relation between direct and indirect linkages in addition to total backward and forward linkages that should be studied more carefully.

Linkage analysis has been criticised for not taking into account the complex nature of economies in a comprehensive way. Policy implementation based on such analysis could therefore be misleading. However, linkages are used here purely for the purpose of indicating interdependencies among industries, not policy options. The method itself is a valid and important tool for identifying the dependencies that work in the economy.

3.4.5 *The effective rate of protection*

When the impact of tariffs is evaluated, a distinction should be made between formal tariffs, nominal tariffs, and effective tariffs. The formal tariff is the customs duty defined in the legislation, and takes the form of a specified duty or *ad valorem* duty, or both at the same time. The nominal tariff, in turn, is the *ad valorem* equivalent and depends on changes in import prices. The effective rate of protection, then, is defined as the percentage addition made possible by the existence of the tariff to the value-added of the domestic industry, with prices at free-trade levels.

The level of benefits from any tariff depends chiefly on how much it raises domestic prices above world prices. The effective rate of protection measures the most immediate impact – on the prices of both material inputs and finished outputs. Tariffs protect not only a product but also the economic activity that produces that product from certain inputs. The advantage of effective rates compared with nominal tariff rates is that they take into account the discouraging effect on inputs, and recognise that an industry is more sensitive to tariffs the lower the share of value-added in the price of its output. The effective rate of protection is thus more focused on the measurement of the impact of tariffs.[147]

The effective rate of protection also takes into account the use of tradable inputs. The following example explains the concept. Consider a situation in which an economy is producing two products, A and B, with an output of 100 units. Suppose, then, that both industries use imported inputs worth 80 units and make a value added of 20 units. If a nominal tariff of 20 percent is imposed on A and 50 percent on B, it would be easy to draw the conclusion that B is more protected as its output rises to 150 and its value added to 70 units, while A has only been able to raise output to 120 and value added to 40. Suppose, now, that A has no customs duty on its raw materials while B has to pay a duty of 50 percent. A still has a value added of 40 units while B has suffered due to increased

147 For studies applying the concept of the effective rate of protection in a historical context, see, for example, Capie (1978); Webb (1980); Webb (1982); Kitson & Solomou & Weale (1991).

production costs to 120 units (80 units + 50%) and makes a value added of only 30 units. Product A therefore has a higher effective rate of protection.

In its mathematical form, the effective rate of protection for industry j is written as

$$ERP_j = \frac{t_j - \sum_i a_{ij} t_i}{1 - \sum_i a_{ij}},$$

where t_j is the nominal tariff rate for final product j, t_i is the nominal tariff rate of any input i, and a_{ij} is the input coefficient of industry j. However, the change in relative prices only affects the share of production that has been sold domestically, and the proportion exported does not gain from the impact of customs duties. Adjustment should therefore be made in the ERP calculation to take into account only the proportion of domestic sales. This was done in the practical application described in Chapter 6.2 by weighting the nominal tariff according to the proportion of domestic sales by industry.

3.5 Limitations

There are some limitations in the supply and use tables as well as in the input-output analysis. The first is the problem of scant data. Even though the approach itself is reliable the historical data is often inadequate and there is a need to use other measures in order to reflect developments.

Secondly, it is still not possible to assess in a reliable manner whether both supply and use are wrong. It is possible to come up with an estimate whereby no statistical discrepancy exists, but in reality both estimates, that of supply and use, are incorrect. There is no way of knowing what is the direction of the error in this kind of case. This is partly caused by a third problem. Because there are seldom many sources available, both use and supply can be, in some cases, estimated from the same sources, with a resulting distortion of both in the same direction.

These are all problems with data and they are difficult to overcome because of the lack of availability in some cases, and because many of the same sources have been used extensively in previous studies. On the other hand, it is much easier to go more deeply into the original sources when constructing a table for a single year than in the case of time-series data.

The concept of statistical discrepancy is useful as a measure of the reliability of estimation, and the above criticism does not diminish its value. In order to describe the possible direction of distortion in the results however, a more appropriate method of estimating the confidence level should be applied, which would also take into account the possibility of distortion in the final outcome.

Moreover, correct description of the methods and sources used further increases the reliability of the calculations and makes it possible for other researchers to repeat the calculations and evaluate the results. It should also be mentioned that in some cases the supply and use tables may be easier to construct from historical than from present-day data. The structure of production

was much more homogeneous in the 1920s than today, and it could be notably easier to trace flows between industries and final-demand components than through present-day economic structures. More importantly, the older statistics are, in many cases, of much better quality than today's equivalents. For instance, the manufacturing statistics from 1928 separate the use of intermediate inputs of domestic and foreign origin by commodity, which today's statistics do not do.

The method of transforming supply and use tables into symmetric input-output tables is still a matter of dispute, and some criticisms were discussed earlier in this chapter. The product-technology assumption, for example, results in some technical coefficient turning negative, and this can be avoided if the industry-technology assumption is used. However, this has one major weakness, according to Ten Raa: inputs are allocated to outputs in proportion to the output shares. Because the tables are presented in current values, there is a possibility that if some relative prices happen to be high compared with other prices, there will be high use of the input in question, resulting in a high technical coefficient.[148] Discussion on the advantages and disadvantages of the two approaches still continues, and it has not been possible to move it forward in the present study.

One of the aims of this study is to provide a concrete example of the construction of historical input-output tables based on the supply-and-use approach. It is by no means argued that input-output methodology is the only possible means of analysis. The intention is to demonstrate the potential of the supply-and-use concept in the construction of input-output tables in a historical context. It is also argued that, combined with historical input-output tables, the approach does provide valuable means of analysis in the field of economic history.

It is acknowledged that the input-output analysis carried out in this study is not without problems. However, this should not be seen as an endemic to input-output methodology, as Thomas pointed out. It is a matter of recognising and respecting the limitations[149] , which are summarised below.

The principal criticism of the input-output model concentrates on the use of fixed input coefficients. This assumption has at least two consequences. First, economic development always involves changes in production technology, structural changes in production and resource allocation, and changes in the pattern of demand. Secondly, the criticism concentrates on the assumption that each sector of the economy produces a single homogeneous product that can be used for consumption, investment, export, or as an intermediate input for other industries. In reality, changes in the structure of demand may very well cause changes in production technologies, i.e. in input coefficients. It is assumed in the input-output theory that the industrial structure remains unchanged by any economic event. Thus, the use of a fixed (technical) coefficient implies that indus-

148 Ten Raa (1995), pp. 90–91.
149 Thomas (1987), p. 128.

try's response to an economic event (i.e. a change in final demand) is equivalent to the average rather than the marginal relationship.[150]

These criticisms are also somewhat misleading, as Thomas also pointed out.[151] They are only valid in cases in which the input coefficient of a particular year is being used for the analysis of growth or long-term development. The use of a fixed input-output coefficient is applicable in the analysis of short-term developments and it can be assumed that the technology is fixed. It has also been argued that changes in input coefficients are relatively small over a short period of time.[152] This does not eliminate the fact that they do change, however, and using the same coefficients for different years could always produce errors in the estimates.

The general equilibrium framework could be considered a more appropriate model of the economy in the long run. On the other hand, there is always a risk of results becoming "black boxes" that make it very difficult to understand the final outcome. This is especially true in the case of economic history, where statistical data is often scant and any modelling further distances the analysis from the reality. The quality of a complex general equilibrium model cannot be easily determined in a historical context,[153] and simplicity may be the answer in avoiding these black boxes. On the other hand, simplicity may also be a problem because not all economic behaviour is included: the results may be far too simple, and exclude important developmental factors. However, the focus in this study is on the construction of supply-and-use-based input-output tables, and it offers a deeper analysis of short-term interdependencies on the basis of input-output modelling. Nevertheless, it is clear that the present study, as a static exercise, does not take into account dynamic elements such as investments. Extending this analysis to incorporate the general equilibrium model would also account for the dynamics of growth.

Another disadvantage of input-output analysis is the fact that it does not go into detail on the demand side of the economy. This is a more serious problem and should be taken into account when the final results are assessed. The open model, described in Chapter 3.4.1, excludes households from the circular flow. Chapter 3.4.2 described the closing input-output model, which does take the household sector into account.

It has been argued, however, that the basic model described in Chapter 3.4.2 is likely to lead to an overestimation of the total effects on the economy because part of the value added created in the production will be used as additional savings.[154] In the closed model, all value-added creation is considered to flow back to the expenditure side. This is taken into account in the practical application discussed in Chapter six by including an estimate of savings and direct taxes. Furthermore, an attempt was made to include entrepreneurial incomes in the closed

150 See, for example, Miller & Blair (1985), pp. 12–13.
151 Thomas (1987), p. 129.
152 Miller & Blair (1985), p. 266–273.
153 Feinstein (1988), pp. 723–724.
154 Thomas (1987), p. 130.

model as well. However, there might again be an underestimation of the effects because it was not possible to estimate all entrepreneurial income, especially in the case of manufacturing and transport. The extent of this possible error is difficult to assess, however.

It is safe to say that the static input-output model does give a general view of interdependencies and impacts, while the open model underestimates and the closed model tends to overestimate the impacts for some industries and to underestimate them for others. If the area under study is a small open economy, the use of input-output models could be considered a reasonable choice. It has been argued that more complex models would probably not surpass more simple input-output models in this case.[155]

Criticisms of the price model are similar to those mentioned above. The greatest problem is the lack of physical coefficients. In addition, the industry-technology assumption applied is not price invariant, as already pointed out, thus resulting in a possible bias in the analysis. Furthermore, the impact of a fall in import prices and tariffs on consumer prices is debatable. To assume that such an impact is fully reflected in the value added of firms is open to discussion. It could nevertheless be argued that this assumption reflects the worst-case and best-case scenarios, resulting in an upper and lower limit for its impact on prices. Discussion on the use of the industry-technology assumption is also ongoing, as mentioned above. Results obtained from the price model should be considered tentative, however, and seen as only one way to further clarify the question of tariffs, prices and profits.

Calculation of the effective rate of protection relies on the assumption that the country concerned is a small open economy. It is thus a small operator on the world market, and any tariff has no effect on the world price of the goods concerned. It does increase the cost in domestic markets by the full amount of the tariff, however. The critical assumption with the effective rate of protection is that companies have full market power to transfer rises in world prices to domestic prices.

Critics of the effective rate of protection touch upon the assumption that tariffs on output and inputs are fully reflected in domestic prices. This is also reflected in the question of input substitution. One effect of the tariff system is to change coefficients, and therefore the result of the analysis is not fully reliable. Further problems concerning the classification of industries and products and comparability between the trade and the industrial classifications have also been mentioned.[156]

All of these problems are considered topical in this study. The lack of comparability between trade statistics and tariff classifications made it problematic to obtain a fully accurate picture of the nominal *ad valorem* level of tariff protection in 1928, and due to the lack of input-output tables from 1934, the input structure of 1928 has been assumed to represent that of 1934. Furthermore, there is no

155 West (1999).
156 See, for example, Hawke (1975).

method for estimating the possible impact of tariffs on the input structure. Input coefficients have nevertheless proved to stay relatively constant in the short term. It is acknowledged that the concept of the effective rate of protection describes the extent to which the value-added of industries has been protected. Whether or not tariffs on output and input are fully reflected in prices still does not lessen the importance of the ERP estimate. It does give an allocation assessment in terms of whether or not industries have been able to fully benefit from the policy in carrying the benefit into prices. For this reason the results are also compared with the real development of certain prices, thereby allowing assessment of the extent to which companies have been able to capitalise on this benefit.

3.6 *Input-output and economic history*

Input-output methodology is by no means a new approach, and has been applied in numerous studies since its introduction. It has been used in impact analysis, and in studies on productivity and growth, technological change, energy consumption and many more. Input-output tables can quite easily be integrated into macroeconomic models in order to analyse the link between final demand and industrial output, and they therefore serve as a basis for other economic models such as social-accounting matrices and more refined general-equilibrium models. Popular applications of the basic input-output model include environmental models. Input-output analysis thus provides a wide range of possibilities for analysing the economy.

The rise of the "new economic history" in the late 1950s and 1960s, with its demands for precise quantitative estimates and analysis, also led to the use of the input-output approach in research. In economic history, for example, it has been applied to issues such as the impact of technical improvements in transport on economic development, the impact of tariffs on resource allocation, sources of change in the distribution of incomes, and the contribution of war to industrialisation.[157] The use of general equilibrium analysis in economic history has also increased. Computable general equilibrium (CGE) models started to appear in the literature, largely based on the input-output structure that describes the flow of goods in the economy in a comprehensive way. An excellent article by John A. James (1984) gives a survey of applications of general equilibrium models.[158]

Input-output tables are important tools for compiling data into consistent accounts, as well as in economic analysis. Despite these obvious benefits and the emergence of cliometrics in the 1950s and 1960s, input-output analysis has still held limited appeal for economic historians, and only few historical tables are available (Table 10).[159]

157 Thomas (1987), p. 121.

158 James (1984). The use of general-equilibrium analysis in economic history is discussed when directions for future research are discussed in the conclusion section of this study.

159 The term "historical" input–output tables refers to tables describing the economy before the Second World War.

Table 10. Historical input-output tables

Year	Country	Compiler
1841	United Kingdom	Horrell et al. (1994)
1851	United Kingdom	Feinstein (unpublished)
1880	Australia	Siriwardana (1987)
1899	USA	Whitney (1968)
1907	United Kingdom	Thomas (1983)
1919	USA	Leontief (1936)
1923/1924	Soviet Union	Popov (1926)
1929	USA	Leontief (1941)
1934	Denmark	Abildgren&Norskov (1991)
1934/1935	Australia	Siriwardana (1995)
1935	United Kingdom	Barna (1952)
1939	USA	Leontief (1951)

Source: Abildgren & Norskov (1991), p. 12; the above studies.

The pioneer in this field was obviously W. Leontief with his construction of input-output tables for the United States. There were also experiments with the table construction in the former Soviet Union in the 1920s. One of the problems with the earlier tables was, however, that they lacked integration with the system of national accounts. As a result of the data problems, the last industry in Leontief's tables was called "undistributed", and included many items that could not be distributed to any given industry.[160] In addition, there were still many problems with the classifications and methods used. Despite these shortcomings, the first tables identified the problems with what were the current statistics at the time, which in turn gave the impetus to improve them.

Still, of the above historical input-output tables only six were explicitly constructed for the purpose of economic history, and only those produced by Horrell et al., Siriwardana, Whitney, Thomas, and Abildgren & Norskov have been applied in the research.

Horrel et al. (1994) presented an input-output table for the United Kingdom for 1841. They used it to identify the interdependency of industries and the linkages between them, as well as to assess the total productivity of each one. Their focus was on short-term developments, and as they quite correctly state, static analysis cannot provide information about sources of growth.[161]

Siriwardana used the input-output table he constructed for Australia for the year 1934/1935 in order to examine the causes of the depression in the country in the 1930s. He extended his input-output tables into a nine-sector computable general-equilibrium model for the purpose of his analysis. He used the 1934/1935 table to calibrate his CGE model, even though he admitted that an ideal exercise would have been to impose actual 1929–1934 shocks onto a model

160 Similar solutions were adopted with the first Finnish input–output tables.
161 Horrell et al (1994), pp. 545–546, 565.

calibrated with a 1929 database. This was not possible, however, due to the lack of a comprehensive database for 1929.[162]

Thomas extended the existing input-output table for the United Kingdom for 1935 into a social-accounting matrix, also taking into account the institutions in the model. He then used his 62 x 62-sector social-accounting matrix (SAM)[163] to measure the impact of defence expenditure on output and employment, and to investigate the impact of an imagined (counterfactual) public works programme, working through the construction sector, on economic activity.[164]

Feinstein and Thomas used the input-output tables for the United Kingdom for 1851 and 1907 in an attempt to measure the growth of industrial production during that period. They also made a valuable contribution in analysing the problem of how best to measure value-added growth in the individual industries that make up the aggregate GDP index. They proposed a method that was based on the input-output tables so as to overcome the data-availability problem of double deflation.[165]

Abildgern & Norskov (1991) constructed an input-output table describing the year 1934 for their Danish study. The table was further extended and used in a linear programming analysis of the employment effects of Danish exchange controls in the 1930s.[166]

There are also two Ph.D. theses in existence, which were not available for the present study. Whitney used his table from 1899 for the United States in order to analyse the structure of the American economy in the late nineteenth century, and Siriwardana constructed a multisectoral general-equilibrium model of tariff protection in Australia in 1880.[167]

If input-output tables can be used for such a variety of purposes, why have there not been more studies on the subject? According to Thomas, this is not surprising as the amount of high-quality statistical data required for constructing historical input-output tables is immense, and the construction is thus very labour-intensive, especially if the result is to yield reliable and accurate figures.[168]

James' analysis of the problems of using general equilibrium models in economic history can be further extended to include input-output analysis.[169] Firstly, the data requirements are significant, and the lack of data may become a constraint in applying the general equilibrium model, especially in economic history. This also holds true for input-output tables. Secondly, as a consequence of the data problems the general equilibrium models may be too simple to carry out

162 Siriwardana (1995). On model calibration, see p. 68.
163 The social-accounting matrix is basically an extension of the input–output framework, and incorporates the demand side in order to describe the circular flow of incomes from firms to households and back again.
164 Thomas (1983); Thomas (1987).
165 Feinstein & Thomas (2000).
166 Abildgren & Norskov (1991); Abildgren & Norskov (1992).
167 Information on these studies is based on Thomas (1987), pp. 180–183.
168 Thomas (1987), p. 127–128.
169 James (1984).

the tasks for which they have been built: they might not be detailed or complex enough to grasp the problems or questions. Thirdly, most economic historians are interested in questions concerning growth and development. The comparative static nature of input-output analysis, for example, cannot explain the dynamic longer-term implications of economic growth.

James also argues that the lack of intuition in evaluating results may be a crucial factor inhibiting the widespread use and acceptance of general equilibrium models. The complexity of any issue that goes way back in history makes it even more difficult to understand the results, especially in terms of determining what forces are driving them. In addition, perhaps their seeming complexity, or the lacking knowledge of national accounting structures, creates barriers for researchers in employing input-output methods in economic history.

One might well ask: why bother? There are clearly questions of motivation that cause the relatively narrow use of these methods. The extensive work of data gathering and the static nature of the analysis for a single year have hindered the spread of the methodology. However, even historical national accounts are labour-intensive, but they have still attained widespread popularity. If the construction of the tables was motivated by factors other than economic analysis, more economic historians might be working on the construction of historical input-output tables. One major motivation could be the compilation of supply and use tables, which already provide valuable information on the economy and, more importantly, can be used for sensitivity and reliability analysis of the historical national account figures. Thus, supply and use tables as such are already informative and valuable, and need not be extended further unless so desired. Their simple and understandable presentational form makes it easier to point out the driving forces in the economy. They also help to further understanding of and to identify what assumptions and parameters are crucial to the outcome of a model based on the tables as they give a clear picture of their robustness. The virtues of the input-output approach are in its operational simplicity and in the high level of disaggregation it makes possible.[170]

Integrated national accounts and supply and use tables further facilitate the construction of input-output tables, which exploits historical national accounts. Extensive historical national accounts are available in many countries. One Nordic project involving economic historians from Denmark, Finland, Iceland, Norway and Sweden, for example, has been working on a uniform framework for Nordic historical national accounts. The aim is to develop a common framework and, on that basis, to construct new aggregated series. This will provide a solid basis for comparative studies of the economic performance of the countries in question.

Swedish historical national accounts have been employed in a recent Swedish computable general-equilibrium model analysing the performance of the Swedish economy between 1910–1930. However, no explicit aim to create input-output tables has been expressed. As Vikström points out, the lack of historical

170 Thomas (1987), p. 127.

input-output tables for Sweden is a serious problem, which sets limitations on the social-accounting matrix constructed in his study for the purpose of computable general equilibrium analysis.[171]

Finnish historical national accounts, on the other hand, have been compiled in a theoretically and methodologically systematic way comparable to the system of national accounts. The data also includes the aggregate supply and demand account, which is of importance in the construction of supply and use tables. The most significant advantage in the compilation process, however, is the detailed information on the sources and methods used for calculating historical national accounts, which could serve as a starting point in the construction of historical input-output tables.

There has not been any attempt in Finland so far to construct historical input-output tables, despite the existence of historical national accounts data. Furthermore, regardless of its clear benefits, the supply and use approach was not applied in the compilation of any of the historical input-output tables described above.

The following chapter describes the construction of the first historical input-output tables on the Finnish economy in 1928. Full use was made of the historical national accounts as well as of the supply and use approach in order to obtain reliable results. It is demonstrated that the problem of data availability can be compensated by other means, and more importantly can be overcome through the use of more sophisticated methods of table construction.

171 Vikström (2002), p. 60.

4 Input-output tables describing the Finnish economy in 1928

> *"Some historians have held that there is no point in applying powerful statistical methods to economic history because the available data are too poor. In actual practice, the correlation often runs the other way. When the data are very good, simple statistical procedures will usually suffice. The poorer the data, the more powerful are the methods which have to be employed."*[172]

4.1 The approach and the classifications

Statistics Finland reformed the national accounts in 2003. The main goal of the reform was to combine the annual national accounts and the supply and use tables, which are now compiled together and published annually by Statistics Finland. They are compiled in accordance with the concepts and classifications used in the European System of National Accounts (ESA 1995) and the global System of National Accounts (SNA 1993).[173]

It was therefore obvious that the input-output table describing the Finnish economy in 1928 should also be compiled through the supply and use tables. In this study, the supply and use tables are first constructed and balanced, and then transformed into symmetric input-output tables. There are clear benefits with this approach, as mentioned earlier, and it is also in accordance with the SNA 1993 recommendations.

An underlying principle in the compilation of supply and use tables is the systematic treatment of the flow of products from supply to use. In practice, the compilation was carried out in three stages. First, the supply of each industry was estimated on the basis of various sources of archival and statistical data, and of additional studies on various industries. Secondly, the use table was compiled from some of the same data that was used for the supply table, and some additional material. In the final stage these two tables were combined.

It is emphasised that the supply and use tables were intentionally constructed separately and combined only at the final stage. This was done to ensure that there would be no intentional or unintentional consolidation of the figures during the construction of the two tables, and it was only in the final stage that any possible errors and statistical discrepancies would be revealed. This procedure made it possible to obtain maximum benefit from the utilisation of the supply-and-use approach.

172 Fogel (1966), p. 652.

173 See Tilastokeskus (2003) for more information on the reform of the Finnish national accounts.

In order to obtain a balance between supply and use, estimates calculated on the basis of the source materials must often be altered, the data in the source materials must be amended, and the correct data for the whole have to be sought by combining several data sources. The compilation of supply and use tables produces a balanced product account, which at the same time constitutes the national balance of demand and supply, and in which supply equals use so that no statistical discrepancy should appear. Thus, as the tables are being compiled by industry, the correctness of the data is simultaneously viewed in several different ways.

The approach used in the compilation of the supply and use of individual industries involves five stages. The point of departure has always been the available statistics on each industry. Firstly, the existing estimates of the historical national accounts are reviewed. Secondly, all possible statistics on individual activity are collected. Thirdly, additional data and sources are sought, especially committee reports. Fourthly, other studies are used as reference material and additional sources, and finally, estimates based on other indicators are used if no other information on individual activity is available. The level of detail of the results naturally depends on the level of accuracy in the basic sources, and there are significant differences between industries in the level of detailed information. The more the method used was based on secondary approaches (stages 4–5), the more unreliable the results should be considered.

The production approach has been used in the calculations. The total output of industry is first calculated, and then the intermediate use of products by each industry is estimated. Gross value added is calculated as a residual of the two items: output and intermediate use. In the case of services, the income approach is applied, in which wages and salaries as well as the consumption of fixed capital together form the value added of the industry. When the intermediate use is added up, the total output of industry is obtained.

The reformed European system of accounts requires that supply and use tables are compiled according to commonly accepted industrial and product classifications.[174] The Finnish national accounts are compiled according to the Finnish Standard Industrial Classification 2002 (TOL 2002), which is based on the European Union Industrial Classification NACE[175] Rev. 1. The product classification used is the national accounts product classification (KTTL), which in turn is based on the European Union's Classification of Products by Activity (CPA). The supply and use tables for the years 1995–2000 were originally compiled for more than 950 product groups and 182 industries. The official tables cover 34 product groups and 34 industries, while tables are also available as 60 x 60 matrices.

The industrial classification used in this study is based on *Toimialaluokitus 1995* (TOL 1995), which is the earlier Finnish version of the European NACE, Rev.1 industry classification. When the compilation process started the new

174 Eurostat (1996).

175 European classification of economic activities, NACE, is an acronym for *Nomenclature Générale des Activités Economiques dans les Communautés Européennes.*

TOL 2002 classification had not been introduced, but there are no major differences between the two.

Industries were formed mainly at the TOL95 3-digit level, at which there are around 200 industries, but in certain cases a more disaggregated level was chosen. All in all, the division of industries was largely dependent on the industry classification used in the historical national accounts and statistics, as well as on data availability (more detailed data was available on manufacturing than on services).

The product classification used follows the CPA classification. Data availability, again, limited the number of product groups used in the study. The groups were typically formed at the 3-digit level, but some exceptions were made due to data availability. There are over 200 product groups at this level.

The supply and use tables used in this study were originally compiled for more than 200 product groups and around 130 industries. The number of products varies significantly by industry according to the data availability, but at least one product is characteristic of each industry. The results obtained were verified by comparing the supply of each product with its use to a level of 190 products. Thus, the balancing process was carried out on a relatively detailed level.

Here the supply and use tables and all other results based on them are published at the level of 30 industries and 30 product groups. More aggregate presentation would possibly harm the reliability due to data problems, while it is admitted that some economic behaviour might be concealed due to the aggregation of industries and product groups. The classification used is intended to represent the structure of the Finnish economy in 1928 as far as possible.

The classification of industries used in the published tables is presented in Appendix 1, and it also corresponds with the product-group classification. A fully detailed description of the methods and sources by industry is presented in Appendix 2, and Appendix 3 gives the final statistical tables.

4.2 Overview of methods and sources

4.2.1 Supply and use by industry

A broad description of the methods and sources used is given in this section. In this context, the main starting points in the construction of the supply and use tables were the existing historical national accounts and series of studies on Finland's economic growth (so-called growth studies) by industry.[176] These studies served as important references for the basic data and statistics, and as a reference point for the results obtained. V. Lindberg's study on Finnish national accounts between 1926 and 1938 was also a key reference in the compilation process and it was utilized both as source of data and as reference to original sources.[177]

176 The growth-study series is published in the Bank of Finland series and includes 13 studies on Finnish economic growth by industry. The latest series was compiled in Hjerppe (1996).

177 Lindberg (1943).

These studies basically lack information on industrial use and supply on the product level, however, in terms of what products have been produced or used as intermediate inputs. Therefore, the standard practice of repeating all calculations from the basic statistics and archival records available was adopted. In many cases, too, additional sources were employed.

In the case of *primary production* (agriculture, forestry, hunting and fishing), there are studies available on the historical national accounts as well as extensive statistics on production.[178] However, some data on production and on intermediate use by product group in agriculture is missing, especially on the products produced and consumed at farms. In addition, Viita's study on agriculture in Finland in 1860–1960 has quite correctly been criticised for its lack of documentation, which has made it difficult to rely fully on his estimates.[179] Therefore, new estimates on the production and intermediate use of agriculture at the level of 15 product groups are made based on the statistics and studies available on output quantities, prices and production technologies.

In terms of constructing supply and use tables, *manufacturing* (including mining as well as electricity, gas and water supply) could be considered the most important industry, thus the fact that there is extensive data on manufacturing was a crucial starting point for the whole task. Manufacturing statistics include accurate quantity and value information on products produced as well as on the intermediate use of manufacturing establishments for over 190 industries. Intermediate product use is further divided into domestic raw materials, domestic semi-products, foreign raw materials and foreign semi-products.[180] The statistics are considered very reliable.

Manufacturing statistics also include detailed information on labour input, wages, and sources of energy for engines, all of which are important in the compilation of supply and use tables, but they ignore certain significant industries such as milk production, animal slaughtering, publishing, steam heating and thermal power. This information is included in other statistics, which were thus used accordingly.

Moreover, manufacturing statistics only include establishments with more than 10 employees or with a production value of over 15,000 Finnish marks.[181] Data on small establishments (with less than 10 employees) are therefore totally lacking. An estimate of the extent of these so-called industrial handicrafts was made in the growth study on manufacturing conducted by Hjerppe et al. (1976): it seems that they had a 7.6% share of the total manufacturing output in 1928.[182] There was therefore a need to develop a method for estimating the output and intermediate use of industrial handicrafts by product group.

178 On agriculture, see Viita (1965); on forestry, see Kunnas (1973); on hunting and fishing, see Kunnas (1962); on estimates of total primary production, see Lindberg (1943), pp. 31–64.

179 On critics, see Soininen (1966).

180 SVT XVIII A, Teollisuustilastoa 45 (Manufacturing statistics), 1928.

181 The limit has been difficult to observe in practice.

182 Hjerppe et al (1976).

There are statistics available on industrial handicrafts for the years 1913, 1923, and 1934, but they do not include any information on intermediate inputs. Moreover, the collection of data was not straightforward as the industry has been very difficult to define: according to the statistics it includes "all establishments that are not included in the annual manufacturing statistics",[183] but in the view of Hjerppe et al. (1976), this covered only about 70 percent of the total employment in industrial handicrafts. For the present study, therefore the output level was estimated based on the level calculated in Hjerppe et al. (1976), while the structure of output (ie. what products were produced) was obtained from the industrial handicraft statistics for the year 1923.

The general economic census of 1953 includes information on the intermediate use of both manufacturing and industrial handicrafts. The difference between the census and the manufacturing statistics reflects the use of intermediate products by the industrial handicrafts sector. The information is not presented by product, however. Therefore, as small establishments are not covered by the manufacturing statistics of 1928, the input structure of large establishments was applied to them. This method could be considered intuitively reliable, and is also in line with the recommendations of the United Nations.[184]

The use of other intermediate consumption components (e.g., repairs and fuels) by manufacturing industries was not included in the statistics until 1954. As there is virtually no additional information available on the subject, the 1954 data were used here. The shares of other intermediate products were assumed to be same in 1928 as in 1954. However, the cost of packaging and other small products was not included, as according to the 1954 statistics, "in the 1928 statistics packaging materials and other small products were included in the raw materials and are now included among other intermediate products".[185] This procedure differs from that used in Hjerppe et al. (1976), which probably featured some double counting.[186] As far as fuels were concerned, additional studies on the consumption of petrol, coal and wood were consulted in order to obtain accurate results.[187]

Even though there were estimates of *house construction and land and water construction* in the growth study series,[188] new estimates were compiled due to the lack of detail concerning the output and use of intermediates by product group. Extensive work was carried out in order to investigate the output of land and water construction by producing sector, as well as intermediate use of the whole construction industry. Despite the fact that no direct national accounts data on construction activity are available, the abundance of other statistics as

183 SVT XVIII B, Käsityötilastoa (Industrial handicrafts) 3, 1934, pp. 1–2.
184 United Nations (1999), p. 110.
185 SVT XVIII A:70 1954, p. 21.
186 Hjerppe et al (1976), p. 29.
187 KOM 7/1950, Polttoainekomitean mietintö (Committee report on fuel); Holopainen (1950); Saari (1934).
188 On house construction, see Heikkonen (1977); on land and water construction, see Kohi (1977).

well as additional studies on the activities and cost structure have yielded results that could be considered reliable.

Data on *trade* is scant. Value added has been included in the growth series[189], but in the present study, output was taken from a study conducted by Pekka Tiainen, while intermediate use was calculated from total sales, based on information provided in studies on trade profitability and on the composition of trade in Finland.[190] Even though the growth series also includes estimates for *hotels and restaurants*, new estimates were calculated in the present study based mainly on a committee report on the consumption of alcohol,[191] which includes detailed information on the output and allocation of costs in restaurants. Data on hotels was based mainly on a study conducted by Hirn & Markkanen on the history of tourism in Finland.[192] The results for trade as well as for hotels and restaurants should be considered only moderately reliable, however.

There are reliable statistics available on *transport and communications* by government institute, and much effort has been put into collecting all possible information on the extent of privately operated transport and communications operations (e.g., buses, horse transport, goods transport by road, and private telephone companies). A wide range of statistical and additional source material was used in calculating the estimates, together with the growth study on transport conducted by Seppo Leppänen.[193] The results obtained could be considered relatively reliable.

In the case of *banking and insurance*, the data availability set some serious limitations. Hjerppe (1996) includes estimates for this industry, but information on intermediate use is almost non-existent. The intermediate use of banking and insurance was thus estimated from secondary sources, based on data on the use of intermediate products in government offices and individual banks. As far as *housing services* were concerned, extensive growth data was available[194], nevertheless intermediate use by product group was again estimated with reference to additional studies on the subject, especially the one conducted by M. Tamminen on housing production.[195]

Data on public services (*administration, education, health and social services*) are based on government balance sheets, municipal balance sheets and financial statistics, and other parliamentary documents, and could be considered very reli-

189 Forssell (1979); Hjerppe (1996).

190 For studies on the profitability of trade, see Wiherheimo (1946a); Wiherheimo (1946b); Wiherheimo (1949); Raninen & Kaskimies (1952a); Raninen & Kaskimies (1952b); Raninen & Kaskimies (1953); Raninen & Kaskimies (1954); Virtanen (1954). For other studies, see Järvinen & Korpisaari (1940), pp. 256–277.

191 KOM 7:1946 Alkoholikomitean mietintö.

192 Hirn & Markkanen (1971).

193 Leppänen (1973).

194 Heikkonen (1971).

195 Tamminen (1945).

able.[196] In the case of *private education and health services*, Hjerppe (1996) includes an estimate, but given the lacking information on intermediate use, the same cost structure as in public services is assumed. Even though the results should be regarded as only tentative, the share of private services has been so low that this should not affect the final result.

On *other services* (such as business activities, cultural services, entertainment and research) the data available varies. Services by public sector are basically well documented, while private services lack some, or almost all, information. Hjerppe (1996) includes estimates on the level of these services, but not on intermediate use. Again, some very rough estimates by product group were made, based mainly on the intermediate use of publicly produced services. These should be considered only tentative.

In sum, in the compilation process the greatest efforts were put into estimating the supply and use of primary production, manufacturing, construction and communications. These sectors together comprised over 70 per cent of the domestic production in 1928. Estimates on the extent of the production and use of intermediate products in many areas of service, on the other hand, were unfortunately more or less based on secondary sources, and the results should only be viewed as moderate. Once the two tables (supply and use) were connected in the final stage of the compilation process, it was possible to observe errors in the results largely because supply and use should be equal in both. This, in turn, further increased the reliability of the final result. A more detailed analysis of the balancing procedure is given in Chapter 4.2.6, and the reliability of the calculations is analysed in Chapter 4.3.

4.2.2 Foreign trade

Oksanen & Pihkala (1975) compiled the historical national accounts data on foreign trade in their study *Suomen ulkomaankauppa 1917–1949* (Finnish foreign trade). They present data on both import and export by product group, and also divide it according to the components of demand.

The approach chosen for dividing imports and exports into demand components was not described accurately enough in Oksanen & Pihkala's study, however. There is no information on the basis on which imports were divided between intermediate use, private consumption and investments, for example,[197] and it was therefore necessary to take the data from the official statistics on foreign trade in order to compile the supply and use tables.[198] In the statistics, imports are presented at the level of over 600 products and exports at the level of almost 300.

196 Valtion tilinpäätös (Government balance sheets) 1928; Valtiopäiväasiakirjat 1929; SVT XXXI B1 Kuntien finanssitilastoa, Kauppalain ja maalaiskuntien finanssit 1930–1931; SVT XXXI 6 Kuntien finanssitilastoa, Kaupunkikuntien finanssit vuonna 1928–1929; STV 1929.

197 Oksanen & Pihkala (1975), p. 30.

198 SVT 1 A Ulkomaankauppa (Foreign trade) 48, 1928.

This data was compiled at the CPA 3-digit level and incorporated into the supply and use tables once the domestic production tables were finished. As there was reliable data available on the use of imported products by manufacturing industry and other major sectors, it was also possible to construct separate use tables for domestic and imported products. The methods used are described in more detail in Chapter 4.2.7. The import data is given in c.i.f. prices and the export data in f.o.b. prices.

Data on foreign trade could be considered very reliable due to the high quality of the available statistics. The export and import of services are not included in the official statistics, however, and as a result no effort was made to include this information in the calculations. Foreign service companies were mostly operating as agencies in Finland, providing some services in transport, forwarding and trade.[199] The level of this activity was difficult to verify fully, however. It was nevertheless assumed that it was of no significance in 1928, and therefore any possible error should not be significant. This also applies to comparison with the supply and use of services.

4.2.3 Final-demand components

There are wide variations in the available data for each of the final-consumption components. There is extensive data on government expenditure, and private household consumption is analysed well by E. Laurila in his extensive study on private consumption in Finland, but little is available on investments.

The data on final government consumption is based on the balance sheets as well as on additional budget material.[200] The basic sources are reliable, but there have been some difficulties in separating certain items of expenditure due to the way the information has been presented in the balance sheets. Additional information was therefore sought in other parliamentary documents. All in all, however, the data could be considered reliable.

In the case of private household consumption, Laurila used methods similar to input-output analysis in estimating the share of consumption in different product groups. He devoted a lot of attention to the factors that affect consumption, and classified them into three groups: general factors (societal structure, habits), demand factors (income levels, income distribution) and supply factors (changes in production, imports). Thus, at least to some extent, he explored both supply and demand in this study on private consumption.[201]

A household-consumption survey was carried out in Finland in 1928. There had been similar studies every now and then since 1908, but the 1928 study included as many as 1,224 households and was carried out among a more diversi-

199 Hjerppe (2004b), pp. 234–235.
200 Valtion tilinpäätös 1928; Valtiopäiväasiakirjat 1929.
201 Laurila (1985), p. 13–22.

fied population grouping. This survey formed a solid basis for Laurila's study.[202] As a rule, he did not resort to second-hand sources, but made every effort to use all possible primary data, official statistics and other comparable material.

Laurila presents data on household consumption for nearly 100 product groups. When used for the construction of supply and use tables, this data was again compiled at the CPA 3-digit level and connected to the use table at the final stage. The household-consumption data could be considered very reliable for the most part.

Of the final-demand components, that of gross fixed capital formation was the most difficult. Investments were focused on in Hjerppe et al. (1974 and 1981). The sources used in this study for the investment series on residential buildings as well as other house construction included E. Heikkonen's studies on housing in Finland, while data on land and water construction was obtained from a study undertaken by P. Kohi.[203] All of these data could be considered quite reliable given the fact that there is a lot of information on government construction activity in particular.

Data on investments in machinery and transport equipment, on the other hand, was somewhat limited, and a more indirect approach was needed. First, the production value of machines and transport equipment was calculated from the manufacturing statistics. Imports of these products were then added while exports and intermediate use were deducted on the basis of the data on foreign trade and manufacturing. The residual was assumed to present the value of investments in machinery and transport equipment. It is acknowledged that the method for estimating gross fixed capital formation is not optimal, but it does correspond to the one used in the Finnish historical national accounts.

4.2.4 Value added and its components

Of the value-added components, only that of wages and salaries (compensation to employees) is presented in the final tables in Appendix 3. Calculations of the consumption of fixed capital, operational surplus and mixed income were carried out, but due to the unreliability related to some of the items, they are not presented in the final tables. The reason for the unreliability is twofold. Firstly, as mentioned previously, the statistical information on other components (i.e. the consumption of fixed capital, operational surplus and mixed income) is very scant, and therefore cannot be considered fully reliable for the statistical purposes. Secondly, even if other value-added components are interesting in terms of the central research question in this study, the wages sum is the most important and relevant. The estimation

202 Ibid., p. 37.
203 Heikkonen (1971); Heikkonen (1977); Kohi (1977).

of other components is a relevant area of study for the future, however, and new results could easily be combined with the tables presented here.[204]

Reliable data on wages was available in most cases, and for most industries was obtained from the same sources as were used for calculating supply and use. Moreover, since wages have attracted a lot of research interest in Finland, there are extensive studies on the subject, and these were consulted in the process of estimating supply and use. Again, the main starting point in the calculation of compensation to employees was the data in the Finnish historical national accounts.

4.2.5 Price components

The data on *taxes* is based on M. Leppo's extensive study of state taxation on consumption in Finland during the inter-war years.[205] Leppo's study gives detailed information on taxation structure, development, and level by product group, and gives the amount of taxes collected.

Data on import and export duties were obtained from the statistics on foreign trade, which list the quantity of products imported and exported, as well as the duty per quantity, for 900 products. This information was used in order to calculate the duties on products, which again was compiled at the CPA 3-digit level.

According to government balance sheets, and Hjerppe (1996), there were no *subsidies* in 1928. All in all, the figures for taxes and subsidies could be considered very reliable.

The construction of the trade-and transport-margin matrices was in many ways the weakest link in terms of reliability in the construction of the supply and use tables. It was very difficult to find out the exact transport and trade margins of certain specific products, and they were therefore estimated more or less as averages of different product groups. This approach is in line with UN recommendations, as the construction of margin matrices presents difficulties even today.[206]

The SNA recommends that the compilation of *trade margins* should start from the supply side (trade turnover by industry and product divided between wholesale and retail sales). However, because there was virtually no data available on trade turnover by industry (or product), a use-side approach was adopted instead.

The use of each product (in over 100 product groups) was first calculated from the use table at purchasers' prices and divided between intermediate use, consumption, exports and investments. The proportion of trade purchases for every single element in the use table was then estimated.

204 Tiainen (1994) estimated these value-added items in his study. They do not necessarily fall into the classifications adopted here, however, and therefore cannot be applied as such in the final tables. Tiainen's figures on capital stock, on the other hand, were used, after adjustement, for analytical purposes for Chapter five of this study. Furthermore, his data on the rate of savings and direct taxes were used in the closed model in the Chapter six.

205 Leppo (1938).

206 United Nations (1999), p. 187.

In the case of intermediate consumption, export and investments it was assumed that all sales went through wholesale trade. As far as agriculture was concerned, additional sources were consulted in order to estimate the proportion of production consumed by the farms.[207] For the rest of the final-demand components it was assumed that 50 per cent of sales went through retail: this was based partly on the information available on the farms' own consumption of their production.

The next step was to use data on trade margins by product to estimate the share of the trade margin in product use at purchasers' prices. However, there is little or no information on *actual* trade margins by product available even today, and additional data was therefore sought. During the Second World War, The Ministry of Supply (kansanhuoltoministeriö) issued regulations on the maximum trade margin allowed for different products.[208] This data included margins for both retail and wholesale trade for 760 products, and was used in order to calculate the trade margins included in the product use at purchasers' prices.

It goes without saying that this data obtained from The Ministry of Supply does not reflect the trade margins applied in 1928. In order to check the reliability of the figures for 1928, therefore, additional data covering the 1920s and 1930s was used. The Wholesaler's Union was founded in 1920, and as a result there is some data from 1928 onwards, when the union began to publish annual statistics. More importantly, there is information on average gross profit by product group, which the union has considered *reasonable*. Further data on trade margins was gathered from the newspapers published by the different trade groups.[209]

Despite the extensive work on trade margins, the result obtained could be considered only relatively reliable because the actual margins are probably different from the estimated reasonable gross profits. However, the available information on average trade margins does support the data obtained from The Ministry of Supply. The average profit percentages also vary quite remarkably by product group, which is also the case in reality.

According to ESA 95, the calculation of *transport margins* should start from the supply side by identifying the transport services produced. However, only the services that contribute to the difference between the supply of products at basic prices and their use at purchasers' prices should be included. Thus, only transport services that are arranged by the seller and invoiced separately should be considered transport margins.[210]

Data on goods transport by different modes was used for estimating transport margins. There is extensive data on rail transport as well as on transport tariffs by product group and distance.[211] As far as road and inland-water transport is con-

207 Tutkimuksia Suomen maatalouden kannattavaisuudesta, XVII, 1928–1929.
208 Hintatiedoituksia N.o 119, Kansanhuoltoministeriö 23.12.1942.
209 Järvinen & Korpisaari (1940), pp. 278–279; Rautakauppojen uutiset; Paperikauppias; Puuteos.
210 EUROSTAT (1996), pp. 138–139.
211 Castrén (1927); Rautatierahdit, liikennöitsijän käsikirja N.o 3, Helsinki.

cerned, there is information on the division of services by product group in a study conducted by A. Kiiskinen.[212] In addition, Kunnas' study on forestry growth contained information on the value of log floating.[213]

All in all, information on the value of transport services by product group for 50 products was obtained. It was estimated that only five percent of the value could be attributed to transport margins according to the ESA 95 definition. This assumption was based on information on the organisation of transport services during the 1920s and 1930s.[214]

In sum, the calculations on trade and transport margins were based on various sources. There are still serious problems with the estimations, especially concerning the level of transport services arranged by the seller and invoiced separately (estimated at five percent). Therefore, the results obtained should be treated with caution. On the other hand, it is commonly accepted that the estimation of margin matrices is not without problems, even today.

4.2.6 *Manual balancing*

The finalising of the commodity-flow system of supply and use required a balancing procedure to be carried out. According to the ESA 95 recommendations, the first step in such a procedure is to adjust the column totals to the column targets. This was not done, however, since there were no target figures available because historical data is being produced for the first time.

In this case, a horizontal manual balancing procedure was carried out at the level of 190 products. For each product group, the balance between supply and use was checked and the calculations were double-checked. Any errors were corrected manually.

The main errors arose because of the wrong coding of products in the CPA classification, or due to simple human error when the figures were entered into the system. If the available data did not offer any explanation for the difference between supply and use, no changes were made. At this stage, no adjustments were made to the product-group totals of supply, intermediate industry use, imports, or any final-demand components other than private consumption. Only the household-consumption figures were altered in some cases in order to achieve a better balance. This was based on the fact that Laurila's study included additional information on consumption patterns in different product groups on a more detailed level in the text part of the book. The original figures were thus altered only if the information on household consumption in Laurila's study was presented on a more aggregate level than was necessary for the balancing procedure, and if there was more information in the text part of the study.

212 Kiiskinen (1954).
213 Kunnas (1973).
214 Herva (1932); Puuteos N:o 6, 1929; Jalava (1932); Tapion taskukirja (1944); Puutavarakaupan käsikirja II (1950).

The final result of the manual balancing procedure was an adjusted product balance. There is normally no remaining discrepancy between product supply and use in official tables, but the statistical discrepancy was left unbalanced in this study in order to illustrate the reliability of the results (see Chapter 4.3).

As the two tables (supply and use) were constructed separately and connected only in the last phase of the work (the manual balancing), it was possible to maximise the benefits of the supply and use approach. The statistical discrepancy was originally four per cent of the total supply, but this was reduced to 0.5% after the manual balancing process, which could be considered a good result. It should be emphasised, again, that no alterations were made to the data unless there was a clear input error, or if other statistics supported new estimations of either supply or use.

4.2.7 Symmetric input-output tables

The discussion on the best possible methodology to apply in transforming supply and use tables into symmetric input-output tables is still ongoing. Thage put forward strong points in favour of industry-by-industry tables, while the European System of Accounts recommends a product-by-product approach.[215] The former approach was used here under the assumption of a fixed sales structure. The choice of method was influenced by Thage, and by the fact that it was also used in the construction of recent Finnish input-output tables: it seemed a natural choice in order to maintain comparability in terms of time. Furthermore, the choice of method should not affect the final input-output tables as long as enough information is given on the assumptions included in the transformation process.

The assumption of a fixed sales structure is briefly presented in the following equations. Product c can be produced by various industries. The market share of industry j in the production of product c can be presented as

$$(30)\quad b_{ci} = \frac{v_{ci}}{v_c},$$

where $v_c = \sum_{j=1} v_{ci}$. The product flow from industry i to industry j can be calculated as presented in the next equation, where b_{ci} describes the share of industry i in producing product c, and u_{cj} describes the amount of product c used by industry j. Thus,

$$(31)\quad z_{ij} = \sum_{k=1}^{n} b_{ci} u_{cj}.$$

215 Thage (2002); Eurostat (1996).

In the matrix form, the equation can be presented as

(32) $Z = B'U$,

where **B′** equals the market-share matrix calculated from the supply table, while U equals the intermediate-consumption matrix in the use table.

There are two preconditions, however, before the transformation process can be carried out: both supply and use must be presented at basic prices, and the use of imported and domestically produced products must be separated.

Data on taxes and subsidies, transport and trade margins was used in converting the use table at purchasers' prices into basic prices. The proportions of taxes and subsidies, as well as of transport and trade margins, were deducted from each cell, thus the transport and trade margins are included in the use of these services.

Historical statistics are often more informative about the separation of the use of imported and domestically produced products than many statistics available today. The manufacturing statistics do separate the two, and there are statistics available on the share of imported products for many other industries. Therefore, the results could be considered relatively reliable. The separation was carried out in four stages. First, the known use of domestic and imported products was allocated based on the statistics available. Secondly, of the remaining supply, the products were categorised as supplied only domestically or only through imports. Thirdly, since all that remained in many cases was to allocate product groups as imports or domestic production, this was done. Fourthly, for the remaining supply it was assumed, that use was first satisfied through imports and then through domestic production. This resulted in zero statistical discrepancy in the use table of imports.

Once the separation mentioned above had been done, the transformation process was quite straightforward. The symmetric input-output table is basically the use table of domestic products only transferred to the industry-by-industry dimension using the fixed-sales-structure assumption.

4.3 An improved estimate of the GDP in 1928

Supply and use tables provide a detailed description of product flows in the economy and an adequate accounting framework for compiling consistent and reliable national accounts data. In this case the result was a new improved estimate of the gross domestic product in 1928. According to the calculations presented in the final tables in Appendix 3, the total supply of the economy was FIM 58.2 billion, of which imports accounted for FIM 8.0 billion. The gross domestic product at basic prices was FIM 26.8 billion. These figures differ quite significantly from earlier calculations presented in the historical national accounts, in which the GDP was estimated at FIM 25.2 billion.[216]

216 Hjerppe (1996).

What accounts for the difference? In the original calculations the economy was described in a set of national accounts with unquestioned precision. In reality, economic data always includes an error component due to problems of measurement, omission or procedure.[217] Errors of measurement may be errors in the basic source (committed by the institutions providing the data, or by those collecting it). There may also be conceptual discrepancy, even if the figures are otherwise correct. The statistician may cause measurement errors by incorrectly entering numbers or failing to notice a change in definition, for example. Errors of omission arise when some components are left out because no sources are available, or they are considered too small. Errors of procedure, in turn, include the use of inappropriate methods for calculating estimates of intermediate use or of the GDP. All these errors may be random or systematic.

Because all data includes an error component, any new data should always incorporate some estimates of the reliability of the calculations. This would ensure that the users of the data were aware of the extent to which the estimates could be relied on. The use of reliability estimates also reduces the need for further revision if it can be demonstrated that the calculations could be considered reliable enough. They could also be used as a guide to enable other researchers to concentrate on the points that require the most revision.[218] More than often, however, researchers tend to provide only a general appraisal of the reliability of their estimates in statements such as, "a crude indication", "reasonably reliable", and there is often no attempt to indicate the size of the likely error.

There are many ways of conducting a reliability analysis. A basic check on the reliability of estimates can be carried out through sensitivity analysis, by comparing alternative estimates, or by means of statistical reliability analysis. There are problems with error estimation, however, especially in the case of historical economic data. This is partly because data series or benchmark accounts are often compiled for the very first time and there is no point of reference at which to compare the results obtained. Furthermore, errors of measurement are always difficult to observe. Often we just have to accept the fact that all data has errors, and that the figures presented in the original statistics are as close to the reality as possible.

Naturally, attempts were made in this study to minimise possible errors of measurement. The final assessment of the results obtained involved two different approaches to estimate errors of omission and procedure. The supply and use approach provided important means for both minimising errors as well as estimating their size in the final results.

In order to avoid errors in measurement (through entering wrong numbers, for example), all the figures were double-checked and cross-checked by adding up all the numbers entered in order to check their consistency with the original statistics. In addition, the manual balancing procedure made it possible to point out the errors of measurement that occurred in the compilation process. If the

217 Feinstein & Thomas (2001), pp. 9.
218 Ibid., pp. 3–4.

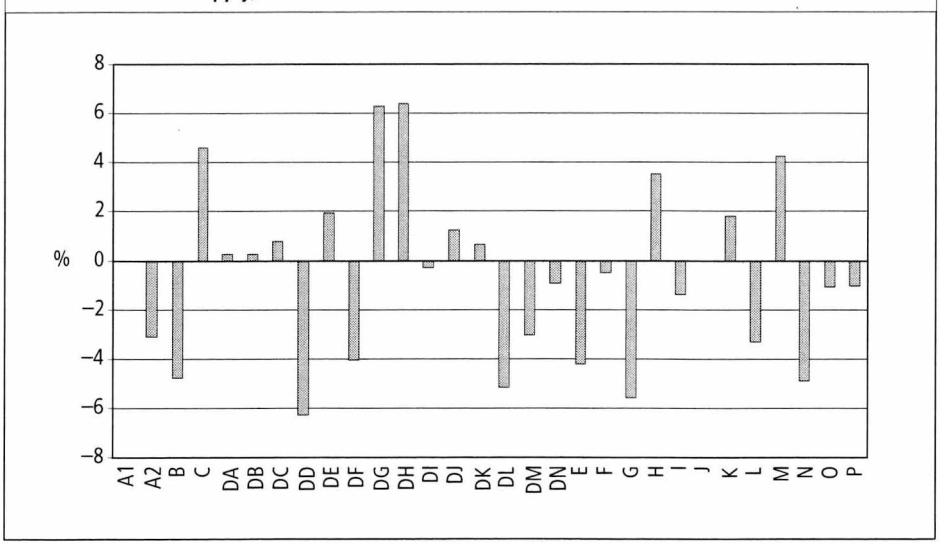
statistical discrepancy between the supply and use of a product group was high, the sources of this error were searched for and the correction made as part of the balancing process. Naturally, if no measurement error was found, the discrepancy was left as it was (see Chapter 4.2.6).

Once the balancing procedure was complete, any statistical discrepancy was assessed. Discrepancies were not caused by errors in measurement, but by the scant data and the more indirect methods used in order to arrive at estimates of the different components of the total output. These errors of omission and procedure are difficult to correct and it is more reasonable to try to estimate the size of the error caused by these indirect methods. Knowing that there is an error but not knowing the relative size of it is not enough.

The supply-and-use approach was again utilised to describe the extent of the error. As the total supply of a product group equals its total use, the statistical discrepancy describes the size of the imbalance. The following figure shows this statistical discrepancy between supply and use at the level of 30 product groups. As mentioned earlier, the discrepancy in the whole system was only 0.5%, which could be considered a very good result given the historical nature of the material applied. There arewide variations between different product groups, however, the statistical discrepancy being between minus and plus six percent.

In terms of reliability, the fact that data on most of the largest products (in terms of total output) was readily available is important. The statistical discrepancy for agricultural products (A1), forestry products (A2), food products (DA), paper products (DE), construction (F), and transport services (I) was relatively small. In the case of wood products (DD), the size of the discrepancy could be

Figure 11. Statistical discrepancy (supply minus use) by product group (as a percentage of total supply)



Source: The author's own estimates (see Appendix 1 for the classification).

explained by the fact that the figures also included changes in inventories. There might have been excess wood stored from the year before, which was now being pushed onto the market. On the other hand, the export volume of wood products, as well as export prices, fell in 1928[219], and the high statistical discrepancy could also have been caused simply by too high an estimation of wood-product consumption in this study.

The biggest discrepancies were in the service sector. This clearly illustrates the fact that there was not enough data available on the production, intermediate use and foreign trade of services. Despite the well-recorded production of public services, such as education and health care, we do not know enough about their private production and consumption.

The fact that the calculations involving the largest product groups in the economy were the most reliable is perhaps not surprising. It would seem reasonable to assume that, precisely because of the great economic significance of these products, there was a need and a desire to compile statistics as well as to conduct other studies in this area.

Naturally, the above analysis does not fully answer the question of the extent of the error. It is possible to come up with an estimate in which no statistical discrepancy exists, but in reality, the estimates of both supply and use are incorrect. In the end, it is rather pointless to make further attempts to find possible reasons for the discrepancy. We should rather try to give a better evaluation of the reliability of the final result, which would require more appropriate statistical analysis.

A general approach to statistical analysis is as follows. We do not know precisely the underlying variables of output (a). However, we can use the information provided in the supply and use tables in order to carry out a pure error analysis. We therefore have two estimates (supply and use) of output ($\hat{a}$) for each product group. These two output estimates for 30 product groups can be used in order to calculate an upper and lower boundary of the total domestic output. We assume that each product group either takes its lowest value or its highest value at the same time. Sums of the lowest and the highest values thus present the worst-case and best-case scenarios of total output. Naturally, in the case of individual product groups, the real output may be lower than the lower boundary or higher than the upper boundary, but with a very low probability.[220]

On the basis of the information obtained from the use table for domestic products presented in Appendix 3, the total domestic output at the lower boundary was estimated at FIM 49.9 billion, and at the upper boundary FIM 50.8 billion. Now consider the fact that the two estimates of supply and use already include possible errors in intermediate use as well. Therefore we also obtain upper and lower boundaries for the value added. The GDP was estimated at between FIM 26.5 (lower boundary) and 27.5 (upper boundary) billion.

219 Halme (1955), p. 216.

220 This approach is presented in Ten Raa (1995), while the calculation of the 95% confidence interval is partly based on Feinstein & Thomas (2001).

It is very unlikely that all components take their worst- or best-case scenarios at the same time, however, and the size of each product group should also be taken into account. For this reason, an analysis of the confidence interval is introduced below.

The 95% confidence interval for total output and GDP can be calculated by applying the Lindeberg-Feller variant of the central limit theorem,[221] according to which for independent variables $x_i, x_2, \ldots, x_n$, whose expectation and variance are $E(x_i) = \mu_i$ and $Var(x_i) = \sigma_i^2$, respectively, the distribution of the standardised sum

$$(33)\quad \frac{\sum_{i=1}^{n}(x_i - \mu_i)}{S}, \text{ where } S = \sqrt{\sum_{i=1}^{n}\sigma_i^2},$$

is close to the standard normal distribution for large n.[222] When this normal approximation holds, the 95% confidence interval for the unknown $\sum_{i=1}^{n}\mu_i$ is

$$(34)\quad \left(\sum_{i=1}^{n}x_1 - 1.96 \times S, \sum_{i=1}^{n}x_i + 1.96 \times S\right).$$

In the case of the supply and use tables constructed, n = 30 since the final use table of domestic products presents output at the level of 30 product groups. This is large enough to justify the normal approximation. What we need to estimate is $\sum_{i=1}^{30}\mu_i$, the total output, which is the sum of unknown product-group outputs. For each product group i, there are two observations for μ_i: supply and use. It is assumed that errors in these observations are random and independent with zero means, but not necessarily normal.

The point estimate x_i in (33) for the true product-group output μ_i is the mean of supply and use in the corresponding product group i. The point estimate for $\sum_{i=1}^{30}\mu_i$ is the sum of the product-group means, that is, $\sum_{i=1}^{30}x_i$. From (34) it is possible to see that for the 95% confidence interval for $\sum_{i=1}^{30}\mu_i$, an estimate $\hat{S}$ is needed for the unknown S. For this, variance estimates s_i^2 are required for unknown variances σ_i^2. These are obtained by applying the standard formula using information on supply and use by product group

$$(35)\quad s_i^2 = \frac{\left(x_c - \frac{x_c + (z_c + y_c + e_c)^2}{2}\right) + \left((z_c + y_c + e_c) - \frac{x_c + (z_c + y_c + e_c)^2}{2}\right)}{2 - 1}$$

221 On basic methodology and its applications, see, for example, Knottnerus (2003), pp. 21–22. Mikko Myrskylä from Statistics Finland has been of great help in formulating this approach.

222 This holds true on the technical condition that $P(|x_i| < M) = 1$ for every i.

Now the 95% confidence interval for the unknown total output $\sum_{i=1}^{30} \mu_i$ is obtained by plugging the calculated values $\sum_{i=1}^{30} x_i$ and $\hat{S} = \sqrt{s_1^2 + s_2^2 + \ldots + s_{30}^2}$ into (34).

According to the above calculation, the total domestic output of the economy was between FIM 49.8 and 50.9 billion, while the value added was between FIM 26.5 and 27.5 billion at the 95% confidence interval (Table 11 summarises the results).

Comparison of the above with the estimate provided in the Finnish historical national accounts shows that the HNA clearly underestimates the value added: the estimate is below the lower boundary of the 95% confidence interval. The new GDP estimate presented in this study is nearly seven percent higher than that presented in the growth study on the Finnish economy.

Finally, what does this result mean? Is the difference between the old and the new GDP estimates relatively insignificant, or does it change our view of the economy? We could compare the results obtained with the historical national accounts by industry. However, due to differences in the industrial classifications used, some industries had to be combined (Figure 12). The estimates by industry in the two studies also differ somewhat. The greatest absolute differences between the two studies are in agriculture (A1+B), manufacturing (C–E), trade (G), transport (I) and other services (H, K–P).

The reason for the 14% difference in the agriculture figure lies in the different approach to the estimation of both output and intermediate usage. The use of firewood, for example, was classed as intermediate for housing, but not for agriculture. In addition, production for the producer's own use was calculated as output. Some of this went for intermediate use in the production processes, but some was sold outside. In the case of manufacturing, there was clear double counting of intermediate consumption in the HNA estimation (see Chapter 4.2.1), and this caused most of the 7% difference between the two estimates in the value-added figures. All in all, in the case of manufacturing, the differences arose in the estimation of the other intermediate inputs.

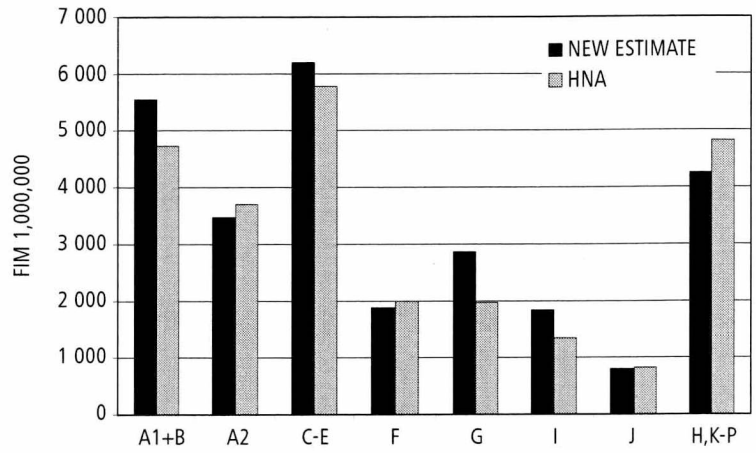
The biggest difference (46%) applied to trade, and could be partly explained by the different approaches to national accounting: the concepts of trade and of its value added differ in the two studies. The system of national accounts recom-

Table 11. The domestic output and value added at basic prices (FIM million, current prices)

	Output	Value added
The author's own estimate	**50,205**	**26,861**
Lower boundary	49,872	26,528
Upper boundary	50,827	27,483
95% confidence interval		
Lower boundary	49,821	26,477
Upper boundary	50,878	27,534
Historical National Accounts		**25,183**

Sources: The author's own estimates, Appendix 3, the use table of domestic products; Historical National Accounts, Hjerppe (1996).

Figure 12. GDP by industry at basic prices (FIM 1,000,000, current prices)



Source: Hjerppe (1996); the author's own estimates (see Appendix 1 for the classification).

mends that the value added should be estimated by deducting purchases from the total sales, whereas the HNA method is based on the income approach. The starting point in this study was the output estimate given by Tiainen (1994), and intermediate use was calculated from the total sales based on information provided in studies on trade profitability and the composition of trade in Finland. It must be admitted that the figures thus obtained are not without problems.

In the case of transport, the estimates for goods transportation by road were much higher in the present study. In turn, detailed study of most of the services (H, K–P) revealed more intermediate use than previously estimated, and thus lower value added. Generally, it could be concluded that much of the difference in the two estimates arose from the fact that it is always easier to make calculations for a single year than for a time series.

Even though the individual industry estimates appeared to show relatively large differences, the overall change was not as dramatic. In the subsequent investigations the new gross domestic product was estimated to be nearly seven percent higher than the HNA estimate. The new GDP level does not, for example, have an impact on the general trend in relation to other countries, for example, if compared using purchasing-power-parity-corrected GDP figures for a few countries.[223]

Sectoral analysis nevertheless suggests that the new GDP level of individual industries does affect the earlier view on structural change in the economy to some extent. The greatest change in the national accounting figures concerns services: the new level was nearly nine percent higher than previously estimated.

223 Maddison (2001).

GDP in the primary sector grew by seven percent, while growth in secondary production was only four percent.[224]

It should be concluded, however, that the big picture of the Finnish economy did not change dramatically as a result of the new estimates. On the contrary, these results suggest that the estimations are for the most part in line with those carried out for the historical national accounts (and *vice versa*), which is an encouraging result for the users of these accounts. On the other hand, there were some quite dramatic changes in individual industries (such as trade and transport).

It was demonstrated above that available historical national accounts could also provide a starting point for estimating the reliability of calculations. As pointed out in Chapter 3.2, one way of checking whether the results of any statistical work are correct is to compare them with the results of other studies. The historical national accounts could also be used for analysing the reliability of the supply and use tables, and vice versa.

Supply and use tables, in turn, provide a means of checking the reliability of the estimates through comparison of the levels of output obtained from the two different accounts: supply and use. This approach is of great help in producing reliable results in statistical work. It is also a tool for estimating the reliability, and more importantly as was demonstrated by the method developed in this chapter, the size of the reliability (or error), through analysis of the confidence interval. It was also shown that more accurate new estimates for a certain benchmark year could yield important information on future areas of research into the Finnish historical national accounts. It could be concluded from the above analysis that revisions are still generally required in the case of trade and other services.

224 See Hjerppe (1996).

5 Structural interdependencies in 1928

5.1 Identifying the key industries

So far, the discussion in this study has only touched upon the construction of the basic framework of supply-and-use and input-output tables. This chapter extends the statistical basis laid in the previous part into an analytical framework. It is also demonstrated that even the information on the economy provided by the supply and use tables allows us to make deep analyses of economic structures that could also be used to challenge some of the main interpretations of the Great Depression of the 1930s.

A product in the supply framework can be produced by different industries. It can also enter the economy domestically or through foreign trade as an imported good. At the same time, it could be used by industry as an intermediate input in order to produce a new more refined product. It could also be used for final-demand purposes, i.e. in household consumption, government final consumption, gross fixed capital formation, or for export. Again, these intermediate inputs and final-demand products can be produced domestically or imported.

Imports, in turn, may be a substitute for domestic production. On the one hand, a product may be produced domestically but for some reason (price, quality, supply, for example) it is purchased from abroad. On the other hand, there are products that are not available domestically at all, and must be obtained through foreign trade in any case. This is an important division in terms of the input structure of an economy, and has many implications for production structures, and especially production costs.

Information on the economy is organised in the supply and use framework in a manner that makes it possible to examine these transactions between different economic units simultaneously. Every transaction is income for one party and expenditure for another. The matrix presentation of supply and use therefore allows us to take a bird's eye view of the whole economy at any one time. The greatest advantage of the tables is the fact that they do not include any assumptions on production technologies, elasticity of demand, or any other economic behaviour. The input-output table, in turn, allows us to take into account the direct and indirect impacts of a certain industry on the economy as a whole. It therefore, gives a comprehensive picture of the linkages and interdependencies. In the following, both supply and use and input-output tables are used in order to identify the key industries in the economy. Import dependency and industry factor proportions are then considered in more detail.

The input-output method of linkages is applied in this chapter in order to identify key industries in the economy – defined as industries with high interdependency with other sectors and thus affecting economic development the most. In addition, the supply and use tables are used to further identify industries with

high economic importance in terms of their size. This will provide information on, for example, whether any of the domestic market industries had a major role in the economy during the depression, and on their linkages to other sectors of the economy, and for the final-consumption categories.

The total domestic output in 1928 amounted to 50.2 billion Finnish marks at basic prices. Of this total output, secondary production accounted for the largest share, nearly 44 percent. Primary production and services amounted to little under 30 percent each. In terms of the gross domestic product, however, services accounted for the largest part. They comprised over 36 percent of the total value added in 1928, while the largest sector in terms of output, secondary production, contributed only 30 percent. Even the smallest sector in terms of output, primary production, comprised more than one third of the total value added. The largest sector in terms of compensation to employees was services, which accounted for over 45 percent of the wages sum in the economy. Secondary production was also significant, accounting for one third of the wages, while primary production comprised only a little over 21 percent (Table 12).

The sectoral picture of the economy corresponds to that given in Chapter 2 of this study. The structural change described earlier was on its way, and services had already passed the primary sector in terms of value added. The transformational nature of the process is still evident, however. On the one hand, the economy was still very much agrarian, with the primary sector accounting for over one third of the value added, while secondary production was clearly the largest sector in terms of output, although still producing less than a third in terms of value added. The process of industrialisation was nonetheless well on its way. With regard to figures on wages, there is one point that should be taken into account: they only include compensation to employees and therefore exclude income to forest owners (mixed income / surplus), for example. If these were included, the proportion of primary production of total income would increase significantly as most people were still living in the countryside and the income of forest owners was peaking because of the successful export of wood products. Nevertheless, the above analysis corresponds to the structural transformation in Finland that has been presented in other studies: there was a direct

Table 12. Output, value added and wages sums of the Finnish economy by sector, 1928

Sector	Output		Value added		Wages sum	
	FIM billion	%	FIM billion	%	FIM billion	%
Primary production	13.3	26.5	9.0	33.5	2.8	21.5
Secondary production	22.0	43.8	8.1	30.1	4.3	33.1
Services	14.9	29.7	9.8	36.4	5.9	45.4
Total	**50.2**	**100.0**	**26.9**	**100.0**	**13.0**	**100.0**

Source: the author's own estimates.

move from primary production to services, while secondary production did not achieve the same magnitude as it did in the old industrialised countries.[225]

However, the sectoral classification presented above does not give an accurate enough reflection of the economy. There are significant differences between industries within the classification that are better revealed by presenting the results on a more accurate level. The following table shows how output, value added and wages all came from a few main industries (Table 13).

Table 13. Output, value-added, and wages summed by industry, 1928 (at basic prices).

Industry		Output		Value added		Wages sum	
		FIM billion	%	FIM billion	%	FIM billion	%
A1	Agriculture, hunting	10.7	21.3	5.4	20.1	1.7	12.8
A2	Forestry	3.8	7.5	3.5	13.0	1.1	8.8
B	Fishing	0.2	0.4	0.2	0.6	0.0	0.0
C	Mining	0.2	0.4	0.2	0.6	0.0	0.3
DA	Manuf. of food products	3.9	7.9	1.2	4.3	0.3	1.9
DB	Manuf. of textiles	1.7	3.4	0.7	2.5	0.3	2.6
DC	Manuf. of leather products	0.8	1.6	0.2	0.9	0.1	1.0
DD	Manuf. of wood and wood products	3.5	7.0	0.7	2.8	0.7	5.2
DE	Manuf. of pulp, paper and paper products	2.8	5.6	1.2	4.6	0.4	2.9
DF	Manuf. of coke and refined petroleum products	0.0	0.0	0.0	0.0	0.0	0.0
DG	Manuf. of chemical products	0.4	0.7	0.1	0.5	0.0	0.2
DH	Manuf. of rubber and plastic products	0.1	0.2	0.1	0.2	0.0	0.1
DI	Manuf. of non-metallic mineral products	0.5	1.1	0.3	1.2	0.1	1.0
DJ	Manuf. of basic metals and fabricated metal products	0.9	1.8	0.4	1.3	0.2	1.5
DK	Manuf. of machinery and equipment	0.6	1.1	0.3	1.3	0.2	1.7
DL	Manuf. of electrical and optical equipment	0.1	0.2	0.1	0.2	0.0	0.2
DM	Manuf. of transport equipment	0.3	0.6	0.2	0.6	0.1	0.7
DN	Manuf. of other products	0.3	0.6	0.2	0.6	0.1	0.5
E	Electricity, gas and water supply	0.5	1.0	0.4	1.5	0.1	0.6
F	Construction	4.5	9.0	1.9	7.0	1.6	12.4
G	Trade	3.6	7.1	2.9	10.6	0.9	6.9
H	Hotels and restaurants	0.7	1.3	0.2	0.9	0.1	0.8
I	Transport, storage, post and telecomm. services	2.9	5.8	1.8	6.8	1.1	8.5
J	Financial and insurance services	1.0	2.0	0.8	3.0	0.2	1.8
K	Housing and business services	3.2	6.3	2.0	7.4	1.6	12.3
L	Public administration	1.0	2.1	0.7	2.5	0.7	5.2
M	Education	0.8	1.6	0.5	1.7	0.5	3.5
N	Health and social-work services	0.7	1.4	0.3	1.2	0.2	1.9
O	Other services	0.3	0.6	0.3	1.1	0.3	2.2
P	Household work	0.3	0.6	0.3	1.1	0.3	2.3
Total		**50.2**	**100.0**	**26.9**	**100.0**	**12.9**	**100.0**

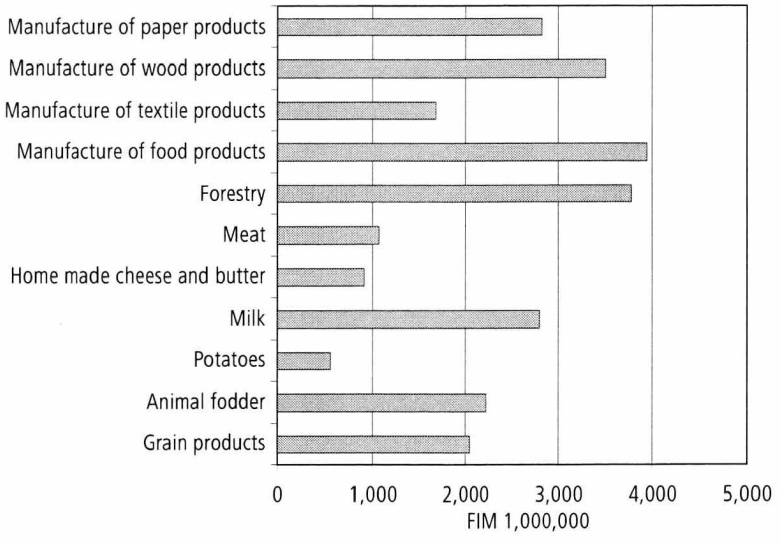
Source: the author's own estimates.

225 See Hjerppe (1989), p. 68.

Agriculture was by far the largest industry, comprising over 20 percent of both output and value added, while agriculture, forestry, the manufacturing of food, wood and paper products, construction, trade, transport and housing together accounted for nearly 80 percent, and 70 percent of all wages. Thus, the three-sector classification clearly neglects important information on the structure of the economy. The Finnish economy in 1928 was, in fact, dominated by a few main industries. Furthermore, these industries mainly produced their primary product, indicating a homogeneous production pattern with relatively little in the way of secondary products (see Appendix 3, the supply table).

The production of agriculture requires further analysis. It is symptomatic that the value of milk production alone corresponded to the value of the total manufacture of paper products. The production of grain products and animal fodder were both at a higher level than the total production of the textile industry (Figure 13). Here it must be acknowledged that supply and use tables describe the level of total activity in the economy. The output figures therefore also include the value of production for the producer's own consumption. All animal fodder was classified as being for intermediate use in agriculture. Furthermore, a proportion of the milk production was used in the production of home-made cheese and butter, while some of the grain products were consumed at farms. This shows the advantage of the input-output approach: it is the total activity that is of interest. People were engaged in these activities whether or not the final products were sold on the market or consumed at home. There is a labour-input

Figure 13. The output of the main agricultural products in comparison with forestry and a few major manufacturing industries (FIM 1,000,000 at basic prices)



Source: the author's own estimates.

requirement regardless of the purpose of the production. This assumes significance later on when the labour input of each industry is calculated.

The agrarian nature of the Finnish economy is also evident from the use perspective. The comparison presented in Table 14 highlights the relatively high proportion of household consumption in Finland compared with the Danish economy. Private consumption mainly concerned agricultural products, food products, textiles, transport services and housing services, and accounted for more than 75 percent of total household consumption. All in all, household consumption accounted for more than one third of domestic production, equalling that of intermediate use, the equivalent figure for the Danish economy during the same period being around 26 percent. This result would, indeed, confirm the major role that household consumption played in the Finnish economy in 1928. A high proportion of private consumption may indicate an increase in purchasing power to some extent, but it also reflects the fact that a relatively small proportion of products was used in manufacturing, thus reflecting again a lower level of refinement. On the other hand, almost 14 percent of domestic production was directed to exports, while investments comprised nine percent and government final consumption around four percent. The level of exports was high compared with the Danish level, which clearly demonstrates their role in the Finnish economy. The higher proportion of investments in Finland is partly explained by the boom in housing construction in 1928. On the other hand, the 1920s was a time of active nation building, as discussed previously in Chapter 2.

Around 80 percent of the total supply of wood products was exported from Finland, and around 60 percent of pulp and paper was allocated to foreign trade. Around seven percent of the total supply of forestry, and a little over six percent of food products were sold abroad. The largest group in terms of output, agricultural products, was almost fully consumed on the domestic market, (see Table 15). The relatively high proportion of exports in some services is explained by

Table 14. The distribution of the use of domestic products in Finland in 1928, and Denmark in 1934 (at basic prices)

	Finland		Denmark	
Component of demand	FIM billion	%	DEK billion	%
Intermediate consumption	18.0	35.7	10.4	59.1
Household consumption	18.8	37.2	4.5	25.9
Government final consumption	2.2	4.3	0.4	2.3
Investments	4.5	9.0	0.7	4.1
Exports	7.0	13.8	1.5	8.6
Total	**50.5**	**100.0**	**17.6**	**100.0**

Source: the author's own estimates; Abildgren & Norskov (1992).[226]

226 The difference between supply and use in the Finnish figures (FIM 0.3 billion) equals the statistical discrepancy and changes in inventories.

Table 15. Use of domestic production by product group in Finland, 1928 (%)

Product group		Inter-mediate use	Private con-sump-tion	Public con-sump-tion	Invest-ments	Exports	Total
A1	Agriculture, hunting	52.7	46.0	0.0	0.0	1.3	100.0
A2	Forestry	92.6	0.0	0.0	0.0	7.4	100.0
B	Fishing	3.6	92.3	0.0	0.0	4.1	100.0
C	Mining	90.3	0.0	0.0	0.0	9.7	100.0
DA	Manuf. of food products	14.2	76.1	0.0	0.0	9.7	100.0
DB	Manuf. of textiles	25.8	72.7	0.0	0.0	1.5	100.0
DC	Manuf. of leather products	15.0	84.7	0.0	0.0	0.2	100.0
DD	Manuf. of wood and wood products	19.0	0.7	0.0	0.0	80.3	100.0
DE	Manuf. of pulp, paper and paper products	20.3	18.6	0.0	0.0	61.1	100.0
DF	Manuf. of coke and refined petroleum products	88.7	11.2	0.0	0.0	0.1	100.0
DG	Manuf. of chemical products	63.9	24.8	0.0	0.0	11.4	100.0
DH	Manuf. of rubber and plastic products	68.3	31.7	0.0	0.0	0.0	100.0
DI	Manuf. of non-metallic mineral products	86.3	11.9	0.0	0.0	1.7	100.0
DJ	Manuf. of basic metals and fabricated metal products	95.4	1.6	0.0	0.0	2.9	100.0
DK	Manuf. of machinery and equipment	52.9	6.2	0.0	38.6	2.3	100.0
DL	Manuf. of electrical and optical equipment	72.3	27.5	0.0	0.0	0.2	100.0
DM	Manuf. of transport equipment	20.2	18.9	0.0	59.0	1.9	100.0
DN	Manuf. of other products	24.9	70.1	0.0	0.0	5.1	100.0
E	Electricity, gas and water supply	100.0	0.0	0.0	0.0	0.0	100.0
F	Construction	11.9	0.0	0.0	88.1	0.0	100.0
G	Trade	42.6	38.8	0.0	2.6	16.0	100.0
H	Hotels and restaurants	0.0	69.9	0.0	0.0	30.1	100.0
I	Transport, storage, post and telecomm. services	42.5	39.5	0.0	0.0	18.0	100.0
J	Financial and insurance services	19.2	80.8	0.0	0.0	0.0	100.0
K	Housing and business services	17.3	82.7	0.0	0.0	0.0	100.0
L	Public administration	0.0	0.0	100.0	0.0	0.0	100.0
M	Education	0.1	14.2	85.7	0.0	0.0	100.0
N	Health and social-work services	9.9	27.4	62.6	0.0	0.0	100.0
O	Other services	16.6	83.3	0.0	0.0	0.1	100.0

Source: the author's own estimates.

the classifications used: one third of hotel and restaurant services were sold to foreign customers, and thus allocated to exports. In the transport sector 18 percent of the services were exported, but in practice these exports consisted of transport-related services for foreign vessels (e.g., pilotage, lighthouse services). For the main part, product use followed intuitively logical patterns. Food, textiles, leather products and most services were mostly accounted for by household consumption, while products of heavy industry, such as bricks, metals and chemicals, were used as intermediates in other industries. Forestry, in turn, was a major supplier of raw materials with over 92 percent of the production put to intermediate use. This could also be attributed in part to the classification used: firewood was allocated to housing rather than private consumption.

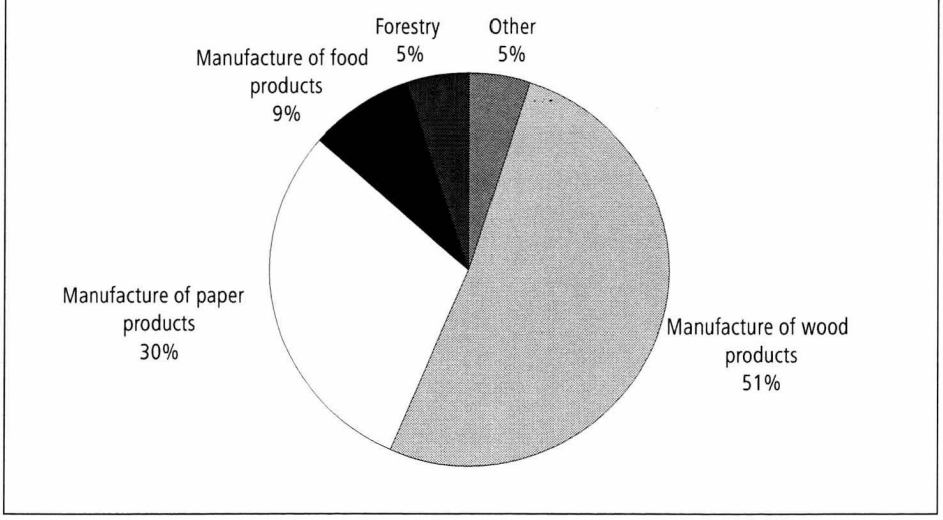
Agriculture was somewhat of an exception. Over 50 percent of the products were for intermediate use in the production process. This was explained above in

terms of the high level of personal use: much of the production is put back into the land as seeds, or is used to make more refined products, such as cheese and butter.

An even closer look at foreign trade shows that exports were dominated by wood products as well as pulp and paper products, accounting for more than 65 percent of the total, and if services are excluded, the figure rises to over 80 percent (Figure 14). Wood-product exports were dominated by sawn timber, and paper exports by pulp and paper. The main exported food product was butter, which accounted for over 86 percent of all food exports, while cheese and berries accounted for nine percent. The main export article in forestry was raw wood.

The above analysis of the economy is focused more on the relative size of the industries, but it would be more interesting to study them in terms of dependency. In accordance with the methodology presented in Chapter 3.4.4, the following analysis describes the direct and indirect, and the total backward and forward linkages of each industry. As already discussed in the methodology section, when an industry increases its production, there is increased demand for inputs from other industries. This demand is referred to as *backward linkage*, and the stronger it is, the more beneficial is the expansion of the industry's production to the economy as a whole. An increase in the production of other industries, in turn, results in an additional output requirement in order to fulfil supply needs in other industries. The stronger these *forward linkages* are, the more sensitive relatively the production of the industry is to other sectors' output. The concept of forward linkages was referred to above as somewhat vague: production rarely increases without an increase in demand. The definition should be analysed in a context in which industries with strong forward linkages provide further possi-

Figure 14. Export share by commodity, 1928 (%)



Source: the author's own estimates.

bilities for increased production in the form of investments or other inputs, and also have the potential to increase productivity in the economy as a whole. Direct backward linkages basically measure the share of domestic production required to produce one unit of output in each industry. Therefore, a strong direct backward linkage also reflects the high use of domestic raw materials. Because the production process for each product is different, indirect backward linkages, in turn, may differ from direct linkages.

Table 16 summarises the results of the linkage analysis based on the Rasmussen method for backward linkages and the Jones method for forward linkages.[227] The manufacture of wood products clearly stands out as having the highest direct backward linkage: the industry consumed great amounts of domestic raw

Table 16. Backward and forward linkages in the Finnish economy, 1928

Industry		Backward linkages			Forward linkages		
		Direct	Indirect	Total	Direct	Indirect	Total
A1	Agriculture, hunting	0.461	1.323	1.784	0.489	1.330	1.819
A2	Forestry	0.072	1.029	1.100	0.926	1.248	2.175
B	Fishing	0.047	1.010	1.057	0.036	1.003	1.039
C	Mining	0.125	1.022	1.147	0.899	1.497	2.396
DA	Manuf. of food products	0.366	1.237	1.603	0.143	1.036	1.179
DB	Manuf. of textiles	0.232	1.079	1.312	0.256	1.068	1.323
DC	Manuf. of leather products	0.274	1.110	1.384	0.152	1.031	1.182
DD	Manuf. of wood and wood products	0.769	1.154	1.922	0.193	1.048	1.241
DE	Manuf. of pulp, paper and paper products	0.515	1.206	1.721	0.204	1.063	1.267
DF	Manuf. of coke and refined petroleum products	0.000	1.000	1.000	0.887	1.446	2.334
DG	Manuf. of chemical products	0.246	1.088	1.333	0.582	1.340	1.922
DH	Manuf. of rubber and plastic products	0.161	1.050	1.211	0.282	1.131	1.413
DI	Manuf. of non-metallic mineral products	0.254	1.074	1.328	0.845	1.187	2.033
DJ	Manuf. of basic metals and fabricated metal products	0.296	1.102	1.398	0.852	1.384	2.236
DK	Manuf. of machinery and equipment	0.194	1.074	1.268	0.535	1.284	1.819
DL	Manuf. of electrical and optical equipment	0.158	1.051	1.209	0.718	1.152	1.869
DM	Manuf. of transport equipment	0.191	1.082	1.274	0.202	1.105	1.307
DN	Manuf. of other products	0.198	1.078	1.276	0.252	1.081	1.333
E	Electricity, gas and water supply	0.041	1.012	1.053	0.997	1.337	2.334
F	Construction	0.410	1.176	1.587	0.119	1.051	1.170
G	Trade	0.190	1.079	1.269	0.426	1.185	1.611
H	Hotels and restaurants	0.502	1.270	1.772	0.000	1.000	1.000
I	Transport, storage, post and telecomm. services	0.254	1.083	1.337	0.425	1.237	1.661
J	Financial and insurance services	0.199	1.064	1.263	0.192	1.118	1.310
K	Housing and business services	0.358	1.065	1.423	0.173	1.072	1.245
L	Public administration	0.262	1.111	1.373	0.000	1.000	1.000
M	Education	0.371	1.153	1.525	0.001	1.000	1.001
N	Health and social-work services	0.417	1.139	1.557	0.099	1.077	1.176
O	Other services	0.103	1.030	1.133	0.166	1.088	1.254

Source: the author's own estimates.

227 For a discussion on the different approaches to estimate linkages, see Chapter 3.4.4.

wood in its production. Still, the indirect linkages of many other industries, such as the manufacture of paper products, turned out to be stronger than those of wood products. This is explained by the fact that the production of the raw wood required in the manufacture of wood products does not have significant backward linkages in itself, while intermediate use in paper production consumes a greater variety of products, such as chemical agents, which again need other products in their manufacture. Indirect linkages in paper production further increased due to the requirement for products from the wood-manufacturing industry, which again had its own strong backward linkages. The manufacture of wood products still turned out to have the strongest total backward linkage, clearly reflecting the economic importance of the industry. Agriculture, construction, and the manufacture of food products also showed strong total backward linkages: the construction industry made significant purchases from nearly every industry in the economy, while in agriculture direct backward linkages mostly went straight back. Of the services, hotels and restaurants in particular showed relatively strong backward linkages due to the fact that they use a significant amount of domestic food products, which in turn have strong linkages of their own. Strong direct backward linkages seemed to indicate strong indirect (and therefore also total) backward linkages, and it was only in the manufacture of food products that the pattern was different. Food production mainly requires agricultural products for intermediate use, thus the direct linkage is relatively weak. However, as agriculture showed strong backward linkages, the indirect linkages of food production became significant.

In the case of forward linkages too, strong direct linkages seemed to indicate strong indirect linkages. Electricity, gas and water supply, the manufacture of coke and refined petroleum products, forestry and mining all showed strong forward linkages. This is not surprising as these are all industries that are required in the production process and are significant in terms of supplying energy and other commodities such as raw wood.

A comparison with the Danish economy supports the conclusion that direct backward linkages also indicate strong indirect backward linkages. The manufacture of food products dominated Danish industry at the beginning of the 1930s. There were significant backward linkages, especially to agriculture, which in turn, according to the Danish input-output table, made significant purchases of food products. These two industries seemed to have had a bilateral product flow that bolstered their economic impact. As with the Finnish economy, construction, paper production and hotels and restaurants also had strong backward linkages.

The findings on forward linkages also gave support to the analysis of the Finnish economy. According to the analysis of the Danish economy, agriculture, forestry, mining, the manufacture of wood, paper and mineral products, and communications were significant industries in terms of forward linkages. It seems that direct forward linkages only indicated the industries that provided most inputs to other industries, while indirect linkages simply strengthened this impact.

Table 17. Backward and forward linkages in the Danish economy, 1934

Industry	Backward linkages			Forward linkages		
	Direct	Indirect	Total	Direct	Indirect	Total
1.A Agriculture	0.290	1.195	1.485	0.784	2.317	3.100
1.B Forestry	0.053	1.023	1.076	0.690	2.618	3.308
1.C Fishery	0.190	1.110	1.300	0.086	2.026	2.112
2 Mining	0.083	1.032	1.114	0.662	2.360	3.021
3.A Manuf. of food products	0.658	1.357	2.015	0.237	2.139	2.376
3.B Manuf. of textile and leather products	0.344	1.143	1.487	0.259	2.126	2.385
3.C Manuf. of wood products	0.312	1.099	1.411	0.568	2.334	2.902
3.D Manuf. of paper products	0.433	1.257	1.690	0.622	2.479	3.102
3.E Manuf. of chemical products	0.290	1.167	1.457	0.506	2.335	2.841
3.F Manuf. of non-metallic mineral products	0.205	1.063	1.267	0.803	2.497	3.300
3.G Manuf. of metal products	0.280	1.087	1.366	0.436	2.260	2.696
3.H Manuf. of other products	0.183	1.061	1.244	0.335	2.224	2.559
4 Electricity, gas and water supply	0.135	1.055	1.190	0.494	2.290	2.785
5 Construction	0.498	1.166	1.664	0.381	2.144	2.524
6.A Trade	0.090	1.040	1.130	0.219	2.129	2.347
6.B Hotels and restaurants	0.513	1.410	1.923	0.000	2.000	2.000
7.A Transport services	0.309	1.122	1.431	0.305	2.165	2.470
7.B Communications services	0.271	1.142	1.412	0.754	2.412	3.167
8.A Financial and insurance services	0.084	1.040	1.124	0.300	2.164	2.463
8.B Housing	0.157	1.096	1.253	0.008	2.001	2.009
9.A Household services	0.165	1.053	1.217	0.000	2.000	2.000
9.B Other private services	0.039	1.015	1.054	0.000	2.000	2.000
9C Public services	0.337	1.202	1.539	0.153	2.082	2.235

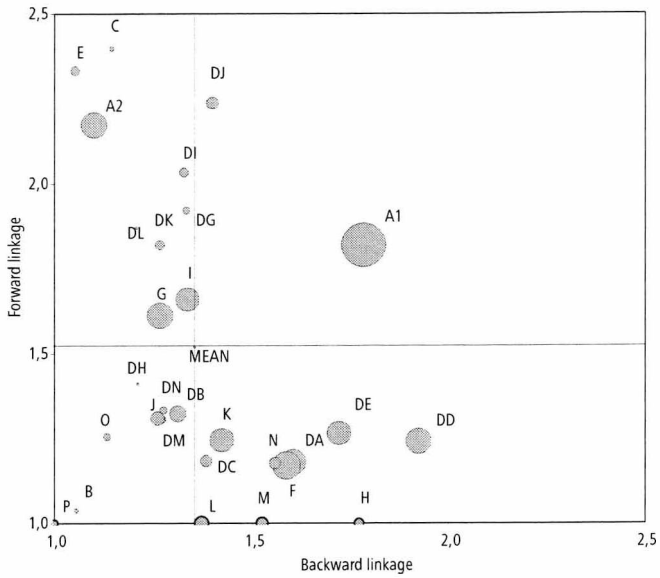
Source: the author's own estimates based on Abildgren & Norskov (1992). Classification is based on the classification used in the Danish study and may differ from the Finnish one to some extent.

Finally, by combining the information on linkages with the previous analysis of the production of each industry it is possible to analyse their relative importance. The following Figures 15 and 16 present the results of the calculations of the total backward and forward industry linkages for both Finland and Denmark, based on the Rasmussen method for backward linkages and the Jones method for forward linkages. The figures also take into account the relative size of the industry in terms of output. The results of the analysis are thus based on both the supply-and-use approach and linkage analysis.

There were clearly a few industries that could be regarded as key industries in the Finnish economy in 1928 in terms of their relative size or relative importance to the economic development through their multiplier effect in relation to domestic production. The findings on the structure of the economy and the interdependency among the industries are summarised below.

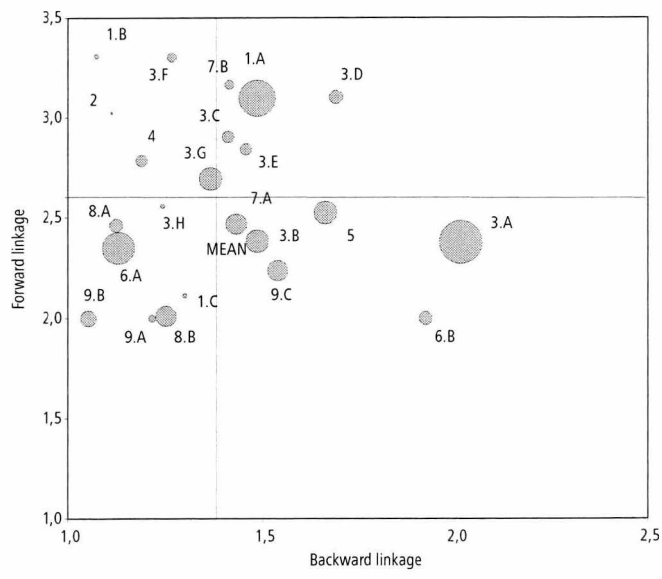
Even though the Finnish economy in 1928 comprised the conventional sectors of primary, secondary and tertiary activities, analysis based on this categorisation leads to misleading simplification. There were interdependencies between the industries that resulted in a complex economic structure. The complexity penetrated beyond the traditional sectoral division. It would nevertheless be an

Figure 15. Total backward and forward linkages in Finnish industry, 1928



Source: the author's own estimates. The size of the circles indicates the size of the total output of each industry.

Figure 16. Total backward and forward linkages in Danish industry, 1934



Source: the author's own estimates based on Abildgren & Norskov (1992). The size of the circles represents the size of the total output of each industry.

exaggeration to argue that it was a major feature in the economy: for the most part, there was a dualistic connection between a few main industries, especially between the export industries and forestry, and food production and agriculture.

According to the classification adopted in this study, *agriculture (A1)* clearly had a major role in the economy in 1928, and could be regarded as the centre of Finnish economic life just by its relative size: it contributed around 20 percent of the total output and value added. Its strong backward and forward linkages – in which respect it differed from other industries – underlines its importance. The backward linkages in particular were perhaps surprisingly high given that the industry mainly produced products with a low level of refinement. This was explained above as having to do with the high production for its own use. While in the Danish case food production (3.A) and agriculture (A.1) seemed to have a bilateral product flow that bolstered the economic impact, in Finland it was agriculture alone that comprised the product circle: almost 90 percent of the total backward linkages were directed back to the industry. The high level of forward linkages would suggest that there were strong links from agriculture to the manufacturing industries, which used agrarian products as inputs in their production processes. Agriculture was an important supplier of inputs only for the manufacture of food products, however. Furthermore, the household consumption of agricultural products was high, representing again the still agrarian nature of the society. Only one percent of the production was exported. Despite the mono-centric nature of agricultural production, it cannot be denied that it did have a significant role in the economy of Finland, simply because it accounted for a large proportion of the economic activity.

Another primary-sector industry, *forestry (A2)*, also had a major role in the economy, comprising almost 10 percent of the total output and around 13 percent of the value added. Its role differed remarkably from that of agriculture, however. Wood was one of Finland's main natural resources and was supplied almost totally domestically. Forestry showed very strong forward linkages, indicating its role as a supplier of inputs to other industries. Further evidence of this was the fact that nearly all forestry production was indeed used as intermediate inputs. Only around seven percent was exported, again suggesting its role as a provider of inputs to the manufacturing process. It was the main connecting industry between primary and secondary production and provided raw materials for the main export industries, and also to be used as heating material in housing. These together accounted for nearly 90 percent of the total use of forestry products in the economy. Forestry was also a significant source of income, and together with agriculture accounted for around 20 percent of the total sum of wages. If the income of the forestry owners were included, the share would be even higher.

It would perhaps not be an exaggeration to say that the relative significance of the *manufacture of food products (DA)* is the most neglected subject in Finnish economic history. The fact that the role of food production has not been stressed before is somewhat surprising: it comprised eight percent of the total output of

the economy, which was larger than the manufacture of wood and pulp and paper in terms of output. The value added of the industry also accounted for four percent of the total. Furthermore, food manufacture had a higher number of backward linkages than the whole of the construction sector, indicating its relative importance to the whole economy. There seems to have existed a similar bilateral circle of flows between the manufacture of food products and agriculture as in Denmark, even though these flows were more one-way in the Finnish case. The manufacture of food products consumed a significant amount of the agricultural products, while the flow was less significant in the other direction. In Denmark, agriculture also purchased food products as intermediates. The high proportion of manufactured food products in the economy partly reflects the fact that Finland was still a relatively poor country and the need to focus on necessities was still high. It is also interesting to note that a study on industrial interdependency in the United Kingdom in 1841 produced similar results, with a surprisingly high role for the manufacture of food products.[228]

The main export industries, *manufacture of wood (DD)* and *pulp and paper products (DE)*, differed significantly in relation to other manufacturing industries. Their role in the economy thus differed remarkably from that of other industries in the analysis reported above. While most of the manufacturing industries had weak backward linkages and stronger forward linkages, wood and paper both had strong backward linkages, thus reflecting their important role in the economy and indicating that an expansion of activity would have had a high impact on other industries. Together they accounted for around 14 percent of the total output and eight percent of value added and wages. Production was completely directed to foreign markets. Even though wood products had a higher total level of linkages, paper products had more significant indirect linkages. Paper production was thus linked not only to forestry but also to the manufacture of wood products. Forestry and the manufacture of wood and paper products also consumed significant amounts of the transport services, accounting for more than 57 percent of all transport services used by industry. Taken as a forest cluster in the economy, these industries accounted for more than 20 percent of the total output and value added. Earlier findings by Heikkinen and Hjerppe also established this relationship. According to them, the multiplier effects of the wood-processing industries were fairly insignificant in 1910–1913, while their growth was reflected outside manufacturing, in agriculture, forestry and transport.[229] It seems obvious that this relationship did not change dramatically during the following years. Heikkinen and Hjerppe neglected the indirect impacts however, only taking account of direct backward linkages. It is therefore somewhat questionable to talk about multiplier effects. Including the indirect impacts, especially the linkages in the manufacture of paper products, makes the situation somewhat more complex.

228 Horrell et al (1994).
229 Heikkinen & Hjerppe (1987), pp. 242–243.

The role of construction (F) in the economy was also relatively strong in terms of output and value added, the former accounting for nine percent of the total output and the latter seven percent. It also accounted for over 12 percent of the total wages bill in the economy in 1928. It is worth noting that construction had above-average backward linkages, reflecting the fact that it used inputs from many industries and formed an important factor of economic development. It differed from other industries in that purchases from other sectors were evenly distributed, while food, wood and paper manufacture mainly purchased inputs from one or two. Construction was naturally final-demand-oriented.

In terms of output and value added there were still few industries of significance in the Finnish economy. *Trade (G)*, *transport (I)* and *housing (K)* made a major contribution to the total output and value added, which more or less reflects the development of the primary and secondary industries. If nothing is produced there will be nothing to transport or trade. Housing, in turn, is a requirement that basically has no option. Therefore, these industries are not defined as key industries in the same sense as the ones mentioned above.

In sum, the key industries of the Finnish economy in 1928 were agriculture (A1), forestry (A2), the manufacture of food products (DA), the manufacture of wood products (DD), the manufacture of pulp and paper products (DE), and construction (F).

5.2 Import dependency

Industries are connected to the national and world economy not only through output but also through inputs. The analysis in the previous section only included domestic supply. One part of the total supply of the economy comprises the import of foreign goods and services. This section deepens the analysis by providing information on the proportion of imports of the total supply by product group. The role of imports for intermediate use, investments, and private consumption is considered vis-à-vis the picture portrayed in previous studies, whereupon quantification of these relations is provided. In addition, dependency on foreign inputs is analysed. Information provided by the supply and use tables is used in order to assess whether imported products would also have been available through domestic supply.

A significant number of products were imported into Finland in 1928. The value amounted to FIM 8 billion, accounting for nearly 14 percent of the total supply of FIM 58.2 billion. Of the total goods produced, imports comprised over 20 percent. This share seems relatively high, given the agrarian nature of the Finnish economy. There had been a clear growth in the propensity to consume during the pre-depression period, which was coincidently seen in the increase in imports.[230] In comparison, the share of imports of the total supply in Denmark in 1934 was only eight percent, and of goods production around 20 percent,

230 See, for example, Halme (1955), p. 251

while in the United States the relative figures for 1929 were around two percent and around five percent.[231]

Almost 56 percent of Finnish imports were used as intermediate products in different industries in 1928, and around 37 percent were consumed directly and seven percent were investment goods. In Denmark, over 75 percent of imports were used as intermediates in 1934, and only around 20 percent in consumption and four percent in investments.[232] The most important import articles in Finland were food products (22%), agricultural products (18%), textiles (13%), transport equipment (6%), chemical products (6%), and machinery (5%).

It is obvious from the account presented in Tables 18 and 19 that there was clear import dependency in the economy in the case of some products. Firstly, the proportion of imports of the total supply of agricultural products alone was as high as 13 percent. This was clearly partly attributable to the bad harvest in 1928, which temporarily increased imports of agricultural products, but it alone cannot explain the high level. Almost 75 percent of the total imports of agricultural products were intermediates. Of these, 46 percent were used in food processing, while significant amounts of imported raw wool and cotton were used in the textile and leather industries, accounting for around 36 percent of the total intermediate use of imported agricultural products.

Table 18. Total supply (domestic and imported) by product group, 1928.

Product group		Domestic FIM Mill.	Imported FIM Mill.	Imports % of total
A1	Agriculture, hunting	9,320	1,450	13.5
A2	Forestry	3,779	42	1.1
B	Fishing	181	4	2.0
C	Mining	177	219	55.3
DA	Manuf. of food products	4,895	1,775	26.6
DB	Manuf. of textiles	1,654	1,061	39.1
DC	Manuf. of leather products	922	160	14.8
DD	Manuf. of wood and wood products	3,330	31	0.9
DE	Manuf. of pulp, paper and paper products	2,839	59	2.0
DF	Manuf. of coke and refined petroleum products	25	251	90.9
DG	Manuf. of chemical products	346	472	57.7
DH	Manuf. of rubber and plastic products	35	92	72.5
DI	Manuf. of non-metallic mineral products	539	188	25.9
DJ	Manuf. of basic metals and fabricated metal products	677	893	56.9
DK	Manuf. of machinery and equipment	595	399	40.1
DL	Manuf. of electrical and optical equipment	160	305	65.6
DM	Manuf. of transport equipment	305	506	62.4
DN	Manuf. of other products	479	104	17.8
Total		**30,258**	**8,011**	**20.9**

Source: the author's own estimates.

231 Abildgren (1992); Leontief (1951).
232 Abildgren (1992).

Table 19. Imported products destined for intermediate use, household consumption and investments (%)

Product group		Intermediate use	Household consumption	Investments	Total
A1	Agriculture, hunting	74.9	25.1	0.0	100.0
A2	Forestry	100.0	0.0	0.0	100.0
B	Fishing	38.7	61.3	0.0	100.0
C	Mining	100.0	0.0	0.0	100.0
DA	Manuf. of food products	35.2	64.8	0.0	100.0
DB	Manuf. of textiles	30.9	69.1	0.0	100.0
DC	Manuf. of leather products	75.4	24.6	0.0	100.0
DD	Manuf. of wood and wood products	96.6	3.4	0.0	100.0
DE	Manuf. of pulp, paper and paper products	54.9	45.1	0.0	100.0
DF	Manuf. of coke and refined petroleum products	89.8	10.2	0.0	100.0
DG	Manuf. of chemical products	81.4	18.6	0.0	100.0
DH	Manuf. of rubber and plastic products	67.5	32.5	0.0	100.0
DI	Manuf. of non-metallic mineral products	82.4	17.6	0.0	100.0
DJ	Manuf. of basic metals and fabricated metal products	84.6	15.4	0.0	100.0
DK	Manuf. of machinery and equipment	31.7	9.5	58.8	100.0
DL	Manuf. of electrical and optical equipment	48.9	51.1	0.0	100.0
DM	Manuf. of transport equipment	25.6	18.1	56.4	100.0
DN	Manuf. of other products	43.4	56.6	0.0	100.0

Source: the author's own estimates.

One third of the manufacturing supplies were imported, indicating that domestic supply was incapable of satisfying the increasing demands. Consumer goods such as food and textiles were largely used for household consumption. Imported food products consisted mainly of flour, grain and bran, which together comprised 41 percent of all food imports, although coffee, tea and sugar comprised over 30 percent. The rest was made up of a variety of products, each accounting for only a few percent of the total. The main imported textile products were fabrics, which accounted for over 50 percent of the total, while cotton thread comprised nearly 20 percent. Food and textile products were also used as raw materials to a significant extent.

Most of the imported goods in manufacturing were intermediates. Over 90 percent of the coke and petroleum products were imported, and were used mainly in transport and housing but also in other industries. Another important raw material was the product of mining, coal, which was used in significant amounts to produce energy. Imported chemical products mainly consisted of raw materials, fertilizers, paints and dyes, as well as medicines. Fertilizers accounted for one third of the chemical imports and were used in agriculture. Chemical raw materials accounted for another third and were used especially in the production of paper and chemical products. The textile and leather-goods industries also used dyes, and the construction industry consumed a large proportion of the imported paints. Medicines and various cleaning products accounted for around 10 percent of the chemical imports, and were used directly by consumers or in hospitals.

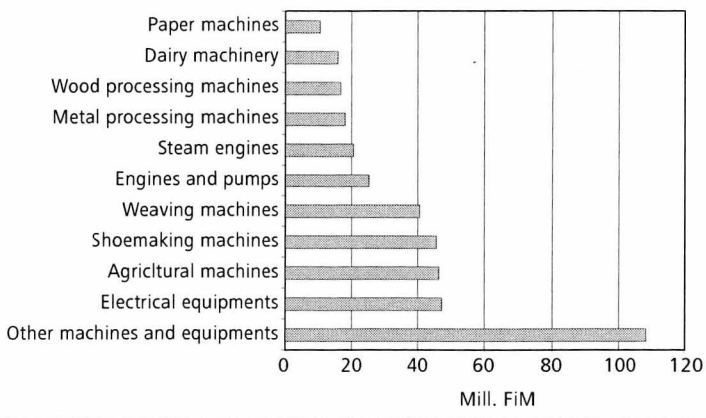
Over 65 percent of electrical and optical products were also imported, destined for both household consumption and intermediate use. Household consumption accounted for various types of clocks, telephones and cameras, for example, while intermediates included different types of electric wire used in construction and office equipment, mainly for the trade and other service sectors.

Over 50 percent of the imported machinery and transport equipment was used for investments. A significant amount in transport and construction was for intermediate use, otherwise imported machinery was mainly used for investment purposes in agriculture and manufacturing. Agricultural machinery, and shoe-making and weaving machines each accounted for over 10 percent of the total, engines and pumps for another 10 percent, and metal- and wood-processing machinery for around five percent each. Nevertheless, most of the imported machinery and equipment was invested in the manufacturing industries (Figure 17).

The largest product groups in the import of transport equipment were vehicles, accounting for nearly half, and vehicle parts that comprised another 30 percent. Private ownership of cars increased significantly during the 1920s, and this was evident in the imports of passenger cars. These are not classified as investments, however, but are assigned to household consumption. More importantly, coinciding with the expanding road network, the number of lorries and buses increased significantly, which was also evident in the increasing import levels: the 1920s was considered the golden era of bus transport. Otherwise, trains and ships both accounted for around 10 percent of imported transport equipment.[233]

The information provided in Tables 18 and 19 is combined in Figure 18, which shows the total supply divided between domestic production and imports, together with information on the split between intermediate use and final

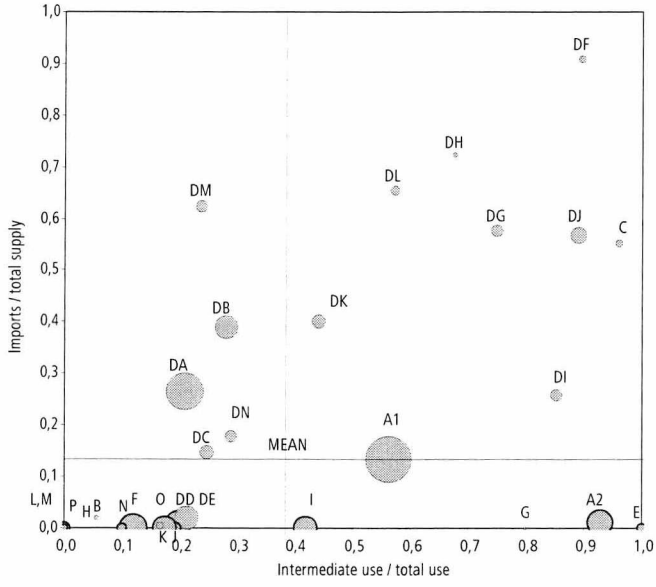
Figure 17. The composition of machinery imports, 1928



Source: the author's own estimates; SVT 1 A 48, 1928.

233 KOM 1954:6. See also Viitaniemi & Mäkelä (1978); Ahvenainen et al (1982), pp. 288–291.

Figure 18. Products for intermediate use and final consumption according to the degree of domestic origin, 1928



Source: the author's own estimates.

demand. The horizontal axis gives the proportion of intermediate use of total use by product group (the value 0.0 means that the product was exclusively used for final consumption, 1.0 means it was exclusively for intermediate use). In addition, the vertical axis shows the proportion of imports of the total supply of each product (the value 0.0 means that import share equalled zero and that the product was supplied entirely through domestic production, and 1.0 means that it was supplied entirely through imports).

First of all, Figure 18 confirms the initial findings reported above, and supports the general intuitive assumptions on the consumption and intermediate use of certain products and services. Services and construction were mainly produced domestically and used in the final demand. Thus, construction (F), hotels and restaurants (H), financial services (J), housing (K), public services (L), education (M), health (N), other services (O) and household services (P) all fell into a logical category in the bottom left-hand corner of the figure. Given that exports are considered a final-demand category, two export products, wood (DD) and paper (DE), also fell quite logically into the same category with their high proportions of domestic production.

The products in the bottom right-hand corner of the figure include agricultural (A1) and forestry products (A2), as well as trade (G), transport services (I) and energy (E). Forests are a natural resource in Finland and used as intermediates in other industries, especially export industries as mentioned before. Trade and transport services, as well as energy, were also produced domestically and

mainly for intermediate use. Transport services were naturally also used in household consumption, and fell close to the average ratio. The result for agriculture is perhaps somewhat surprising: more than half of the production was for intermediate use rather than consumption. This was discussed earlier, however, and was mainly found to be a result of the relatively large production for the producers' own intermediate use. Nevertheless, agricultural products were imported to a relatively large extent.

What is striking in the above figure is the clear pattern in the case of manufactured products. The Finnish economy was highly dependent on foreign imports of manufactured goods. It seems that only in case of the forest cluster (forestry, wood, and paper products) could it be considered self-sufficient. Even in the case of agricultural products there was a high import share, partly due to the import of raw materials such as raw wool for the manufacturing industries, and partly because Finland was not self-sufficient in the production of grain.

Imported manufactured products could be further divided into "consumption goods" and "intermediate goods". Of the former, shown in the upper left-hand corner of the figure, the high final demand for transport equipment (DM) was attributed earlier to its investment role, and also to the increasing ownership of vehicles during the 1920s. The high proportion of imports would thus suggest that the Finnish economy was relatively dependent on the foreign production of transport investment goods. As far as food (DA), textiles (DB), leather goods (DC) and other products (DN) are concerned, there are indications of growth in the purchasing power of households during the 1920s, and domestic production was not sufficient to meet the increased demands. In the case of textiles, the main imported items were fabrics and cotton thread for use in the textile industry and in households. Of the imported leather goods, in turn, 40 percent comprised unworked leather for the leather industry while the rest consisted of leather garments, hats, furs and other clothes for private consumption.

On the other hand, major imported products such as coffee and sugar did not necessarily indicate a higher standard of living: it is well known that coffee and sugar were used as a substitute for food in many poor urban families.[234] Moreover, certain luxury food products, such as oysters and caviar, comprised only around one percent of food imports. One could thus argue that a high proportion of imported food products does not necessarily indicate a higher living standard. The relatively abundant import of other food products such as flour, grain and bran for intermediate use, the high proportion of imported textiles and leather goods used extensively for final consumption, and the use of imported agricultural products in manufacturing all seem to indicate an insufficiency in domestic production that was compensated for through foreign trade.

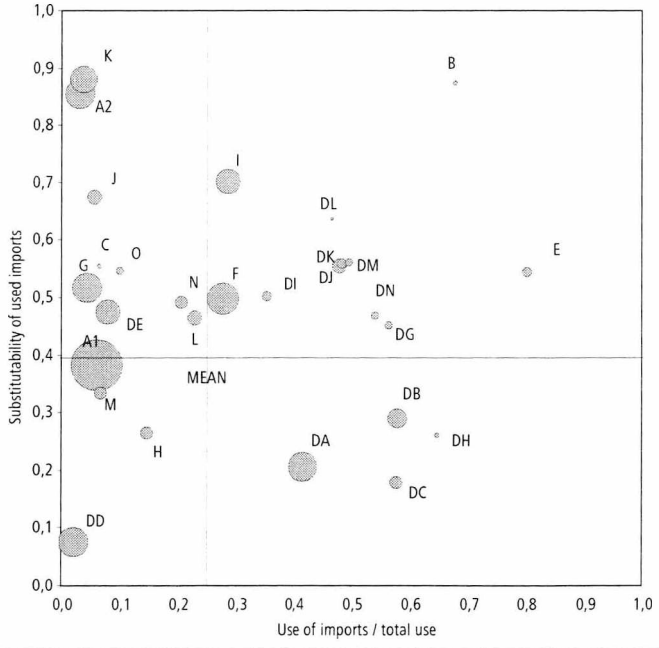
234 For an excellent contemporary description of life in cities during the 1920s, see the novel *Tehtaan varjossa, written* by Toivo Pekkanen in 1932. See also the novel Neito kulkee vetten päällä by Eeva Joenpelto.

In the case of intermediate goods, in turn, the results indicate strong dependency on foreign raw materials. These products fall into the upper right-hand corner of the figure and include coke and petroleum (DF), chemicals (DG), rubber and plastics (DH), non-metallic mineral (DI), and metal (DJ) products, as well as machinery and electrical equipment. The assumption of manufacturing industry dependence on imported raw materials still holds from the perspective of total intermediate use, of which imported products accounted for around 25 percent. This result differs significantly from that obtained for the Danish economy, in which foreign inputs accounted for only 10 percent of total intermediate use in 1934.[235]

Was the high proportion of imports attributable to supply or demand factors? If a product is not produced domestically, it is quite obvious that the high import need comes from the supply side. In simple terms, if a product is domestically available but is still imported there are two main alternative reasons: price or demand. Either domestic production is not sufficient to meet the demand, or the price of the imported product is lower than that of the domestic one, and domestic producers are not able to compete. Whether imports were supply- or demand-related is analysed below.

The next figure considers import dependency from the industry perspective. The horizontal axis represents the proportion of imported products of the total

Figure 19. Import dependency in Finland by industry, 1928



Source: the author's own estimates.

235 Abildgren (1992).

production for intermediate use of each industry (the value 0.0 indicates that the industry used only domestic products as raw materials, and 1.0 that it used only foreign raw materials). The vertical axis, in turn, represents the substitutability of the inputs used, thereby indicating the extent to which domestic raw materials would have been available (the value 0.0 indicates full domestic availability, and 1.0 that there was no domestic substitute). For example, in the case of mining, 99 percent of the imported raw materials were mining products and one percent consisted of coke and petroleum products. The proportion of imports of the total supply of mining products in the economy was 55 percent, and of coke and petroleum products 91 percent. The substitutability of mining inputs was thus calculated as 0.99 * 0.55 + 0.01 * 0.91, equalling 0.56.

The above figure describes, first of all, the proportion of foreign inputs in the production process by industry. The industries on the right-hand side of the figure showed a high use of imported raw materials, while those on the left-hand side relied more on domestic products. Furthermore, in general terms, those in the upper part of the figure were more dependent on imported products, and their use of foreign raw materials was mainly supply-related: what they required was generally not available domestically. The reasons why the industries in the lower part of the figure used foreign raw materials reflect price or demand factors more: the materials were also domestically available but for some reason they were purchased from abroad. As mentioned above, these reasons included the lower price of the foreign raw materials, and the fact that demand required more refined products that could not be produced from domestic raw materials. An example of the latter is clothing: textile raw materials were domestically available, but with the growth in the standard of living, there was a demand for silk clothes that the domestic market could not satisfy. With the growth in incomes came a variety of changes in consumption habits.

There are, again, some very interesting patterns revealed in the analysis. Most of the manufacturing industries had an above-average level of imports for intermediate use, the only exceptions being wood and wood products, and pulp, paper and paper products. The Finnish export industries were thus domestically rather self-sufficient in terms of raw materials. This observation is significant with regard to the Great Depression debate: a rise in the world prices of intermediate products would not affect directly these industries to the same extent as it would affect others.

There was also a significant difference in the case of the export industries: the wood and wood products industry was the only manufacturing industry in the economy that had low levels of imports for intermediate use and in which the imported inputs were, for the most part, replaceable by domestic products. Only agriculture (A1), hotels and restaurants (H) and education services (M) are situated in the lower left-hand corner of the figure, but even they had a higher dependency on foreign intermediates than the wood-product industry. Hotels and restaurants mainly imported food products and, to some extent, textiles and agricultural products, while education services mainly purchased school materi-

als such as pencils and erasers, and food and oil products were their main foreign intermediates. In agriculture, imports comprised seeds, animal fodder and fertilizers, accounting for 90 percent of all imports. Of these, fertilizers in particular were not domestically available, which explains their relatively low substitutability. Refined petroleum and agricultural machines comprised about 10 percent of agricultural imports .

The industries falling in the upper left-hand corner of the figure used few foreign raw materials, but were relatively dependent on them. It is interesting to note the difference between the manufacture of wood and wood products, and of pulp, paper and paper products. The latter was somewhat more dependent on foreign imports, mainly because the chemical products used in the production process were available only as imports. These comprised about 70 percent of all imports in the manufacture of pulp, paper and paper products. The industry also purchased paper from abroad and used it in the production of paper products. A significant proportion of forestry imports comprised petrol and lubricants, which were not domestically available. Housing (K), in turn, was highly dependent on imported coke, the main heating material. Of the other industries in the upper left-hand corner of the figure, the low substitutability of foreign imports used as intermediates was mainly attributable to products such as calculators, office equipment and other electrical equipment, which were not domestically available.

Most manufacturing industries, as well as construction and transport, are located in the upper right-hand corner of the figure. Transport (I) had around average use of foreign intermediates, but was at the same the highly dependent on these imports. Of the total imported products used in transport, fuels accounted for 33 percent, vehicle parts 20 percent, tyres and other rubber products 20 percent, and machines 10 percent. These were all products of low domestic supply. About 30 percent of the raw materials used in construction (F) were purchased from abroad, of which over 50 percent were metals, and around 20 percent were non-metallic mineral products such as bricks and cement. Other important foreign raw materials included asphalt, rock materials, paints and windows. These imports were required as domestic substitutes were not always available, either because the products were not produced domestically or (and mostly) because the domestic supply could not satisfy the demand during the construction boom. This was the case especially with products such as mineral and metal, and mining products.

The manufacturing industries in the upper right-hand corner of the figure were highly dependent on imported metals, especially iron and steel, which accounted for over 80 percent of the imported raw materials in the manufacture of metal products (DJ), 70 percent in machinery (DK), and around 60 percent in both transport equipment (DM) and other products (DN). As far as non-metallic mineral products (DI) were concerned, 65 percent of the imported raw materials consisted of mining products such as clay, chalkstone and gypsum, while the level of imports in energy production (E) was over 80 percent, mainly due to the

use of coal. The chemical products industry (DG) was again dependent on imported chemicals, which were not domestically available.

Other manufacturing industries (food DA, textiles DB, leather products DC, and rubber products DH), in turn, had above-average use of imports, but these imported products were also replaceable by domestic supply. These industries fall into the lower right-hand corner of the figure and could be described as consumption-goods industries. Their demand is highly dependent on household consumption, which may partly explain the results obtained. The fact that they could have used domestic raw materials but were using imported products instead would suggest that there was a private consumption element that demanded more refined goods than the domestic supply was capable of producing. Even though some raw materials, such as coffee beans and cotton, were not available domestically, they still reflected changes in consumer habits. In addition, world prices for many agricultural products fell during the 1920s, and as a consequence domestic production was not capable of competing on this level.

The level of foreign imports in household final consumption also reflects the increase in living standards to some extent. Of the products consumed by households, which mainly comprised food products (almost 40 percent of imports), textiles (25 percent) and agricultural products (12 percent of imports), almost 14 percent were imported. The level of imports for household consumption could be considered relatively high, given the fact that the economy was rather self-sufficient in food products, as discussed above.

Of the total amount of investments, imports comprised 10 percent, which also includes investments in building stock. If these are deducted, over 50 percent of investments in machinery and transportation vehicles were of foreign origin. This is a high figure by any standards (it was 18% in Denmark in 1934), and clearly demonstrates the dependency of the fixed capital formation of the Finnish economy on foreign imports. The latest study on foreign companies in Finland conducted by Riitta Hjerppe, as well as Timo Myllyntaus' study on electrification in Finland, emphasise the fact that new technologies and ideas were obtained through competition with foreign companies, and that this further encouraged Finnish industries to become more effective and productive.[236]

5.3 *Factor proportions and trade structure*

The dependency of industries on domestic and foreign raw materials was considered in detail in the previous sections. It was noted that industries are connected to the world economy not only through output but also through inputs. Their need is not only for raw materials and semi-finished goods, however, and they also require other types of inputs in their production processes, namely capital and labour. This section analyses the relationship between labour and capital, and foreign trade.

236 Hjerppe (2004b), pp. 234–235; Myllyntaus (1991).

One of the first empirical tests of the Hecksher-Ohlin theorem was conducted by Wassily Leontief in 1956. The factual basis of his analysis was the input-output table of the United States economy for the year 1947. Leontief calculated the amount of capital and labour required by the whole economy for the production of exports and products to compete with imports using the input coefficient table together with the Leontief inverse matrix. The input-output table was thus used in order to calculate not only the direct factor requirements of each industry, but also the total factor requirements. Using his inverse matrix, Leontief calculated both direct and indirect labour and capital requirements.[237]

Leontief concluded that the United States exported commodities that, on average, absorbed less capital and more domestic labour in their production than would be required for the production of goods it apparently found comparatively cheaper to import. These results were surprising. The most important export industries had higher labour requirements and lower capital requirements per dollar of output than the most important competitive importing industries.[238] This contradicted the Heckscher-Ohlin theorem, and these findings became known as the Leontief paradox of the Heckscher-Ohlin theorem.

Quite naturally, Leontief's results awakened discussion about and criticism of the approach. Market transformation (the essence of international trade) is different from technical transformation (the essence of the domestic input-output economy). Furthermore, capital was considered to be a more complex issue than could be encompassed within the framework of a simple static input-output model. These criticisms and other explanations of the Leontief paradox have not diminished the importance of his work in carrying out the first empirical test of the Heckscher-Ohlin theory.[239] Explanations have been sought in the role of the U.S. tariff structure, for example, and in the different levels of labour skills, while more refined proposals refer to human capital and natural resources. A growing number of studies have analysed the role of government policy and production location in the determination of comparative advantages and consequent trade patterns.[240]

Following Leontief were a number of studies in economic history focusing on the comparative advantages of economies and testing the Heckscher-Ohlin theorem. It is in these studies that support is to be found for the Heckscher-Ohlin hypothesis in the context of the late nineteenth and early twentieth centuries, the period that inspired Heckscher and Ohlin.

Crafts and Thomas looked at comparative advantage in UK manufacturing trade in 1910–1935. They used a linear regression model in order to investigate sources of comparative advantage, including three direct factor inputs: physical

237 Leontief (1956), pp. 390–395.

238 Ibid., p. 398.

239 On the criticism, the discussion, and Leontief's reply, see especially *The Review of Economics and Statistics*, Vol. 40, No. 1, Part 2. Problems in International Economics (Feb., 1958), 111–122.

240 See, for example, Appleyard & Field (1998), pp. 127–201 for an elementary discussion on the Heckscher–Ohlin theorem, the Leontief paradox, and post Heckscher–Ohlin theories of trade.

capital, human capital and unskilled labour, in UK international trade. They concluded that Britain's comparative advantages during the period 1910–1935 lay in unskilled-labour-intensive, capital-neutral and human-capital-scarce commodities. By comparison, they found that comparative advantage in the United States lay in human-capital-intensive, unskilled-labour-scarce commodities. As they remark, however, their analysis only includes direct impacts. Because of the absence of input-output tables for Britain before 1935 it has not been possible to verify the relevance of the Leontief paradox to British manufacturing trade.[241]

Wright followed the general format of the Crafts and Thomas analysis in his study of the origins of American industrial success in 1879–1940. He regressed the net trade balance for each industry against measures of factor intensity in the United States. Even though he noted that the results should be considered descriptive summaries of trade patterns in a multifactor setting, he also concluded that the Leontief paradox still existed in a multivariate setting. More importantly, he established that capital and natural resources were complementary factors of production, and that capital intensity derived largely from specialisation in industrial technology in which capital was complementary to natural resources. Nowadays, with globalisation, natural resources have become commodities to some extent, rather than part of the factor endowment. This was not the case in American manufacturing during the late 19th and early 20th centuries, however.[242]

O'Rourke and Williamson link the discussion on factor-price equalisation in the Heckscher-Ohlin theory with the literature on convergence. They use a simple general equilibrium model for the United Kingdom and the United States in order to see how much of the Anglo-American factor-price convergence between 1870 and 1895 or 1913 could be explained by the convergence in commodity prices. As they note, however, the model they developed tests the historical insight of Heckscher and Ohlin rather than any theoretical premise. They further suggest that the factor endowments were the key determinant of trade patterns in the late 19th century, despite the fact that Leontief discovered his trade paradox for the late 1940s. They also conclude that trade did have a powerful impact on factor prices, living standards, and income distribution in the United States and Britain in the late 19th century.[243]

The question of capital and labour intensity in Finland was also touched upon in a study conducted by Heikkinen and Hjerppe. They found that only the manufacture of paper and food products could be considered capital-intensive industries between 1910 and 1940. They traced the capital intensity in the paper industry to its faster productivity growth resulting from the mechanisation and rationalisation that took place during the early 1900s. The metal and wood-products industries were considered the most labour intensive (Table 20).[244]

241 Crafts & Thomas (1986).
242 Wright (1990).
243 O'Rourke & Williamson (1994).
244 Heikkinen & Hjerppe (1983).

Table 20. Labour intensity of industries (wages sum / value added), average 1910/12 and 1936/38 (%) and direct labour requirement (h) per FIM 1 million of output, 1928

Industry	Labour intensity %	Direct labour input h
DA Manuf. of food products	37	9,921
DB Manuf. of textiles	54	48,925
DC Manuf. of leather products	54	26,330
DD Manuf. of wood and wood products	64	57,325
DE Manuf. of pulp, paper and paper products	35	27,872
DG Manuf. of chemical products	52	15,369
DH Manuf. of rubber and plastic products		42,111
DI Manuf. of non-metallic mineral products	57	55,658
DJ Manuf. of basic metals and fabricated metal products	68	78,550
DK Manuf. of machinery and equipment		32,214
DL Manuf. of electrical and optical equipment		30,126
DM Manuf. of transport equipment		9,125
DN Manuf. of other products		31,340
Total manufacturing	**52**	**35,520**

Sources: Labour intensity, Heikkinen & Hjerppe (1983); Labour input, the author's own estimates.

There are some shortfalls in Heikkinen and Hjerppe's estimations of labour (or capital) intensity. First of all, labour intensity is measured as the proportion of wages of the value added by industry. A more appropriate measure would have been labour hours or years, which ignores the impact of wage differences by industry on the results. A comparison of the results with the direct-labour-input requirements, measured by labour hours, nevertheless indicates that the error is small, and that using labour hours changes the order of industries only in the case of paper and food. Secondly, Heikkinen and Hjerppe only used labour inputs in their analysis. This has led to some simplification in that low labour input automatically implies high capital input. It is possible, however, that both labour and capital inputs are low compared with the average. Finally, Heikkinen and Hjerppe only included direct labour inputs. By taking into account the total (direct and indirect) dependency of the output of each industry, it is possible to analyse not only the direct labour and capital requirements of each industry, but also the sum of the requirements of other industries.

Following on from Leontief's original analysis, the next section analyses the factor proportions and structure of Finnish trade in 1928. The aim is to observe the connection between factor endowment and foreign trade in Finland in the content of the Heckscher-Ohlin theory, and not directly to test their hypothesis.

The data on labour and capital inputs were based on the extensive research conducted by Pekka Tiainen on the contribution of the labour force, capital and total productivity on the growth of the Finnish economy in 1900–1990.[245] Tiainen only presents the total capital input for manufacturing, which was in this study allocated to the different industries based on information on the total

245 Tiainen (1994).

amount of horsepower in each one as shown in the manufacturing statistics. In addition, studies on Finnish growth, together with archival sources covering private services, were used to verify the labour-input figures.[246] It is acknowledged that the input figures for both labour and capital are somewhat crude. In particular, the different classifications used in Tiainen's and the present study may have caused some problems, but on the whole the results could be considered relatively reliable. Given the extensive work carried out both in Tiainen's study and in studies on historical national accounts, further revisions of the labour- and capital-input figures were not considered a priority. The direct and indirect labour and capital requirements (labour and capital coefficients) by industry are presented in Tables 8 and 9 in Appendix 3.

Leontief calculated the total labour and capital requirements in the production of a million dollars' worth of commodities defined as export goods. In the same way, he also calculated the labour and capital required to produce competitive imports. He then defined an index of comparative capital-labour intensity in the production of competitive imports and export goods as the capital/labour ratio for import industries divided by the same ratio for export industries. According to the Heckscher-Ohlin theorem, a relatively capital-abundant country obtains a value of less than 1.0, and a relatively labour-abundant country a value greater than 1.0.[247]

Table 21 below gives the figures calculated for the total domestic capital and labour requirements in the production of one million Finnish marks' worth of output for export industries and for competitive-import industries in Finland. Thus, the capital/labour ratio for export industries, the manufacture of wood and paper products, was 19.5 (FIM 2,202,749 / 112,992 hours), and for import-competing industries, including all other manufacturing industries, 10.2 (FIM 5,604,291 / 549,943 hours). The index of comparative capital-labour intensity in the production of competitive import and export goods is therefore 10.2 / 19.5 = 0.5. This result would lead us to assume that, on the basis of Leontief's original work, Finland exported commodities that absorbed more capital and less labour, on average, than would have been required for the production of the goods it found cheaper to import.

Table 21. The total labour and capital requirements of the export and competitive import industries per FIM 1 million of output, 1928

Industry	Labour hours	Capital FIM
Export industries	112,992	2,202,749
Import-competing industries	549,943	5,604,291

Source: the author's own estimates, Appendix 3, Tables 8 and 9.

246 SVT XVIII A 45, 1928; On growth studies, see Sources. On private services, see Appendix 2, Methods and sources.

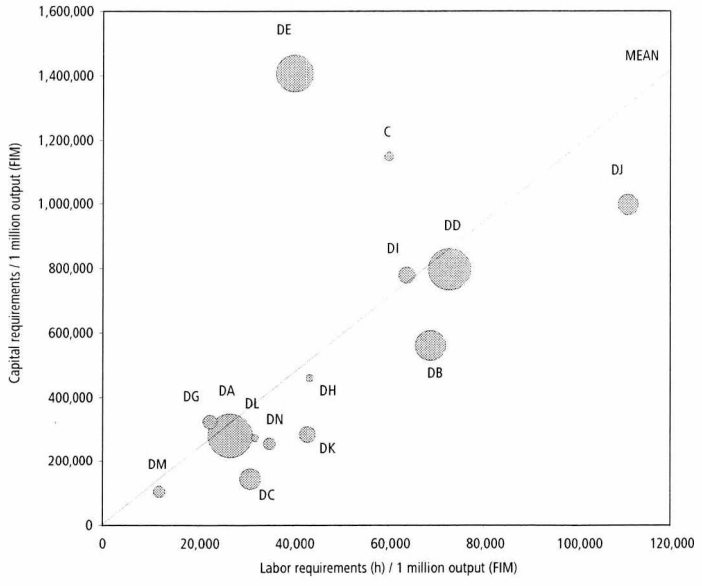
247 Leontief (1956), pp. 390–392.

The definition of an import-competing good is somewhat problematic, however, as Leontief himself noted. Wright also pointed out this problem in his study, especially in the case of refined sugar: if that had been included in the analysis it would have single-handedly generated the Leontief paradox for the year under study. Because Wright did not attempt to account for all international flows, he omitted sugar refining.[248]

Given that it is not the aim in this study to test the Heckscher-Ohlin theorem, and there clearly are classification problems concerning competitive imports, we could consider the question from another perspective. Figure 20 represents the data on the total (direct and indirect) capital and labour requirements by industry in Finland in 1928. The horizontal axis measures the total labour requirements per FIM 1 million of final output, while the vertical axis measures the total capital requirements per FIM 1 million of final output of all industries in 1928. The Heckscher-Ohlin theorem would lead us to expect the export industries to be located towards the upper-left section of the figure, and the import industries towards the lower-right section.

While the average capital/labour ratio calculated from the input-output table for manufacturing industries was 11.8, paper manufacture (DE) had a clearly higher ratio than other industries. The rationalisation and mechanisation that took place in the industry during the 1920s is clearly reflected in this figure. The

Figure 20. Total labour (hours) and capital (FIM) requirements per FIM 1 million of output, 1928



Source: the author's own estimates.

248 Wright (1990), p. 657.

only other industry clearly falling in the upper-left section was mining (C), while the chemical (DG) and non-metallic mineral products (DI) industries had a capital/labour ratio only slightly above the average. The manufacture of wood products (DD), the most important export industry, fell more towards the lower-right section of the figure, with a slightly lower capital/labour ratio than the whole economy, on average.

These results justify further observations in the light of Heikkinen and Hjerppe's conclusions. First of all, low labour intensity does not necessarily reflect high capital intensity. Heikkinen and Hjerppe concluded that the most capital-intensive industry in Finland in 1910–1940 was the food industry.[249] However, its capital/labour ratio was 10.5, which was lower than the average in manufacturing: the industry also had lower capital intensity than many other industries. Secondly, taking into account both direct and indirect requirements clearly further emphasises the capital intensity of paper production in comparison with food manufacture in particular. This also applies to the manufacture of metal products (DJ): the labour requirements multiplied when the total requirements were taken into consideration. The capital intensity of the industry was apparently higher than for wood products, again contradicting Heikkinen and Hjerppe's analysis based on direct-labour requirements.

The results for the Finnish economy seem to give partial support to the Heckscher-Ohlin theorem. It is clear from Table 20 that Finland exported products that were intensive in capital and imported products that were intensive in labour in 1928 if the capital intensity of export industries is compared with that of import industries. Thus, the comparative advantages in Finnish manufacturing lay, at least partly, in capital-intensive export commodities. The more detailed analysis of the export industries nevertheless revealed some contradictions in this result. The case of the manufacture of wood products was not as clear-cut as might have been assumed. The relatively high labour intensity of the industry requires further examination.

The analysis carried out in this chapter should be seen as a descriptive summary of industrial patterns, and as a way of pointing out areas of distinctive strength in terms of labour and capital in different industries. The findings on the manufacture of wood products should therefore not be considered fully within the traditional Heckscher-Ohlin framework: the industry exploited the extensive natural resource of Finland, namely the forests. In addition, the relatively high labour intensity reflects the exploitation of a labour force that is available for seasonal work in forests. Finland was also able to make full use of natural resources in the transportation of wood products. The question of transportation costs is highly relevant to the comparative advantages of industries: Finland was able to exploit its natural infrastructure of rivers in the form of log floating in the manufacture of wood products.

249 See Heikkinen & Hjerppe (1983), p. 122.

These findings are also in line with results presented in Hjerppe (1975) where it was concluded that capital intensive comparative advantage industries have been developed in Finland due to the suitable natural resources.[250] Finland has taken advantage of the raw material provided by forests and specialised in the wood and paper prosessing.

The conclusions drawn by Wright attributing at least some of the United States' industrial success to accidental or fortuitous geographic circumstances could also apply to Finland. The role of natural resources in the competitive potential of Finland's manufacture of wood products is obvious, and partly explains the low capital intensity and the relatively high labour requirements. It could therefore be concluded that the source of Finland's export industries' comparative advantages in the 1920s was a favourable endowment of its natural forest resources, combined with a sufficient stock of labour to exploit these advantages. A structural change in exports from wood to paper took place during the depression of the 1930s.[251] This change was also significant in terms of factor endowments, as the country's comparative advantages shifted partly from the exploitation of natural resources to the capital-intensive manufacturing of paper products. Whether this shift was accidental or intentional remains an open question. There might have been somekind of path dependency in a sence that the old paper industry was not as capital intensive as the new one but once paper was started to produce, there was no sense in turning back.

250 Hjerppe (1975), pp. 160–161.

251 Von Tunzelmann concluded that the structural shift towards new industries did not explain economic growth in Britain in the 1930s. Von Tunzelmann (1982), pp. 46–47.

6 Short-term impacts of the Finnish depression

6.1 The impact of the key industries on the economy

Chapter 5 identified the key industries in the Finnish economy in 1928. It was concluded that there was significant import dependency in some cases, which was perhaps somewhat typical for a small open economy such as Finland. The structural change in exports from wood to paper was also confirmed, and this was found to have some important implications as far as domestic labour and capital use were concerned.

This chapter investigates short-term impacts of the Great Depression of the 1930s in Finland. The basic input-output table is used in a static impact analysis of changes in the final demand of some of the key industries defined earlier on the basis of the supply and use framework and linkage analysis: food manufacturing, wood, pulp and paper products, and construction. The basic model is also extended into an input-output model that is closed in relation to households, and which takes into account the change in private household consumption as a consequence of the change in the wages sum and entrepreneurial income. This analysis makes it possible to indirectly analyse the role of private consumption in relation to the direct effects of industries. Applying observed changes in exports and construction produces the first ever impact analysis of the Finnish economy during the Great Depression of the 1930s, thereby contributing to the discussion on the role of export industries, domestic-market industries, construction and private consumption. Thus, Halme's demand for quantification in terms of impacts is now met.

Secondly, the focus of the analysis in this chapter is the tariff policy applied during the depression. This is reviewed, and the view of Finnish economic policy (automatic stabilisation) described by Kalela, for example, is challenged. The concept of the effective rate of protection (ERP) is applied in the analysis as it takes into account the indirect impacts of tariffs on products. This brings new knowledge to the traditional view on the rate of protection. Furthermore, the impact of tariffs applied to agriculture and food products on domestic consumer prices compared with the effects of changes in import prices are investigated using an input-output price model. This will challenge contemporary assumptions on whether or not consumers were made to pay for the protection of agriculture.

These exercises combined with the structural analysis presented in the previous chapter are then related to the research questions developed in Chapter 2.3 with a view to adding new insights, and particularly quantification, to the debate on the Great Depression. It is suggested that it is at least as important to study the causes of the depression as it is to study the consequences, as they are often closely linked. The basic approach has been to keep the models simple and intu-

itively understandable in order to avoid "black boxes": with historical data the statistics are often scant and the modelling tends to further distance the analysis from the reality.

The starting point for the modelling exercise is the observed changes in the final demand of the key industries. These observations are based on other studies or on the statistics available. This chapter thus examines the impact of the change in the value of exports of both manufactured wood products and manufactured paper products. The effects of changes in the investments in house construction are also studied. The final-demand changes in agriculture, forestry and food products are not modelled because they were more affected by the change in the above industries, as is demonstrated below. The role of these industries in the development is nevertheless discussed on the basis of the model results.

This chapter thus provides quantification of the effects of the fall in wood exports, the growth in paper exports and the fall in construction investments on different industries, on the economy as a whole, and on the total wages sum (defined as wages + entrepreneurial incomes – direct taxes – savings). The wages sum also reflects the decrease (or increase) in the purchasing power of households as a consequence of the changes in exports or investments.

The basic open input-output model shows the full impact of an exogenous increase (or decrease) in net final demand on all industries. The principal way in which the static open input-output model is normally used for analysis purposes is based on the assumed changes (observed or hypothetical) in the final demand of some industries. The model shows the change in output by industry due to the assumed change in final demand. The problem with the exogenous categorisation of household consumption was discussed in Chapter 3.4, and a solution given by moving the household sector from the exogenous final demand to the technically interrelated input-output coefficient table. This was described as closing the model in relation to households.

The following table shows the impact of a hypothetical one-billion-unit decrease in the final demand of three different industries separately, according to both the open and the closed model, on different industries and on the economy as a whole in Finland in 1928. This provides the starting point for the exercise as it compares the relative importance of the three industries based on an equal reduction in final demand. The open model describes more of the inter-industry impact, while the closed model also includes households in the analysis.[252] The table thus shows by how much a one-billion-unit reduction for example in the export of wood products reduces the output of each industry, the total output of the economy, and the total wages sum.

252 The sources used for calculating entrepreneurial income were mainly the same as for wages and were described in Chapter 4.2.4. Data on the level of savings and direct taxes were obtained from the study conducted by Tiainen (1994). Estimates of entrepreneurial incomes, savings and direct taxes are available from the author by request together with related input coefficients and inverse matrices for the closed model.

Table 22. The impact of a hypothetical one-billion-unit reduction in the export of wood products, pulp and paper, and in investments in house construction (% change in output by industry, total output and total wages sum in the economy)

Industries	Change in wood-product exports		Change in paper-product exports		Change in construction demand	
	Open model	Closed model	Open model	Closed model	Open model	Closed model
A1 Agriculture, hunting	−0.3	−8.5	−0.3	−5.2	−0.1	−6.5
A2 Forestry	−14.4	−17.0	−6.3	−7.9	−1.4	−3.4
B Fishing	0.0	−8.5	0.0	−5.1	0.0	−6.7
C Mining	−0.7	−2.9	−3.3	−4.7	−11.0	−12.7
DA Manuf. of food products	0.0	−7.8	0.0	−4.7	0.0	−6.1
DB Manuf. of textiles	0.0	−8.0	−0.1	−4.9	−1.5	−7.8
DC Manuf. of leather products	0.0	−8.9	0.0	−5.4	0.0	−7.0
DD Manuf. of wood and wood products	−28.0	−28.7	−1.9	−2.2	−2.0	−2.5
DE Manuf. of pulp, paper and paper products	−0.1	−2.4	−41.4	−42.8	−0.2	−2.1
DF Manuf. of coke and refined petroleum products	−2.4	−8.2	−1.9	−5.4	−1.7	−6.3
DG Manuf. of chemical products	−0.6	−6.1	−1.1	−4.4	−4.0	−8.3
DH Manuf. of rubber and plastic products	−0.7	−8.9	−0.6	−5.5	−0.3	−6.7
DI Manuf. of non-metallic mineral products	−0.1	−2.0	−1.5	−2.6	−17.6	−19.1
DJ Manuf. of basic metals and fabricated metal products	−0.7	−2.5	−1.0	−2.0	−14.2	−15.6
DK Manuf. of machinery and equipment	−1.5	−4.4	−3.3	−5.0	−2.6	−4.9
DL Manuf. of electrical and optical equipment	−0.1	−3.6	−0.2	−2.2	−13.8	−16.4
DM Manuf. of transport equipment	−0.6	−3.2	−0.6	−2.1	−0.2	−2.2
DN Manuf. of other products	−0.1	−7.5	−0.1	−4.5	−0.5	−6.3
E Electricity, gas and water supply	−2.1	−7.1	−5.4	−8.5	−2.4	−6.4
F Construction	−0.1	−0.9	−0.1	−0.5	−22.2	−22.7
G Trade	−1.3	−6.9	−1.4	−4.8	−1.9	−6.3
H Hotels and restaurants	0.0	−6.3	0.0	−3.8	0.0	−4.9
I Transport, storage, post and telecomm. services	−4.2	−9.1	−3.6	−6.6	−1.0	−4.9
J Financial and insurance services	−0.4	−8.8	−0.4	−5.5	−0.2	−6.8
K Housing and business services	−0.2	−8.5	−0.2	−5.2	−0.2	−6.8
L Public administration	0.0	0.0	0.0	0.0	0.0	0.0
M Education	0.0	−1.3	0.0	−0.8	0.0	−1.0
N Health and social-work services	0.0	−3.3	0.0	−2.0	0.0	−2.5
O Other services	−0.1	−8.9	−0.1	−5.4	0.0	−6.9
P Household work	0.0	−9.0	0.0	−5.4	0.0	−7.0
Wages sum		**−9.0**		**−5.4**		**−7.0**
Total output	**−3.7**	**−8.8**	**−3.4**	**−6.5**	**−3.1**	**−7.1**

Source: the author's own estimates.
The open model describes the change in total output by industry.
The closed model describes the change in total output by industry as well as in the wages sum.

The analysis clearly describes the importance of wood exports to the economy. In addition to the original one billion, and based on the open model, the inter-industry effects cause an additional reduction of FIM 859-million worth of output, corresponding to a total reduction of 3.7% in the total output. The same reduction in paper exports would have a slightly smaller impact on the economy:

a one-billion-mark reduction would, again in addition to the initial impact, cause an additional 734-million-mark reduction in total output. These total effects correspond to a 3.4% reduction in the total economic output. In the case of construction, the additional reduction in output would have been FIM 581 million, the total impact amounting to a 3.1% reduction.

The modelling shows clear differences in the distribution of the inter-industry impacts of different industries. The one-billion-mark reduction in wood exports causes a 28% reduction in the industry output. In addition, the output of forestry, the main supplier of raw materials to the wood-producing industry, would fall by FIM 559 million, corresponding to 14.4% of the total industry output. Reductions in the manufacture of wood would naturally have an impact on the transport sector: output would fall by FIM 124 million, amounting to 4.2% of the industry's output. The remaining effects would be distributed mainly among the manufacturing industries, trade and agriculture.

A one-billion-mark reduction in exports of pulp and paper products would cause a reduction of over 41 percent in the output of the industry. Forestry would also suffer, but due to the higher refinement level than in wood production, the decrease would only correspond to 6.3% of forestry output. Similarly, transport would suffer to the extent of FIM 107 million, but again not much less than in the case of wood exports. The rest of the 240-million-mark impact is distributed more widely throughout the economy. However, energy and mining in particular would suffer, reflecting the energy intensity of paper production in comparison with the manufacture of wood products, for example. Machinery manufacture would also suffer from the fall in exports of paper products, again reflecting the capital intensity of the industry.

The impact of the hypothetical one-billion reduction in investments in housing construction would differ from that in the export industries: the reduction in the construction sector would be over 22 percent. The effects are felt especially in mining, the manufacture of non-metallic mineral products and basic metals, and of electrical and optical equipment. The manufacture of chemical products would also suffer. The rest of the effects are again widely distributed throughout industry, although the impact on the manufacture of wood and wood products is perhaps surprisingly small.

The above analysis only included the total inter-industry effects. If the reduction in wages and entrepreneurial income had been included, the impact would have been stronger. In contrast to the results based on the open model, those from the closed model suggest that the total impact on the economy of the hypothetical one-billion reduction in final demand would be greater in the construction sector than in paper production. The greatest impact still stems from the manufacture of wood products. Taking into account the reduction in household income causes an additional impact of a 5.1% unit reduction in total output in the case of wood manufacturing, a 4.0% unit reduction in construction, and a 3.1% reduction in the manufacture of paper products. This is explained by the fact that wood manufacturing causes a reduction in total wages of 9.0%, while in

the case of construction it is 7.0%, and in paper production 5.4%. This again reduces consumption in domestic market industries and services. Because the model operates on fixed Leontief coefficients, the structure of household consumption does not change. It is assumed that private consumption is fixed for all income groups and for all changes in production. This is also reflected in the results. Change in final demand by different industries results in a proportionally similar fall in the private consumption of various products.

The above analysis was based on a hypothetical reduction in demand in three key industries, each separately. The following analysis, in turn, models the observed changes in final demand of these industries during the period 1928–1932. Each change is entered into the model separately in order to isolate its impact. Thus, the following assumptions, based on actual changes in demand, are made (tables 23–25 summarise the results of the exercises):

1) Demand for manufactured wood products decreases by 1,192 million marks, reflecting the decrease in the value of exports in 1928–1932 at 1928 prices.[253]
2) Demand for pulp and paper products increases by 457 million marks, reflecting the increase in the value of exports in 1928–1932 at 1928 prices.[254]
3) Demand for house construction decreases by 1,781 million marks, reflecting the decrease in value of house-construction investments in 1928–1932 at 1928 prices.[255]

The decrease in exports of wood products by 1,192 million marks, according to the analysis in the open model, caused a decrease of over 33 percent in the output of wood products. In addition, there was a notable decrease in forestry production of over 17 percent. The transport sector was naturally affected as the demand for transport services correlates with the amount of production. In the case of wood products, log floating, horse transport, and new transportation modes such as by heavy-goods vehicles, were directly affected by the reduction in exports. The impact on other industries was less significant, however. The total effect on the economy was a 4.4% reduction in total output, corresponding to FIM 2,216 million. Thus, the original reduction of FIM 1,192 million was nearly doubled by the impact on other industries, especially forestry and transport.

Taking into account the fall in wages and entrepreneurial income more than doubles the effects. According to the closed model, the total impact of the decrease in wood exports was a 10.5% reduction in total output. The initial decrease of FIM 1,192 million was multiplied due to indirect effects totalling a FIM 5,285 million fall in total output. Thus, the total impact was over four times

253 The value of exports was obtained from Oksanen & Pihkala (1975). Current values were deflated by the wholesale index in order to obtain 1928 values.

254 The value of exports was obtained from Oksanen & Pihkala (1975). Current values were deflated by the wholesale index in order to obtain 1928 values.

255 Kohi (1977). Current values were deflated by the wholesale index in order to obtain 1928 values.

Table 23. The impact of a FIM 1,192 million decrease in the value of exports of wood products at 1928 prices (change in output by industry, total output and total wages sum in the economy)

Industries		Output 1928	Impacts: Open model	Change	Closed model	Change
		FIM m		%	FIM m	%
A1	Agriculture, hunting	10,710	−39	−0.4	−1,080	−10.1
A2	Forestry	3,895	−666	−17.1	−789	−20.3
B	Fishing	190	0	0.0	−19	−10.2
C	Mining	163	−1	−0.8	−6	−3.5
DA	Manuf. of food products	3,924	−1	0.0	−363	−9.3
DB	Manuf. of textiles	1,677	0	0.0	−160	−9.5
DC	Manuf. of leather products	809	0	0.0	−86	−10.6
DD	Manuf. of wood and wood products	3,733	−1,247	−33.4	−1,275	−34.2
DE	Manuf. of pulp, paper and paper products	2,756	−3	−0.1	−80	−2.9
DF	Manuf. of coke and refined petroleum products	16	0	−2.8	−2	−9.7
DG	Manuf. of chemical products	308	−2	−0.7	−22	−7.3
DH	Manuf. of rubber and plastic products	97	−1	−0.8	−10	−10.6
DI	Manuf. of non-metallic mineral products	537	−1	−0.1	−13	−2.3
DJ	Manuf. of basic metals and fabricated metal products	863	−7	−0.8	−25	−2.9
DK	Manuf. of machinery and equipment	548	−10	−1.8	−29	−5.3
DL	Manuf. of electrical and optical equipment	120	0	−0.2	−5	−4.3
DM	Manuf. of transport equipment	309	−2	−0.8	−12	−3.8
DN	Manuf. of other products	292	0	−0.2	−26	−9.0
E	Electricity, gas and water supply	517	−13	−2.5	−44	−8.5
F	Construction	4,546	−6	−0.1	−46	−1.0
G	Trade	3,574	−56	−1.6	−294	−8.2
H	Hotels and restaurants	632	0	0.0	−47	−7.5
I	Transport, storage, post and telecomm. services	2,969	−148	−5.0	−323	−10.9
J	Financial and insurance services	1,013	−4	−0.4	−106	−10.5
K	Housing and business services	3,105	−6	−0.2	−316	−10.2
L	Public administration	1,080	0	0.0	0	0.0
M	Education	756	0	0.0	−12	−1.5
N	Health and social-work services	728	0	0.0	−28	−3.9
O	Other services	324	0	−0.2	−34	−10.6
P	Household work	304	0	0.0	−33	−10.7
Wages sum		**12,930**			**−1,781**	**−10.7**
Total output		**50,494**	**−2,216**	**−4.4**	**−5,285**	**−10.5**

Source: the author's own estimates.

the initial impact when the reduction in incomes was taken into account. Moreover, the effects were felt more widely in the economy. There were significant reductions in the total output of most industries. This reflects the fact that, as total incomes fell by nearly eleven percent, it had an impact on final household consumption, which again reduced the total output of other industries, especially those supplying products for domestic markets. Production of food, textiles and leather products all fell by over nine and even ten percent, while agri-

culture and many services also suffered from the reduced household income. It was, in fact, the agricultural income that distributed the effects more widely into the economy.

The second analysis concentrates on the impact of the increase in the export of pulp and paper products, which according to the model appears less significant than in the case of wood exports. An increase in the value of pulp and paper exports by FIM 457 million, again according to the open model, had the positive impact of a 1.6% increase in the total production of the economy. The effect on the paper industry itself was an almost 20% increase in output. Of the other industries, forestry was again the most affected by the change in exports, while other industries benefited less. It seems obvious that, given the higher refinement level of pulp and paper products in comparison with wood products, the inter-industry impact on forestry was somewhat smaller in relative terms. Similarly, the impact on transport was again larger than on other industries. The open model captures the capital intensity of the manufacture of pulp and paper, and a growth in exports has a positive effect on the manufacture of machinery and the production of electricity.

Again, the modelling based on the closed model produced some significant differences in results. The effect on the economy as a whole was a 3.0% increase in total output, which again was more widely spread among other industries as a result of increased household purchasing power (total earnings rose by 2.5%). The initial FIM 457-million growth in exports was more than tripled, accounting for a positive increase in the output of the economy as a whole of FIM 1,500 million. It is nevertheless worth noting that the increase in output due to the growth in pulp and paper exports only partially compensated for the effect of the decrease in wood exports. On the other hand, paper exports continued their growth after 1932, further compensating for the fall in exports of wood.

Finally, a fall in the value of investments in house construction of 1,781 million marks obviously had serious effects on the economy: according to both models the reduction in construction production was around 40 percent. The impact on other sectors was also relatively significant. Mining production, and the manufacture of mineral and metal products and electrical equipment decreased significantly, by 20 to 30 percent. The effects were also distributed relatively widely among the manufacturing industries. The total effect of a 5.6% reduction in total output, according to the open model, is quite significant. The inter-industry effects of house construction were thus relatively large: the small changes in forestry and agriculture output were still more significant in relative terms than the changes in manufacturing output that were bigger in percentage terms. The total impact, according to the open model, corresponded to FIM 2,815 million.

In the case of house construction, the inclusion of the household sector in the analysis significantly changes the impact of the reduction in investment. The total reduction in the output of the economy was, according to the closed model, as high as 12.7%. In monetary terms, this corresponded to a reduction of FIM

Table 24. The impact of a FIM 457 million increase in the value of exports of pulp and paper products at 1928 prices (change in output by industry, total output and total wages sum in the economy)

Industries		Impacts				
		Output 1928	Open model	Change	Closed model	Change
		FIM m	FIM m	%	FIM m	%
A1	Agriculture, hunting	10,710	13	0.1	253	2.4
A2	Forestry	3,895	112	2.9	141	3.6
B	Fishing	190	0	0.0	4	2.3
C	Mining	163	2	1.5	3	2.1
DA	Manuf. of food products	3,924	0	0.0	84	2.1
DB	Manuf. of textiles	1,677	1	0.1	38	2.3
DC	Manuf. of leather products	809	0	0.0	20	2.5
DD	Manuf. of wood and wood products	3,733	32	0.8	38	1.0
DE	Manuf. of pulp, paper and paper products	2,756	522	18.9	539	19.6
DF	Manuf. of coke and refined petroleum products	16	0	0.9	0	2.5
DG	Manuf. of chemical products	308	2	0.5	6	2.0
DH	Manuf. of rubber and plastic products	97	0	0.3	2	2.5
DI	Manuf. of non-metallic mineral products	537	4	0.7	6	1.2
DJ	Manuf. of basic metals and fabricated metal products	863	4	0.4	8	0.9
DK	Manuf. of machinery and equipment	548	8	1.5	13	2.3
DL	Manuf. of electrical and optical equipment	120	0	0.1	1	1.0
DM	Manuf. of transport equipment	309	1	0.3	3	0.9
DN	Manuf. of other products	292	0	0.0	6	2.1
E	Electricity, gas and water supply	517	13	2.5	20	3.9
F	Construction	4,546	2	0.0	11	0.3
G	Trade	3,574	23	0.7	78	2.2
H	Hotels and restaurants	632	0	0.0	11	1.7
I	Transport, storage, post and telecomm. services	2,969	49	1.6	89	3.0
J	Financial and insurance services	1,013	2	0.2	25	2.5
K	Housing and business services	3,105	2	0.1	74	2.4
L	Public administration	1,080	0	0.0	0	0.0
M	Education	756	0	0.0	3	0.4
N	Health and social-work services	728	0	0.0	7	0.9
O	Other services	324	0	0.1	8	2.5
P	Household work	304	0	0.0	8	2.5
Wages sum		**12,930**			**411**	**2.5**
Total output		**50,494**	**793**	**1.6**	**1,500**	**3.0**

Source: the author's own estimates.

6,409 million at 1928 prices due to the fact that construction had linkages to many of the manufacturing industries, which again played a significant role in the economy as a source of household income. Wages and entrepreneurial incomes fell by nearly 13 percent due to the decrease in house investments corresponding to a total value of FIM 2,086 million. This was again reflected as a reduction in household purchasing power, and as reduced output by other indus-

Table 25. The impact of a FIM 1,781 million decrease in the value of house-construction investments at 1928 prices (change in output by industry, total output and total wages in the economy)

Industries		Impacts				
		Output 1928	Open model	Change	Closed model	Change
		FIM m	FIM m	%	Mill. FIM	%
A1	Agriculture, hunting	10,710	−17	−0.2	−1,235	−11.5
A2	Forestry	3,895	−95	−2.4	−239	−6.1
B	Fishing	190	0	0.0	−23	−11.9
C	Mining	163	−32	−19.6	−37	−22.7
DA	Manuf. of food products	3,924	−2	0.0	−426	−10.8
DB	Manuf. of textiles	1,677	−45	−2.7	−232	−13.9
DC	Manuf. of leather products	809	0	−0.1	−101	−12.5
DD	Manuf. of wood and wood products	3,733	−136	−3.6	−169	−4.5
DE	Manuf. of pulp, paper and paper products	2,756	−12	−0.4	−102	−3.7
DF	Manuf. of coke and refined petroleum products	16	0	−3.1	−2	−11.1
DG	Manuf. of chemical products	308	−22	−7.1	−46	−14.8
DH	Manuf. of rubber and plastic products	97	0	−0.5	−12	−12.0
DI	Manuf. of non-metallic mineral products	537	−169	−31.4	−183	−34.0
DJ	Manuf. of basic metals and fabricated metal products	863	−218	−25.3	−240	−27.8
DK	Manuf. of machinery and equipment	548	−25	−4.6	−48	−8.7
DL	Manuf. of electrical and optical equipment	120	−29	−24.5	−35	−29.3
DM	Manuf. of transport equipment	309	−1	−0.4	−12	−3.9
DN	Manuf. of other products	292	−3	−0.9	−33	−11.2
E	Electricity, gas and water supply	517	−22	−4.3	−59	−11.4
F	Construction	4,546	−1,795	−39.5	−1,842	−40.5
G	Trade	3,574	−120	−3.4	−399	−11.2
H	Hotels and restaurants	632	0	0.0	−55	−8.8
I	Transport, storage, post and telecomm. services	2,969	−54	−1.8	−259	−8.7
J	Financial and insurance services	1,013	−4	−0.4	−123	−12.2
K	Housing and business services	3,105	−11	−0.4	−375	−12.1
L	Public administration	1,080	0	0.0	0	0.0
M	Education	756	0	0.0	−14	−1.8
N	Health and social-work services	728	0	0.0	−33	−4.5
O	Other services	324	0	−0.1	−40	−12.3
P	Household work	304	0	0.0	−38	−12.6
Wages sum		**12,930**			**−2,086**	**−12.6**
Total output		**50,494**	**−2,815**	**−5.6**	**−6,409**	**−12.7**

Source: the author's own estimates.

tries. Thus, to add to the direct impact, industries with high final-demand consumption also suffered.

In sum, the export industries had a large impact on the economy, but it was mainly distributed through the forest cluster, especially agriculture. The spillover effect was surprisingly smaller in paper manufacturing than in the case of construction. The sudden halt in investments in house construction had a far greater

indirect impact on the economy, which was distributed widely, especially through private consumption. It is safe to conclude, therefore, that private consumption played a major role in the economic development. The effects of the initial shocks were more than double in the case of all industries when the household sector was included in the analysis. This result also emphasises the role of agriculture and domestic market industries, especially food production, in the economic development. The reduction in incomes had a direct effect on the domestic market industries, thereby again multiplying their impact on the economy. In the case of the forest cluster, the role of agriculture as a distributing channel of effects was significant. However, perhaps surprisingly, the impact of construction was larger than that of paper manufacture partly because its effects were distributed through manufacturing rather than through the relatively closed forestry cluster.

It is clear from the above analysis that taking into account changes in wages and entrepreneurial incomes reflects the total impact much better than just looking at the inter-industry effects. On the other hand, the closed model also probably underestimates the impact of the household sector in some cases. This is especially the case in manufacturing because it was not possible to include all entrepreneurial income due to the lack of data (it only included the income of private entrepreneurs and not, for example, corporate profits and dividents). More reliable data was available on agriculture and forestry incomes where private entrepreneurs produced a large proportion of the products. If the data on manufacturing was complemented it would most likely increase the impact of construction further because most of the spillovers in construction were distributed through manufacturing. Furthermore, the use of fixed household-consumption coefficients suggests that the pattern of consumption does not change in the event of economic crisis, which is naturally not the case.

6.2 *Effective protection and prices*

While the above analysis considered the impact of the economic development during the depression, the following addresses one of the issues concerning its causes: tariffs. Despite the fact that there are arguments both supporting and denying the effect of tariffs on economic development, their economic impact has received scant attention. Quantitative estimates of the benefits and drawbacks of tariffs in Finland are quite rare.

The connection between trade policy and economic development has been studied extensively in the international context. However, a comprehensive methodology for studying the macroeconomic effects of trade policy is still lacking. It is particularly problematic to include the impact of non-tariff barriers in the analysis, and therefore the focus quite often is only on the tariffs and their effects. This is also the case in this study.[256]

256 On evaluation of the economic impacts of trade policy see, for example, Capie (1994); Milward & Brennan (1996).

International studies on tariffs and their effects on economic development have concentrated on the concept of effective protection. There have been numerous studies on the subject since the introduction of the concept (see Chapter 3.4.5).[257] The effective rate of protection measures the most immediate impact of tariffs, and their impact both on the prices of material inputs and on finished outputs. Tariffs protect not only the product but also the economic activity that produces it from certain inputs.

There are international studies on economic history examining the connection between the rate of effective protection and the Great Depression of the 1930s. One of the first to use the concept of effective protection was carried out by Forrest Capie in 1978. He analysed the effects of the tariff structure on the British economic recovery of the 1930s, and concluded that the 1932 tariff structure actually hindered the recovery process since the fastest growing industries had the lowest rate of effective protection.[258]

Since then many of Capie's assumptions have been questioned by economic theorists, but the usefulness of the ERP measurement has become well acknowledged. Kitson et al. repeated Capie's calculations on the effective rate of protection in the United Kingdom during the 1930s. They used the 1935 input-output table data in order to produce a more refined estimate, and came up with results that differed significantly from those obtained by Capie. Capie estimated that the iron and steel industries, which are important in times of recovery, had a low rate of protection, while Kitson et al. concluded that it was among the top 10 percent in the rank order of effective protection rates. Furthermore, since construction was a non-tradable good, the industry was adversely affected by the relative price changes induced by the tariff structure of 1932. Finally, Kitson et al. carried out a regression analysis in order to gain more insight into the relationship between effective protection and recovery. They concluded that the effective tariff structure did not have a discernible effect on the overall recovery of the United Kingdom from the Great Depression of the 1930s.[259]

G. R. Hawke studied the relationship between United States tariffs and growth in certain key industries in the late-nineteenth century. As there are no input-output tables available for that period, he used the Census of Manufactures data on the inputs and outputs of major industries. He calculated the efficient rate of protection for the years 1879, 1889, 1899 and 1904, and concluded that there had been a much smaller increase in the protection given to U.S. industries between 1879 and 1904 than was commonly believed. More importantly, he found that it was not the industries in which the most rapid growth took place that were

257 See, for example, Basevi (1966); Witthans (1973); Ray (1974); Yeats (1976). The concept of the effective rate of protection has been also diffused into textbooks on international trade: see, for example, Appleyard & Field (1998).

258 Capie (1978).

259 Kitson & Solomou & Weale (1991).

accorded the highest effective tariffs in the late nineteenth century. There was no clear connection to be found between tariffs and industrial growth.[260]

Steven B. Webb studied the economic effects of tariffs and the possible relationship between protection and the growth of output and productivity in the German steel industry between 1879 and 1914. Lacking exact input-output tables too, he used industrial census data in order to review industrial input and output data. He concluded on the basis of his analysis that tariffs and cartels together raised German steel prices above the world level, and also raised input costs for domestic customers of the cartels. Therefore, the highest benefit went to the cartel members that integrated backwards and could get inputs at cost rather than at the cartel price. The tariff-cartel system further encouraged vertical integration and lowered the risk associated with capital-intensive technologies, resulting in high productivity growth. Contrary to the British and American cases reviewed above, tariffs and cartels combined had a substantial impact on the structure and performance of Germany's steel industry in 1879–1914.[261]

The impact of tariffs has been touched upon only on the surface in Finnish research on economic depression. During the 1920s the only exception to the laissez-faire economic policy was the protection of agriculture. The protectionism increased significantly during the years of depression, however, and in the 1930s tariffs accounted for over half of government income.

Lamberg conducted the only quantitative analysis of the relationship between tariffs and change in consumer prices in Finland during the inter-war period. He analysed the economic effects of the trade policy set against price comparisons, and his results supported the notion that agricultural producers had a dominant position in the trade policy, especially in the area of customs duty. The position of the domestic market industries was the weakest from this perspective. Lamberg also constructed a miniature decision-making game involving six products and four interest groups. The outcome was that the biggest losers in the Finnish trade policy were the consumers. The game was won by the agriculture producers: they had the biggest GDP share, the biggest share of the population, and the most extensive representation in the Diet.[262]

The following table lists both nominal and effective rates of protection as calculated for Finland for the years 1928 and 1934. Nominal tariff rates were calculated by dividing the duties collected for each industry by the total value of the imports for that industry. The effective rate of protection, in turn, measures the most immediate impact – on the prices of both material inputs and finished outputs. The effective rate of protection also takes into account the use of tradable inputs. Unfortunately, it was not possible to make fully detailed calculations of the tariffs for all imports for the year 1934. The tariffs were changed in the middle of the calendar year, and the registers on imports and tariffs differed to an

260 Hawke (1975).
261 Webb (1980).
262 Lamberg (1999), pp. 134–152.

extent that made any more detailed calculations difficult. This is also noted in the official statistics, which therefore only include data on the most important import articles. Nevertheless, this covers around 85 percent of all imports and customs duties, and it was only in the cases of forestry, fishing, wood products, paper products and other products that the data was not available. On the other hand, data was available on the most interesting groups, namely agriculture and domestic market industries. Table 26 summarises the results of the calculations.[263]

Table 26. Nominal and effective rates of protection in 1928 and 1934 by industry (%)

Industries		1928		1934	
		Nominal rate	Effective rate	Nominal rate	Effective rate
A1	Agriculture, hunting	24.5	27.5	94.2	105.2
A2	Forestry	7.3	7.0	*7.3*	6.3
B	Fishing	232.8	234.1	*232.8*	233.6
C	Mining	0.0	−0.1	0.0	−0.3
DA	Manuf. of food products	30.9	33.5	174.9	208.1
DB	Manuf. of textiles	14.9	15.7	24.9	34.3
DC	Manuf. of leather products	6.8	5.6	12.8	8.5
DD	Manuf. of wood and wood products	35.1	5.1	*35.1*	1.4
DE	Manuf. of pulp, paper and paper products	8.3	−3.0	*8.3*	−5.3
DF	Manuf. of coke and refined petroleum products	23.7	23.7	92.3	92.3
DG	Manuf. of chemical products	4.3	2.7	7.8	−0.3
DH	Manuf. of rubber and plastic products	37.3	43.2	32.9	35.8
DI	Manuf. of non-metallic mineral products	11.0	12.4	37.7	45.3
DJ	Manuf. of basic metals and fabricated metal products	10.0	11.0	19.7	21.9
DK	Manuf. of machinery and equipment	2.9	1.4	8.3	6.4
DL	Manuf. of electrical and optical equipment	9.3	9.6	9.3	8.8
DM	Manuf. of transport equipment	7.9	7.2	4.9	2.4
DN	Manuf. of other products	27.5	29.6	*27.5*	28.2
E	Electricity, gas and water supply	.	0.0	.	0.0
F	Construction	.	−8.6	.	−15.3
G	Trade	.	−0.7	.	−1.1
H	Hotels and restaurants	.	−22.2	.	−92.2
I	Transport, storage, post and telecomm. services	.	−1.6	.	−3.3
J	Financial and insurance services	.	−0.6	.	−0.7
K	Housing and business services	.	−2.7	.	−2.8
L	Public administration	.	−3.9	.	−13.6
M	Education	.	−2.5	.	−2.5
N	Health and social-work services	.	−7.1	.	−28.7
O	Other services	.	−0.4	.	−0.5
P	Household work	.	0.0	.	0.0

Sources: the author's own estimates based on SVT 1A, 54:1934; SVT 1A, 48:1928. Due the lack of data the figures for 1934 in *cursive* are based on the 1928 data. Thus, it was assumed that there was no change in the tariff structure.

263 SVT 1A, 54:1934, p. 50.

The nominal tariff on *agricultural products (A1)* was 24.5 percent in 1928, and had jumped to 94.2 percent by 1934. The increase in nominal protection was relatively significant, although the effective protection in 1928 was around the same as the nominal protection. This would suggest that the protection was far less planned than later on in 1934, when the effective tariff had risen to over 105 percent. The figures for 1928 would also suggest that tariffs were mainly collected for fiscal purposes. Agricultural output and value added were both protected at around the same level in 1928. This situation changed somewhat in 1934 when effective protection clearly rose above nominal protection. All in all, agriculture enjoyed very high protection during the depression, and was among the most protected sectors in the Finnish economy. By way of comparison, Kitson et al. (1991) estimated that the effective rate of protection was 30 percent in the United Kingdom in 1932, thus the Finnish rate for agriculture grew from the same level as in the UK to over three times higher by 1934.[264]

In the case of the *domestic market industries*, developments in protection varied. Of the consumption industries, *food products (DA)* already had a relatively high nominal tariff (30.9 percent) in 1928, and this had risen to nearly 175 percent by 1934 while the effective rate of protection increased from 33.5 percent to over 208 percent during the period. Food manufacture was clearly the most protected industry in 1934 (the figures on fishing should be considered unreliable). Finnish food production was operating under the cover of a high customs barrier. In comparison, the effective rate of protection for food production was only 26.8 percent in the United Kingdom in 1932. Furthermore, because the value added of the industry was highly protected, this must also have been reflected in the domestic prices of food, which again must have had a negative impact on the real incomes of consumers. This impact on prices is analysed further below. Textile manufacture (DB) also experienced growth in nominal tariff rates in 1928–1934, and the effective rate of protection also increased from 15.7 to 34.3. Leather products (DC), in turn, had a low nominal rate with a slight increase up until 1934, while the effective rate of protection during both years under study was less than the nominal rate. This implies that imported inputs had higher tariffs than the final leather products. From the perspective of the industry this cannot be viewed as a positive phenomenon. It also suggests that in the case of domestic market industries other than food production, the tariffs gave no particular protection. Many of the other manufacturing industries were better protected, as shown below.

The group of industries, that could be defined as *heavy industries* showed different patterns of development in tariffs. Both the nominal and effective tariffs were relatively high in coke and petroleum-product manufacturing (DF), which is somewhat surprising as domestic production was almost non-existent during the 1920s and 1930s. This suggests that the tariffs were only collected for fiscal purposes. Chemical products (DG), on the other hand, had to compete with for-

264 Kitson & Solomou & Weale (1991), p. 332.

eign production without a customs barrier. Industry's effective protection had turned slightly negative by 1934, implying higher tariffs on the raw materials than on the final products. Rubber and plastic products (DH), in turn, were relatively highly protected even though the effective rate decreased somewhat in 1934. Domestic rubber-tyre production thus had the potential to develop behind a customs barrier. The domestic production of non-metallic mineral products (DI) also experienced growth in both nominal and effective tariffs from 1928 to 1934. Bricks were one of the key raw materials in the construction sector, and the tariffs on them could be seen in the negative effective rate of protection of construction. Protecting the brick industry was thus a negative factor from the perspective of construction, and the already critical shortage of raw materials grew even worse. Tariffs on manufactured metal products, in turn, increased slightly from 1928 to 1934, but were at an average level.

Industries producing *investment goods* had a low protection level. Machinery (DK), electrical equipment (DL) and transport equipment (DM) all had low rates of both nominal and effective protection. In addition, deviating from the overall development, the tariffs on transport equipment fell during the depression. This seems sensible in terms of economic development, however. Given the result obtained earlier on the high dependency of industries on these investment goods, it seems very logical that their tariff rates remained low. The low rate of effective protection would also imply that the domestic industries had to compete with foreign producers with these products.

Export industries, the *manufacture of wood (DD) and paper (DE) products*, differed significantly from each other. Nominal protection was higher for wood than for paper, but both industries had a lower effective than nominal rate. In the case of paper production, the results would suggest that the value added was even taxed in some way (negative effective rate). Industry's value added was thus negatively protected. The relatively low rate of protection for export industries is understandable, but at the same time as most of the production was exported the question of why even to give protection to output remains. As the products were sold abroad, the tariffs did not cause any price increase in these products domestically. Therefore, it could be assumed that the tariffs for wood and paper products were imposed mainly for fiscal purposes. Due to the lack of data from 1934, it was not possible to conduct a more thorough analysis.

Forestry (A2) had a low rate of protection in both nominal and effective terms. There was no information on duties in 1934, but the tariffs on raw wood were probably relatively low during the whole period. Forestry obtained other forms of subsidy, such as the promotion of private forestry and the construction of forest roads. In addition, there was little foreign competition in wood production, in which Finland was self-sufficient, while over half of the wood was used in the wood and paper-product industries.

Construction (F) had a negative rate of effective protection. This is a result of the fact that the final output (houses) could not be protected by tariffs while house construction was highly dependent on the foreign import of raw materials

that had relatively high tariffs on them. However, it is worth noting that the effective rate of protection slightly increased further from 1928 to 1934. Given the fact that domestic production of many items used in construction was insufficient in 1928, this suggests that protection had a further negative impact on the value added of the construction sector. All in all, as far as *services* were concerned, it is natural that the effective rate of protection was negative, as they had no protected output. However, the high increase in the ERP of hotels and restaurants (H) requires an explanation: it was mainly due to the fact that food products became more protected and this was reflected in the value added of hotels and restaurants.

In sum, the results of the analysis give strong support to Lamberg's conclusions on the winners of the Finnish tariff-policy during the depression. Agricultural producers obtained high protection and were able to operate under a high customs barrier. They obtained price benefits not only in terms of an increase in nominal protection, but also in terms of production. Their intermediate products had low protection, thus making it possible to purchase raw materials at relatively low prices. There is some contradiction in the results concerning the domestic market industries. Food production, which is closely linked with agriculture, was the most protected industry in the economy, and the level of protection during the depression increased in a very significant way. The findings for food production should, therefore, be analysed in relation to agricultural production because these two industries were closely connected, as discussed in Chapter 5. The increased protection also had roots in the aim of self-sufficiency in terms of food production.

Other domestic market industries, such as the manufacture of textiles and leather products, also experienced some increase in protection for their final goods, and thus benefited from the customs barrier. However, in the case of leather production the customs duties were set in such a way that they hindered the development of the industry. Tariffs on intermediates prevented the full exploitation of the tariff on final goods as the leather industry's generation of value added was hindered by tariffs on their important foreign inputs. The variation in tariffs would imply that there was no controlled tariff policy covering the domestic market industries. This holds even truer if the manufacture of food production is understood more as part of agricultural production. The tariffs on both were disadvantageous from the consumer's point of view, however, as the nominal tariff still raised the domestic prices of final goods. By way of comparison, the British study revealed that textiles had an effective rate of protection of between 9.2 and 42.9 depending on the calculation, while leather products had an effective rate of 22.1 in 1932.[265] All in all, the results of the present analysis would suggest that the Finnish domestic market industries were not able to fully benefit from the tariff policy during the depression. This conclusion is in line with the conclusion drawn in the study conducted by Lamberg, as well as with the view expressed by the

265 Kitson & Solomou & Wealre (1991), p. 332.

Union of Manufacturing Industries (Teollisuusliitto). The domestic market industries were not among the winners in the Finnish tariff-policy game.

The above analysis of levels of protection does not fully provide us with information on the success of the tariff policy. Even though the tariffs on both agricultural and food products were high, it is not certain that they were sufficient to have a real impact on prices. We could therefore ask if they were high enough to stop the dumping of foreign imports. Moreover, who suffered from the protective tariffs on agriculture and food products? During the renewal process of the Finnish customs duties the committee in charge already raised the question of whether the consumers actually suffered from the new tariffs. There were strong arguments that having a tariff policy in force during the depression benefited agricultural producers and state finances while consumers bore the heaviest load.[266] An attempt is made in the following to answer these questions with the help of the input-output price model.

The effective rate of protection provides a simple and efficient analysis of the level and impact of tariffs on industries. It indicates to what extent industries received protection on their generation of value added. On the other hand, import prices fell dramatically during the depression in Finland (see Table 2 in Chapter 2.1). By combining the increase in tariffs with information on the fall in import prices, it is possible to study the impact of these two on the domestic cost-of-living.

The following analysis represents an attempt to determine whether the two most protected industries, agriculture and the manufacture of food products, were able to fully benefit from the protection provided by customs tariffs. The assumption is relatively simple and should be considered tentative. The purpose of tariffs is to protect domestic production from foreign competition. If a tariff is imposed on an imported product, the domestic producers are able to sell their products to consumers at a higher price than they otherwise could. A model was therefore developed to analyse to what extent industries were able to transfer the price increase made possible by the tariff to their prices. In a one-company case with consumers with unlimited financial resources, a rise in the nominal tariff of product A by 10 percent would raise the price of the product by the same amount. Similarly, a 10% fall in the world price of imported product B without tariff protection would cause a fall of the same amount in its domestic price.

The analysis isolates the impact of tariffs and world prices on consumer prices. First, as the nominal tariff for agriculture was raised by 69.7% and for food products by 144.0% from 1928 to 1934 it is assumed that industries were fully able to transfer these increases to the prices of these products and therefore to their profits. Secondly, it is assumed that the fall in the world prices of the

266 KOM 15:1919; Jutikkala (1982), p. 215; Social democrats in particular opposed subsidies for agriculture, as they were "paid by the most low-income members of the society" Kalela (1987), p. 87; See also Kalela (1987), p. 89.

same products by 47.3% and 40.6% respectively reflected a decrease in profits by the full extent.

The model shows the percentage change in consumer prices due to both the tariff increase and the fall in the world prices of imported products. The combined effect is the difference between the price reduction due to the decrease in world prices and the increase due to the imposed tariff. The results are then compared with information on known changes in the domestic prices. If the combined effect according to the model is an increase in prices but the statistics suggest a contradictory trend, the implication is that tariffs were not the key element in the industrial development: companies were not able to transfer the benefits of protection to their profits.

According to the model, tariffs on agricultural and food products alone would have caused a total increase of nearly 20 percent in consumer prices during the period. In fact, consumer prices for agricultural products rose by 43.6% and for food products by 36.4%. As these products were used as intermediates in many other industries, the modelling also indicates some rise in the prices of other products as well. The imposition of tariffs significantly raised consumer prices for hotel and restaurant services, and for chemical production requiring items such as seeds and vegetable oils.

As Table 27 shows, falling import prices alone would have caused a total reduction of nearly 16 percent in consumer prices. The impact of falling import prices on food-product prices was almost the same as the impact of tariff imposition in the opposite direction. As far as agricultural products were concerned, impact of custom tariff was stronger than that of falling import prices. All in all, the modelling shows that tariffs had a bigger effect than the fall in world prices, and should have compensated for the fall in import prices. The result was a total increase of over four percent in consumer prices.

If the results of the modelling are compared with the observed changes in prices it is easy to conclude that tariffs only partly compensated for the fall in import prices. Agricultural wholesale prices fell by 34 percent during the period, even though the model suggests a contradictory trend: tariffs were not an efficient enough tool to stop the fall. Despite the very high effective protection of agricultural value-added, farmers were not able to transfer this benefit to their profits as only part of the production was sold for private consumption: almost half of it was used as intermediate inputs in farms. In the case of food prices, the results are more in line with the observed price changes: tariffs were able to stop the falling trend. This is partly explained by the fact that food products were sold for final consumption, and the price elasticity of food products is generally considered low. Food consumed at home is thus inelastic.

Joel Mokyr, in his study on Irish and Dutch agriculture, argues that the downward slope of the demand curve in agriculture serves as an insurance policy. This is to say that when output falls due to harvest failure, agricultural prices rise, offsetting partly or completely the resulting fall in income. Thus, when crops are small, agricultural prices are usually high, the income to the farmer

Table 27. The impact of tariffs and the import prices of agricultural and food products on consumer prices in Finland, 1928–1934 (%)

Products		Impact of customs tariffs	Impact of import prices	Combined impact
A1	Agriculture, hunting	43.6	–30.0	13.5
A2	Forestry	1.2	–0.8	0.4
B	Fishing	0.0	–0.1	0.0
C	Mining	0.1	–0.1	0.0
DA	Manuf. of food products	36.4	–33.2	3.2
DB	Manuf. of textiles	3.1	–9.3	–6.2
DC	Manuf. of leather products	5.0	–15.5	–10.5
DD	Manuf. of wood and wood products	2.7	–1.9	0.8
DE	Manuf. of pulp, paper and paper products	2.0	–1.4	0.6
DF	Manuf. of coke and refined petroleum products	0.0	0.0	0.0
DG	Manuf. of chemical products	6.3	–8.3	–2.1
DH	Manuf. of rubber and plastic products	0.8	–1.0	–0.2
DI	Manuf. of non-metallic mineral products	0.8	–0.7	0.2
DJ	Manuf. of basic metals and fabricated metal products	0.9	–0.6	0.3
DK	Manuf. of machinery and equipment	0.3	–0.2	0.1
DL	Manuf. of electrical and optical equipment	0.1	–0.1	0.0
DM	Manuf. of transport equipment	0.4	–0.3	0.1
DN	Manuf. of other products	1.1	–1.0	0.1
E	Electricity, gas and water supply	0.0	0.0	0.0
F	Construction	0.8	–0.7	0.1
G	Trade	0.7	–0.5	0.2
H	Hotels and restaurants	42.9	–23.7	19.2
I	Transport, storage, post and telecomm. services	1.9	–1.3	0.6
J	Financial and insurance services	0.2	–0.1	0.0
K	Housing and business services	0.4	–0.3	0.1
L	Public administration	9.9	–6.0	3.9
M	Education	6.9	–3.8	3.1
N	Health and social-work services	17.4	–9.8	7.6
O	Other services	0.1	–0.1	0.0
P	Household work	0.0	0.0	0.0
Total		**19.8**	**–15.7**	**4.1**

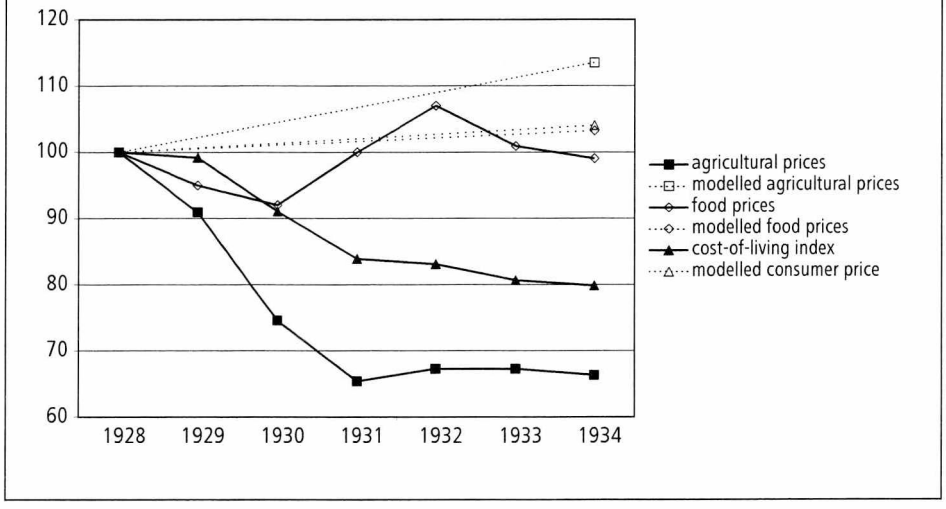
Sources: the author's own estimates based on SVT 1A 1929–1935.

being higher than with good crops. The risk of starvation in the case of harvest failure is smaller for the commercial farmer than for the self-sufficient farmer.[267]

Agricultural products in Finland, in turn, were sold mostly as intermediates and the demand was more limited during the depression. From the consumer point of view, however, this was not a positive phenomenon. As nominal wages fell, real income declined rapidly as the cost of living remained higher in relative terms. On the other hand, the falling agricultural prices compensated for the

267 Mokyr (1980), pp. 452–453.

Figure 21. The modelled price changes and observed wholesale price index, 1928–1934 (1928=100)



Source: STV 1933–1935; the author's own estimates.

increase in the cost of living. Total wholesale prices fell by over 10 percent during the period while cost-of-living index fell by 20 percent.[268]

Finally, even if the price development was affected by tariffs in the case of food production, it still remains an open question whether they had an impact on output growth or on the overall price change. A preliminary analysis on the level of effective protection indicates that a rise in the general tariff level would also have had an impact on output growth in Finland. However, the above analysis of price development would suggest that companies were still not able to transform the benefits of tariffs into profits. It has not been possible to provide comprehensive evidence of this in the context of the present study. International studies have shown, however, that the tariff level has not been an explanatory factor in long-term economic development.[269]

268 Due to the lack of subindices for cost-of-living index, wholesale price index was used. It should be noted that the figures for wholesale prices are not fully comparable in terms of the product classification, but they do illustrate the general development.

269 See for example Kitson & Solomou & Weale (1991); Hawke (1975).

7 Conclusions

The emphasis at the beginning of this study was on the structure and interdependency of industries. It was argued that they are important factors when studying any economy. Furthermore, no study on the inter-war economy can avoid the Great Depression of the 1930s. The industrial structure was found to be the main focus also in the international studies on the Great Depression of the 1930s. There are also numerous Finnish studies on the depression, but they are more concentrated on its impact on the export industries.

The aim of this study was to provide new data on the structure and short-term development of Finnish industries during the period. The outcome is a new set of statistical tables that can be used in further analytical efforts. The input-output tables together with the input coefficients and inverse matrices provide a sound basis for any further study on the Finnish economy. In the present study, once the structure and interdependency of industries was revealed, the results were used in order to test some of the findings concerning the Great Depression of the 1930s in Finland, and to challenge some of the conclusions drawn in previous studies. The first step in achieving this goal was to trace the economic developments in Finland during the interwar period, and extensive use was made of existing historical national accounts data. The depression appeared to have been relatively mild measured by the gross domestic product: the decline in Finland was only four percent, while in Europe it fell about six percent. The reason for this was the fact that the slump occurred at different times in different industries in Finland. Even though growth picked up again afterwards, there had been significant structural change in the economy. The Great Depression halted the growth in secondary production for a long period of time, but the structural change affected exports: pulp, paper and paper products replaced wood products as the most dominant export goods.

Secondly, the most comprehensive analyses of the depression in Finland were reviewed with a view to invoking detailed research questions for the present study. Despite the relatively extensive work done on the Great Depression in the context of economic history, there was a lack of quantification in the results in Finland. In addition, much was written about foreign trade but little on the domestic market industries. The main research questions were thus formulated as:

- What were the key industries of the Finnish economy in the late 1920s?
- How dependent was the Finnish economy on imports?
- Did the structural change in exports have any long-term effects on the economy?
- What was the impact of the export industries on the Great Depression or did any other industries, i.e. the domestic market industries, play a major role in the depression?
- What was the role of customs duties in the depression?

The input-output approach was the methodological choice, and the advantages of using input-output tables as a statistical and analytical tool were discussed in Chapter three. The use of the input-output methodology in economic history was also reviewed, the conclusion being that it was very limited even though it is well established, and input-output tables are constructed at regular intervals in modern national accounting practice: in fact, they form a solid basis in the central framework of the system of national accounts. It was found that questions of motivation clearly had a role in the relatively narrow use of input-output methods in economic history. If the construction of input-output tables were motivated by factors other than economic analysis, more economic historians might be working on the construction of historical tables. One clear motivation could be the compilation of supply and use tables, which already provide valuable information on the economy, and more importantly, could be used for sensitivity and reliability analysis of the historical national accounts. Furthermore, it should be acknowledged that input-output tables provide a sound basis for more sophisticated modelling.

The above hypotheses were tested in Chapter four. The first historical input-output table in Finland was constructed. The Finnish historical national accounts data was the main starting point in the compilation process, but most importantly, it was demonstrated that input-output tables based on the supply and use table facilitated estimation of the reliability not only of the results obtained, but also of the historical national accounts. A proposed method for reliability estimation was introduced. The tables were tools for estimating the reliability, and more importantly the size of the reliability (or error), through analysis of the confidence interval. Two estimates of output for 30 product groups (supply and use) were used in order to calculate an upper and lower boundary for total domestic output as well as a 95% confidence interval for the GDP estimate. The new GDP estimate for the year 1928, at seven percent higher than the previous one, also yielded information on areas in which future research on the Finnish historical national accounts is mostly required. It was concluded from the analysis that most revisions are required in the case of trade and other services.

Finally, the earlier depression analyses, summarised in the research questions addressed in this study, were challenged using information provided by the supply and use tables as well as the input-output analysis. The first three questions revealed the typical features of the Finnish industries in terms of structure and interdependency. Based on that information, the last two questions tested some of the earlier conclusions on the Great Depression in Finland. The main findings of the study are summarised below.

What were the key industries of the Finnish economy in the late 1920s?
This study identified agriculture, forestry, the manufacture of food products, the manufacture of wood products, the manufacture of pulp and paper products, and construction as key industries of the Finnish economy in 1928.

Agriculture clearly had a major role in the economy in 1928, and could be regarded as the centre of Finnish economic life just by its relative size: it contributed around 20 percent of the total output and value added. Its strong backward and forward linkages – in which respect it differed from other industries – underlines its importance.

Forestry also had a major role in the economy, comprising almost 10 percent of the total output and around 13 percent of the value added. It showed very strong forward linkages, indicating its role as a supplier of inputs to other industries. It was also a significant source of income, and together with agriculture accounted for around 20 percent of the total sum of wages. If the income of the forestry owners were included, the share would be even higher.

The fact that the role of food production has not been stressed before is somewhat surprising: it comprised eight percent of the total output of the economy, which was larger than the manufacture of wood and pulp and paper in terms of output. The value added of the industry also accounted for four percent of the total. Furthermore, food manufacture had a higher number of backward linkages than the whole of the construction sector, indicating its relative importance to the whole economy.

This study identified both major export industries, the manufacture of wood and of pulp and paper products, as key industries in the economy based on their relative size and important linkages to other industries. The backward linkages in particular, in the form of significant inter-industry connections, were found to be strongest in the manufacturing industries: the stronger they were, the more beneficial an expansion in production was to the economy as a whole. The important connection between export industries and forestry was established and identified, and it has also been described in earlier studies. This connection was described as the forest cluster, which accounted for more than 20 percent of the total output and value added in the economy. Forestry cluster was also rather self-sufficient in terms of raw materials.

The role of construction in the economy was also relatively strong in terms of output and value added, the former accounting for nine percent of the total output and the latter seven percent. It also accounted for over 12 percent of the total wages bill in the economy in 1928. It is worth noting that construction had above-average backward linkages, reflecting the fact that it used inputs from many industries and formed an important factor of economic development.

How dependent was the Finnish economy on imports?

From the analysis conducted in this study it could be concluded that the Finnish economy was heavily dependent on foreign imports. The reasons for this dependency were found to be two-fold. It had its roots in the increased purchasing power of households as a consequence of higher incomes, and in the expanding manufacturing and construction activity in general. The level of foreign imports in household final consumption reflects the increase in living standards to some extent: of the products consumed by households almost 14 percent

were imported, and in the case of food products almost 40 percent were of foreign origin. The level of imports for household consumption could be considered relatively high given that a large share of food production was directed directly for own consumption. There was some private consumption that demanded more refined goods than domestic supply was capable of satisfying. In addition, world prices for many agricultural products fell during the 1920s, and as a consequence domestic production was incapable of competing with imports. On the other hand, the cause of the depression could not be traced to the increased imports for private consumption, as proposed by Mercator magazine and a study conducted by Suviranta. It did contribute to the negative balance of trade, but it was not a specific cause of the depression.

More importantly, Finland was highly dependent on foreign raw materials, semi-finished goods, and investment goods: over 33 percent of manufacturing products and over 50 percent of investment goods were of foreign origin. These are high figures by any standards. Especially in the case of investment goods, comparisons with Denmark and the United Kingdom emphasised the size of the dependency. The 1920s and 1930s were times of electrification and mechanisation in Finland. The construction of the Imatra power plant was finished in 1928, while at the same time many companies were investing in new machinery. This tendency has been noted in earlier studies, but the analysis of the factor proportions of industries brought additional information on the pattern of change in that it was significant in the production pattern of the export industries – from labour-intensive to more capital-intensive.

The dependency on imports in manufacturing was partly related to economic growth, but was more structural in nature. This is an important distinction as the former could refer to change in a relatively short period of time while the latter is more constant. As the analysis of both import dependency and the factor proportions of industries revealed, Finland was exporting commodities that made intensive use of the factors with which it was well endowed, and imported commodities that made intensive use of the factors with which it was poorly endowed. Investment goods were imported largely because they were simply not domestically available. This was also the situation with many of the manufacturing intermediates. These imports were therefore vital in terms of economic development, and should be seen as a factor of success rather than a limitation.

Did the structural change in exports have any long-term effects on the economy?
The results of the study suggest that the fact that the depression hit different industries at different times had a positive impact on the recovery, as proposed by Riitta Hjerppe, for example. It appeared from the impact analysis that the increase in the export of pulp and paper products only partly compensated for the simultaneous decrease in the export of wood products. The analysis quantified the effects as a 1.6% increase in total output based on the open model, and a 3.0% increase in total output and a 2.5% increase in the wages sum based on the closed model. It is acknowledged that the modelling only included the years

1928–1932, and exports of paper products increased significantly from 1932 onwards, which had a further positive impact on recovery.

The effects of the increased manufacture of pulp and paper production were again felt mostly inside the forest cluster, and it was thus mainly the same industries that suffered and benefited from the cyclical changes in exports. However, the results also seem to suggest that the structural change that took place in the export industry (from the manufacture of wood products to the manufacture of more refined products such as paper) had some specific, more long-term effects on the economy as a whole. Paper production was clearly more energy intensive and required more investments in capital goods such as machinery than wood production and house construction. This is obvious from the increased requirements for electricity and machinery in the input-output impact analysis. In addition, the import dependency of paper production was higher than that of wood production, mainly due to the requirements for machinery and chemicals.

Thus, changes in the composition of production did take place in Finland during the depression. The factor-proportion analysis further emphasises the long-term significance of this change. At the beginning of the depression, the relative advantages of the Finnish economy lay in its natural resources and partly labour-intensive wood production, for which sufficient labour was available at a low price. The change towards paper exports was a positive phenomenon in terms of the relative competitiveness of the Finnish economy. The Great Depression was a turning point for the Finnish manufacturing industries, marking a change towards the more capital-intensive production of pulp, paper and paper products. This change was also noted in contemporary newspapers, and should be considered a positive phenomenon for the Finnish economy. It made an important contribution to productivity growth in industry and in the economy as a whole through the move towards more capital-intensive production. This was also reflected in the modelling results, which point to the fact that the impact on wages and entrepreneurrial incomes of a hypothetical one-billion reduction in manufactured pulp and paper exports was lower than in the case of the relatively more labour-intensive manufacture of wood products. This could be considered a positive phenomenom because any impact of a cyclical disturbance in the world economy would not be felt as strongly as before in the Finnish economy.

There was some decline in the "old industries", and a rise of "new industries", but this study produced no extensive evidence that this increased vulnerability to cyclical disturbances. Backward linkages were strong in both paper and wood production, resulting in no great change in terms of dependency.

Finally, energy production showed strong forward linkages, indicating that expansion in the industry would have had a highly positive impact on the economy as a whole. The construction of the Imatra power plant in 1928 probably had positive effects that could be seen in the following years. The role of the expansion in energy production is an important question that calls for further study, but it is not analysed further in the context of the present study.

What was the impact of the export industries on the Great Depression or did any other industries, i.e. the domestic market industries, play a major role in the depression?
The impact analysis also quantified the relative importance of the export industries, thus filling the gap identified by previous studies. Based on the hypothetical one-billion reduction in final demand in the three modelled industries, the total impact (direct and indirect) was found to be the highest on the export industries. The impact analysis carried out based on the observed changes in final demand clearly pointed out the importance of the manufacture of wood and wood products. The role of the export industries was also significant in the economic development during the depression: the total impact on the economy of the fall in wood exports was calculated as a 4.4% reduction in total output, according to the open model. The original FIM 1,192-million reduction in the value of exports was almost doubled because of the strong backward linkages, especially in the forest cluster. Taking the reduction in wages and entrepreneurial incomes into account further increased the impact to over ten percent. Similarly, in the manufacture of pulp, paper and paper products, the impact of increased exports was calculated to have had a positive effect in the form of a 1.6% increase in the total output of the economy according to the open model, while again the closed model almost doubled the effect.

Somewhat contradictory to the conclusions drawn in earlier studies on the Great Depression in Finland, the results suggest that the fall in especially exports of paper products did not have such a significant impact on household income. The impact on forestry income is incontestable, but as mentioned in the context of the linkage analysis, the forest cluster was a rather closed system, with fewer spillover effects to other industries than in the case of construction, for example, in which they were distributed widely. This was further clearly proved by the impact analysis: of the three modelled industries, the biggest impact on wages of the hypothetical one-billion reduction in final demand was still in the manufacture of wood products but it was also relatively significant in construction and larger than in the manufacture of paper products.

The extensive focus on foreign trade in earlier studies meant that some important aspects of the depression fell outside of the research agenda. This study also concentrated on the domestic market industries and construction. Food production and construction were both identified as key industries in the economy, and therefore had significant roles in economic development both before and after the depression, as was demonstrated.

Firstly, the impact of the sudden decrease in investments in house construction has been acknowledged in many studies. However, the extent to which this impact was distributed throughout the economy as a whole was perhaps greater than previously thought. This study quantified these effects. According to the closed model, change in the gross-fixed-capital formation of house construction had a major impact on the economy. This was widely distributed throughout industry, causing a total reduction of nearly 13 percent in the total output of the economy. The impact on wages and entrepreneurial incomes was as serious,

causing a reduction in incomes of 12.6 percent, which in turn considerably reduced the purchasing power of households. This again had a negative effect on the production of the domestic industries. The effects of changes in construction were widely felt in the economy, and they were further increased by the indirect effects of the decrease in household earnings – which in turn further increased the depth of the depression. Whereas the manufacture of wood and wood products, as well as of pulp, paper and paper products, was somewhat forest-cluster based, construction was more widely connected with the economy as a whole. The forest cluster operates to some extent on seasonal work, thus the impact of household incomes was perhaps partly reduced by this fact. Another factor was the great dependency on foreign inputs in the construction industry. Domestic production was not sufficient to meet input requirements during the boom, and the tariff policy further hindered recovery by setting high tariffs on important raw materials, such as bricks, used in the construction sector. The fall in house construction was a domestic cause of the depression, and it had a relatively larger impact on the economy than the fall in wood-product exports.

The role of private consumption was found to be important. The impact analysis conducted on the closed model clearly demonstrated that taking into account household consumption doubled all the impacts. As already pointed out, contrary to the conclusions drawn in some earlier studies, the increase in private consumption was not a cause of the depression. The reduction in incomes was strongly linked to the domestic markets, which suffered the most. The analysis clearly showed that most of the production was still directed towards domestic markets, and that an increase or decrease in the purchasing power of households had immediate effects on the economy as a whole. The role of the domestic market industries therefore requires closer consideration.

It could be argued that the domestic market industries have been overlooked in previous studies. Indeed, the role of the manufacture of food products could be considered one of the most neglected subjects in the economic history of the Great Depression of the 1930s in Finland. The closed-model analysis clearly demonstrated the fact that reduced household incomes had a major impact on the food-product industry, earlier in this study defined as one of the key industries in the economy: it was one that was severely affected by the depression. The reduction in the manufacture of wood and wood products had a negative impact on the food industry of nine percent, while the reduction in investments in house construction caused a reduction in the output of the industry nearly eleven percent. The effect of these two industries was, in fixed terms, a reduction in output of food products of around 790 million marks by 1932. The negative impact of the downturn in house construction on food production alone accounted for nearly as much as the growth in the value of paper exports during the same period.

Together with the manufacture of food products, agriculture formed a food cluster that again had a significant impact on the economy. While in the Danish case food production and agriculture seemed to generate a bilateral flow of prod-

ucts that bolstered their economic impact, in Finland it was agriculture alone that comprised an exclusive circle. Despite the mono-centric nature of agricultural production, it cannot be denied that it did have a significant role in the Finnish economy simply because of the extent of the economic activity that was engaged in agriculture. Even though the forest and food clusters were both identified as somewhat closed systems in which spillovers to other industries were smaller than in the case of construction, the size of these clusters, in terms of output and incomes, and of the industries belonging to them makes it impossible to neglect their impact on the economy. The combined effect of the downturns in house construction and wood exports caused a total reduction of over FIM 3,100 million in agricultural output and the manufacture of food products. This development was also reflected in the fall of over 40 percent in imports of raw materials for manufacturing food products during the depression.

Furthermore, the role of agriculture was two-fold: it was the only industry with both pull and push effects on the economy. It could thus be argued that the harvest failure of 1928 did have an impact, but it should be remembered that only about half of the agricultural production was sold on the market, as shown in the supply and use tables. Thus, the bad harvest of 1928 affected the supply of food for private consumption, but the impact on the economy as a whole was not as significant as that of the wood and paper products and the construction industries. The primary sector did have an important role in the Great Depression, however. The combined effect of the bad harvest and declining forestry incomes had a negative effect on the purchasing power of households, which again had a negative effect on the whole economy. This was felt more heavily in forestry due to the decrease in the export of wood products. Nevertheless, it could be argued that these industries were not driving forces in the depression: on the contrary, they were greatly affected by the indirect impacts of change in the final demand of the export industries and construction.

In the case of Finnish agriculture in 1928, the harvest failure was not compensated for by a rise in prices, as Finland as a small open economy was a price taker in time of falling world prices. Tariffs were introduced in an attempt to compensate for the drop in prices.

What was the role of customs duties in the depression?

The Finnish tariff policy was not as successful as suggested in contemporary research, and it was not consistent during the depression. There was a general increase in the tariff level for most industries, but there was obviously no comprehensive tariff policy, as some studies suggested there was. Tariffs were set in for mainly fiscal purposes.

The Finnish tariff policy during the depression did not help to raise profits, especially in the case of most of the domestic market industries. Of the new, emerging industries, rubber production enjoyed relatively high protection in 1928, but the level of tariffs in both nominal and effective terms was lowered in 1934. Of the clothing industries, textile production was significantly protected,

while the manufacture of leather products was not. Furthermore, manufacturing industry inputs were more protected than output, resulting in increased production costs. Tariffs on electrical equipment were among the lowest during the whole depression. Once again, the inputs were more protected than the output, which was reflected in the lower effective than nominal rate of protection in 1934. These results contradict some of the assumptions repeated widely in textbooks of Finnish economic history.

As far as construction was concerned, there is further evidence of a lack of proper planning of the tariff policy. The cost of construction activity increased during the depression due to the higher tariffs on key inputs in 1934 than in 1928. Even one of the most important commodities, fuel, attracted high tariffs during the depression. The Finnish tariff policy was not successful in terms of profit making. The importance of the effective rate of protection estimates was exactly in the fact that it provided an estimate on how the tariffs were set according to the value added of each industry, thus encouraging or hindering the accumulation of profits.

Only agriculture and manufactured food products were given substantial protection during the depression: both nominal and effective rates were raised significantly. However, their impact on industry profits should be questioned. The price model applied clearly showed that tariffs were only partly able to compensate for the fall in prices, and agricultural producers in particular were not able to transfer the benefits to their profits and therefore to their prices. Accordingly, it could be argued that the Finnish tariff policy during the depression was basically a contra-price-fall policy, which furthermore was directed merely towards agricultural and food products. The focus was on securing the domestic supply of food products, which possibly also further hindered developments in other industries. The winners of the Finnish tariff-policy were, to some extent, the producers belonging to the food cluster, while consumers and domestic market industries were among the losers.

Final conclusions

Even though this study concentrated on the structure and interdependencies of industries in Finland, it also clearly showed that there is no single explanation for the depression. There were changes in the composition of production in the Finnish case and there was some decline in the old industries and the emergence of new ones, but these facts alone do not comprise a comprehensive explanation. The direction of change in production was towards increased consumer durables and investment goods. The investment requirements were also extensive in the primary sector.

Finland was greatly affected by the worldwide slump through the fall in wood exports. On the other hand, there were significant, structural reasons behind the depression that had more of a domestic origin. The manufacturing industries had their investment requirements on hold, there was a need to build new infrastructure, urbanisation required house construction, and agriculture needed capital

for rationalisation. In addition, higher living standards had the effect of increasing imports. All of these factors had a fundamental impact in Finland on both domestic production and economic development.

The modelling clearly demonstrated that an increase in house construction would have had nearly as positive effect on the economy than an increase in exports due to the large positive impact through private consumption. Indeed, boosting private consumption might have been a better solution given its potentially important role in economic growth. Domestic consumption has a multiplier effect, and the domestic production that satisfies it must compete with imports. Growth in domestic consumption leads to economies of scale and specialisation in production. More efficient protection of the profits of the domestic market industries could also have provided them with a greatly needed boost.

Changes in the operation of the labour markets cannot be viewed as a cause of the depression: they rather constituted a reason for quick recovery. During a downswing collective bargaining is said to restrict the downward flexibility of wages, which in turn has a negative impact on the economy, as prices tend to fall while wages remain as high as during periods of growth. The wages in Finland fell rapidly and the price of labour was therefore elastic. Under these conditions, adjustments to business cycles and recovery from crisis were mostly market-based: changes in economic activity were immediately reflected in consumption.

The importance of the international monetary system should not be underestimated. This study did not concentrate on this area, but it is acknowledged that the gold standard had a major role in the economic developments. Finland as a small open economy is a price taker, and international prices determined the prices of Finnish exports. Once the country abandoned the gold standard, and the Finnish mark was de facto devalued, exports returned to the growth track. However, devaluation has two sides: it boosts export industries, but at the expense of those with high foreign debts as it also multiplies the current value of debts. At the same time, it tends to raise domestic prices, thus hampering private consumption. It has not been possible to go into these questions more thoroughly in the context of the present study, however. Further limitations should also be acknowledged, as sufficient account of the demand side of the economy has not been taken. Consumption, investments and savings are all factors that affect economic development, and the modelling does not consider these factors in a comprehensive way.

From the methodological perspective, the supply and use tables were found to be an extremely useful tool for the compilation of reliable input-output tables, and made it possible to present otherwise often complex and broad issues in a more comprehensible way. Their most important feature is their statistical strength in relation to historical national accounts: HNA estimates can be checked and adjusted using the information available from the benchmark year calculation they provide, and this calculation can be used to ensure consistency in the allocation of output between different uses. Because the balanced system of supply and use describes the extent to which the allocation of intermediate

consumption and final use is in error, for example, it is possible to draw conclusions on the uncertainty of the value-added estimates, thus also providing evaluation of the reliability of the existing historical national accounts series during the benchmark year.

Input-output tables, in turn, were considered one among many forms of economic analysis. In terms of methodology, however, the benefits lie in the simplicity of presentation and the number of possibilities on offer. The transparent nature of model making makes it easy to see how the results are derived, and in many cases more complex models may produce similar results especially when data is scant. It is also possible to extend the input-output framework into a social-accounting matrix, or a more elaborate computable general-equilibrium model of the economy, if more detailed analysis of long-term developments or the dynamics of the demand side of an economy is required.

All in all, the methodology was considered fitting for a structural analysis of the economy and of the short-term development of the depression. A more thorough modelling of the demand side of the economy would nevertheless be more appropriate in order to better reflect the changes in private consumption and investments. The combination of historical national accounts data and input-output tables represents an exciting future direction in the field of economic history.

Extending the model into a more complex system of general equilibrium would reflect more accurately the demand side of the economy. It would also be possible to extend the framework further by introducing an input-output table for the year 1938. This would further expand the use of the CGE model by adding data from another benchmark year. In addition, comparison of input-output coefficients over time would facilitate analysis of the contribution of technology to growth through factor and input saving. This could also be potentially extended to cover a time period extending all the way up to the present. Osmo Forssell has carried out pioneering work in Finland by analysing the change in input coefficients between the 1950s and the 1970s.

Future research directions thus include comparisons of input-output coefficients over time. Regional input-output analysis either at the provincial level or between the Nordic countries should also be considered. A more currently applicable target for future research would be to extend the input-output table constructed in this study into a social-accounting matrix and a more elaborate general equilibrium model. This would enable better account to be taken of the role of human capital and natural resources in the analysis. There are many possibilities, all of which have to be considered at the time based on the task at hand. The input-output table constructed in this study forms a solid basis on which these models can be built. This is clearly a task for future research.

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Appendix 1.
Industrial classification (parallel to product classification)

A1	Agriculture, hunting
A2	Forestry
B	Fishing
C	Mining
DA	Manufacturing of food products
DB	Manufacturing of textiles
DC	Manufacturing of leather products
DD	Manufacturing of wood and wood products
DE	Manufacturing of pulp, paper and paper products
DF	Manufacturing of coke and refined petroleum products
DG	Manufacturing of chemical products
DH	Manufacturing of rubber and plastic products
DI	Manufacturing of non-metallic mineral products
DJ	Manufacturing of basic metals and fabricated metal products
DK	Manufacturing of machinery and equipment
DL	Manufacturing of electrical and optical equipment
DM	Manufacturing of transport equipment
DN	Manufacturing of other products
E	Electricity, gas and water supply
F	Construction
G	Trade
H	Hotels and restaurants
I	Transport, storage, post and telecommunication services
J	Financial and insurance services
K	Housing and business services
L	Public administration
M	Education
N	Health and social-work services
O	Other services
P	Household work

Appendix 2.
Methods and sources

A1 Agriculture

The study on agricultural growth was published in *Maataloustuotanto Suomessa* (Agriculture in Finland) by Pentti Viita[270] and includes the total value of output, some cost components and the value added of agriculture. The study has been criticised for the lack of documentation, however.[271] This is valid, as it clearly lacks transparent enough documentation on the sources and methods used for many of the output and cost items.

A more serious problem in Viita's study in terms of supply and use is the lack of detailed data on products used as intermediates in agriculture. For example, producers' own intermediate consumption of many agricultural products is not mentioned at all. As a result, some of the output figures needed for the compilation of the input-output tables are also missing (the production of cattle fodder, for example).

For the reasons mentioned above, new estimates on the production and the intermediate use of agriculture were made on the level of 13 product groups. It was necessary to refer to primary sources to some extent, and other studies and sources were employed in order to obtain supply-and-use information for all agricultural production. Of the existing studies, *Suomen kansantulo vuosina 1926–1938* (National Income of Finland 1926–1938) by Valter Lindberg should be specifically mentioned.[272] The output figures in this study are in many cases notably higher than those presented by Viita. This is mainly due to the fact that Lindberg's concept of output is closer to the one used for input-output purposes, while Viita's estimates were made in order to arrive at the value added.

Calculations of agricultural output are presented below , broken down as follows: cereals, forage crops, potatoes and root plants, vegetables and fruits, milk, home-made butter and cheese, meat products, hide and leather, wool, fowl, gardening products, beekeeping and gathering. The output of milk, butter and cheese produced at dairies is estimated in connection with the estimation of the output of manufacturing products according to the industrial classification.

Output

Data on the production of *wheat, rye, barley, oats and mixed grain* were taken from Lindberg (1943). Viita's calculations only included the output for food consumption, and intermediate use for manufacturing and export. Lindberg, in turn, estimated the total output of grain products from the whole harvest based

270 Viita (1965).
271 On critics, see Soininen (1966); Soininen (1967).
272 Lindberg (1943).

on data obtained from the Statistical Office of the Board of Agriculture. Lindberg's results are also compared to data from Hirvensalo (1929), who calculated the annual harvest in kilograms.[273] For the supply and use tables, it is essential to calculate the total production (even if the output was used for the producer's own intermediate consumption) in order to obtain a correct picture of the product flows in the economy. This is also in line with the compilation of the input-output table for 1995.[274]

It is also essential to specify the correct crop unit value. The harvesting calendar year is not the same as the consumption year. In order to define the unit price per crop, Lindberg divided the yield according to whether it had been used for consumption, sales or seeding. The unit price is then defined based on consumption or year of activity for these different groups.[275] The use of the consumption year is justifiable in that products will turn into income only after crop realisation. Lindberg's estimates of the crop value could be considered relatively reliable as they were based on very extensive sources. They were also comparable with other harvest estimates (see above).

The figures for the production of *forage crops, forage hay etc.* were also based on Lindberg (1943). Estimates were made for green forage, field hay, meadow hay, straw, haulm, clover seeds and other seeds, as well as for spinning plants. Viita (1965) does not include any estimates for these products as they are for the grower's use and need not be included for the purpose of estimating value added.

The data on *potatoes and root plants* was also based on Lindberg's study. Viita's estimate for potatoes seems too low if it is compared with the information in Hirvensalo (1929), for example, which gives the harvest data in kilograms. The figures for sugar beet were based on the manufacturing statistics in which the use of sugar beet as an intermediate input for the manufacture of sugar products is included. Moreover, the estimates of both Viita and Lindberg were used as reference points.[276]

In his estimation of *milk* production Lindberg included the amount of milk sold to dairies, used for milking calves, and used for private consumption. Viita, in turn, based his estimates on the number of cows and average yield per cow. He also used information from the Cattle Inspection Association (*karjantarkastusyhditys*) in order to give a more accurate picture of the number of cows than the one he obtained as a result of his enquiries, in which there were errors in the figures for the 1920s. In terms of milk production Viita could be considered more reliable, given the fact that Lindberg's estimation does not take sufficient account of the direct sales of milk to consumers by farmers.[277] On the other hand, Viita deducted a little over one percent from the production as used for animal forage. This figure was put back into the estimation of milk production.

273 Lindberg (1943), pp. 33–35; Hirvensalo (1929), p. 29.
274 E-mail by Ilmo Mäenpää 12.9.2002.
275 Lindbeg (1943), pp. 33–34.
276 SVT XVIII A 45, 1928.
277 Lindberg (1943), p. 36.

Lindberg estimated the price of milk based on farmers' transfer prices, while Viita's estimate was based on the value of butter produced in dairies – from which he deducted business costs, depreciation and surplus, and divided the results by the amount milk used for making butter. Lindberg's value clearly better reflects the value obtained by farmers for a certain amount of milk, while Viita's estimate was based on the value of a product that had been refined from milk, which does not reflect the actual price of milk. Thus, the price of milk per kilogram was based on the price paid to the producers by the dairies, obtained from the statistical yearbook of Finland as well as from Lindberg (1943).[278]

The amount of *homemade butter* was based on Viita's calculation. The unit value of butter, in turn, was based on the price paid to farmers by the Elanto co-operation, obtained from Lindberg. Viita also used Lindberg's figures. The values of *homemade cheese, skimmed milk, whey and buttermilk* were obtained from both Lindberg (1943) and Viita (1965), as well as from the statistical yearbook of Finland.[279]

The value of *meat* (excluding fowl) production in agriculture was taken from Lindberg (1943). His estimate was compared with the figures presented in the Committee report on the easing of the agricultural depression.[280] The report supported Lindberg's results.

In the case of *hide, leather and wool,* the data was obtained directly from the studies conducted by Viita and Lindberg. The figures for the production of *eggs* and *fowl meat* were taken from Viita (1965) because Lindberg did not include any estimates of these items.

Gardening production, beekeeping and the gathering of honey together gave a relatively significant gross production value in 1928. Lindberg estimated that the total output of gardening production (flowers, vegetables and fruits) was around 180 million Finnish marks in 1928, based on the information obtained from research conducted in 1936 by the Finnish Gardening Union (Suomen puutarhaviljelijäin liitto) as well as on statistics on agricultural profitability. Viita used some of the same sources but produced a different estimate. Further analysis of the reliability of either estimate was not possible, and an average of Viita's and Lindberg's estimates was therefore used. The output of *honey* was taken from Lindberg (1943), which Viita also used.

Lindberg made some crude estimates of berry gathering based on foreign-trade statistics as well as on a study conducted by K. T. Jutila on berry consumption. Figures on the gathering of mushrooms and lichen, in turn, were taken from the growth study on Forestry in Finland conducted by Heikki J. Kunnas. Kunnas estimated these items from the foreign-trade statistics as well as from studies on consumption. The figure on *horse work* produced by the agricultural sector was also

278 STV 1930.
279 Viita (1965), pp. 40–41, 49; Lindberg (1943), pp. 37–39.
280 KOM 11:1930, pp. 47–48.

obtained form Kunnas' study. Kunnas included his estimate in forestry, but it comes under farm production and should be included in agricultural output.[281]

Intermediate use

In the case of intermediate use, Viita (1965) and Lindberg (1943) differed remarkably in their results, probably because of the different approaches they used. Viita did not include seed grain as output, for example, and therefore it is not included in intermediate use either. It is impossible to see the total flow of products in the economy without these items. The following figures show the differences between the two estimates.

Lindberg's estimate	FIM m	Viita's estimate	FIM m
Seeding	462	Seeds	36.5
Feeding of animals	3,621	Feeding of animals	561.9
Fertilizers	187	Fertilizers	190.5
Repairs of machinery	234	Repairs of machinery	105.1
Repairs of buildings	236	Repairs of buildings	110
Firewood	123	Firewood	113.9
Electricity and oil	100	Motor oils etc.	40.3
Crop farming costs	8		
Gardening costs	59		
Total intermediate	5,030	Total intermediate	1,158.2

The two estimates clearly differ considerably. In order to obtain the necessary figures, the data for the intermediate use of agriculture was therefore re-estimated based partly on existing studies and partly on primary sources.

The value of *seeding* was taken from the study conducted by Lindberg , who estimated the size of the area under cultivation and used the Pellervo co-operation transfer price. This value was used in the present study. The value of seeds imported was obtained from the foreign-trade statistics and the remaining part was then assumed to be domestic.[282]

Animal-feed products were divided into three categories: the farmer's own products, industrial products, and imported products. The value of products produced by farms and used for feeding animals was obtained from Lindberg, who based his estimates on the calculations carried out by Dr. O. W. Willandt on the share of production by product used for the feeding of animals. These percentage shares were obtained for skimmed milk, buttermilk, whey, forage, rye, barley, oats, peas, potatoes and offal.[283]

281 Lindberg (1943), p. 45; Kunnas (1973), p. 62.
282 SVT 1 A 48, 1928.
283 Lindberg (1943), pp. 47–48.

The value of products produced by manufacturing industry and used for animal feed (manufactured forage) was obtained from the manufacturing statistics,[284] and that of imported products (forage, corn and bran), in turn, was calculated from the foreign trade statistics.

In the case of *fertilizers* used in agriculture, the value of imported products was obtained from the foreign-trade statistics, while the value of domestically produced fertilizers was based on the value of fertilizers produced by government-owned factories.[285]

The value of *machinery repairs* in agriculture was taken directly from the study conducted by Viita. He based his estimates on national accounts figures from the 1950s, and extended the data backwards according to information on bookkeeping expenditure in farms. Viita's figures should be considered only tentative, however, even though his estimate was basically a refined version of Lindberg's estimate.[286]

The figures on *building repairs* in agriculture differ remarkably in Viita's and Lindberg's studies. Viita's estimate does not include any residential buildings and is more appropriate for supply and use tables. It was also revised in relation to a new estimate carried out for this study on the value of repairs. The calculation was based on the capital stock of the buildings, the relevant figures being obtained from the report of the committee for the easing of the agricultural depression.[287] The percentage share of the total value used for repairs was obtained from the study conducted by Lindberg, where the estimate was based on the expert opinions of the Research Institute for Agricultural Economics (*Maanviljelystaloudellinen tutkimuslaitos*). The calculations supported Viita's results.

The use of oil products was taken from Viita's study, while the use of electricity in agriculture was based on Lindberg's estimate. However, the latter was considered relatively high as the figure also included some use of oil. A crude new estimate was done by first deducting the value of oil as indicated in Viita's study and then halving the remaining figure.

Lindberg also included an estimate of the use of *sugar for beekeeping*. This figure was taken directly from his study.

The intermediate use of *milk* in agriculture was calculated from primary sources. The statistical yearbook of Finland was used to calculate how much milk was needed per kg of homemade cheese and homemade butter, then the output figures for these products, calculated earlier, were used in order to estimate the total amount of milk for intermediate use. Viita also estimated that 1.1 percent of the milk produced was used for the purpose of milking animals.

The total intermediate use of *gardening products* was taken from the study conducted by Lindberg. The value of intermediates by product group was obtained by using the same method of division as in other agricultural production.

284 SVT XVIII A 45, 1928.
285 Valtion tilinpäätös (Government balance sheets) 1928, p. 41.
286 Viita (1965), p. 52.
287 KOM 11:1930, p. 31

Other products for intermediate use included transport, veterinarian services, medicines, office equipment, telephone services, membership fees and insurance premiums. The estimates were based on studies on profitability in agriculture, which were carried out annually. The estimated figures were slightly smaller because the study only included larger government-owned farms. It was thus assumed that the smaller farms had a smaller share of the other costs. The figures were also compared with data presented in the official statistics on agriculture. Data on the profitability study was also used in the final stage in order to check the consistency of the results obtained for the whole of agriculture.[288]

Kunnas made the calculations on the use of *firewood* that were used in Viita's study. He took his estimates mainly from the extensive study conducted by Eino Saari on the use of wood in Finland in 1927.[289] However, the value of firewood used in agriculture was transferred to expenditure for private consumption in this study, and therefore it is not included in the intermediate use of agriculture. This is also in line with the current compilation methods in the national accounts.

Value-added components

Of the value-added components, those of wages and mixed income (surplus) were estimated more accurately. Viita (1965), as well as Hjerppe (1996), for example, gave a wages sum for agriculture, but their estimates included both wages paid to employees as well as wages for farmers themselves. It is important to separate these two value-added components in the supply and use tables.

The wages estimates in the present study were based on Viita (1965), on the reports of the committee for easing the agricultural depression, and on information supplied by various agricultural organisations.[290] The two reports include estimates of the share of wages of paid employees as well as the share of the farmers' own work done on the farms. The study on profitability was also used in order to double-check the results obtained.

Statistical discrepancy

The statistical discrepancy between the supply and use of agriculture was 0.002 percent.

Sources

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288 Tutkimuksia Suomen maatalouden kannattavaisuudesta XVII, tilivuosi 1928–1929,
289 Saari (1934).
290 KOM 11:1930; KOM 6:1932.

Lindberg, Valter (1943), Suomen kansantulo vuosina 1926–1938. Suomen pankin suhdannetutkimusosaston julkaisuja, Sarja B:1. Helsinki 1943. pp. 31–56.

Saari, Eino (1934), Puun Käyttö Suomessa. Eripainos Metsätieteellisen tutkimuslaitoksen julkaisuista 14, Helsinki.

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Soininen, Arvo M. (1967), Kasvututkimus ja dokumentaatio, keskustelua. Kansantaloudellinen aikakauskirja 1967:1, pp. 43–44.

Viita, Pentti (1965), Maataloustuotanto Suomessa 1860–1960. Suomen Pankin Kasvututkimuksia I, Helsinki.

STV (Statistical yearbook of Finland) 1929–1930.

SVT III, Maatalous 25, Maanviljelys ja karjanhoito vuonna 1928, Helsinki 1929.

SVT XVIII A 45, Teollisuustilastoa 1928.

SVT 1 A, Ulkomaankauppa 48 1928.

Tutkimuksia Suomen maatalouden kannattavaisuudesta XVII, tilivuosi 1928–1929, Maatalous-hallituksen tiedonantoja N:o 207, Helsinki 1931.

Valtion tilinpäätös (Government balance sheets) 1928.

A1 *Hunting*

Heikki J. Kunnas estimated that the total output of hunting was FIM 16 million in 1928 (*Metsästystä ja kalastusta koskevat kansantulolaskelmat vuosilta 1926–1969*). His estimate was based on benchmark-year data from the hunting season of 1933/34. Sources present the yield of hunting in three categories: game hunted for food (elk), game hunted for their skins (squirrel, fox, ermine, elk) and other game (game birds, hare). The data also includes numbers of bears, wolves, lynxes, wolverines, otters and martens killed. Kunnas used the yield of hunting presented in the foreign-trade statistics as well as the statistical yearbook of Finland in his estimates of the change in the value of hunting over the preceding years.[291]

Lindberg (1943) gave another figure. He estimated the total value of hunting as high as FIM 30 million in 1928[292], and those were the figures that were used in this study. Neither the foreign-trade statistics nor the Statistical Yearbook of Finland shows any decrease in the numbers of animals hunted or exported in 1928 , and there is no evidence that animal prices had decreased in any significant way. There seems, therefore, to be no reason for the decrease suggested by Kunnas, especially since he put the total output of hunting as high as FIM 30 million in 1927.[293]

291 Kunnas (1962).
292 Lindberg (1943), pp. 59–60.
293 STV 1930, s. 103; Oksanen & Pihkala (1975), appendix 2.

The intermediate use of hunting was based on a very rough estimate drawn up by Lindberg from information obtained from forest rangers. Intermediate inputs were mainly assumed to be ammunition and guns,[294] and all those used in hunting were assumed to be domestic.

In the case of value-added components, it was assumed that no wages were paid, reflecting the assumption that there were no paid employees in hunting.

Statistical discrepancy

The statistical discrepancy between the supply and use of hunting was as high as 25 percent, which is mostly due to the fact that there is little or no information available on the use of hunting products in households for householders' own use.

Sources

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Oksanen, Heikki & Pihkala, Erkki (1975), Suomen ulkomaankauppa 1917–1949. Kasvututkimuksia VI, Suomen Pankin julkaisuja, Helsinki.

STV (Statistical Yearbook of Finland) 1930.

A2 Forestry

The calculations for forestry were based on the extensive study *Metsätaloustuotanto Suomessa 1860–1965* conducted by Heikki Kunnas. His concept of forestry includes timber harvesting, log floating, silviculture, and the promotion of forestry and the harvesting of forest products. The definition thus includes harvesting and log floating, which according to the SNA95 are part of agriculture and transport. These two items were therefore deducted from Kunnas' figures in order to ensure comparability .

Kunnas estimated the timber-harvest volume based separately on cutting for commercial and household use. The data on commercial cutting for the period 1860–1942 were constructed by estimating the use of timber by the main consumer groups: 1) exports, 2) industry, 3) transport and 4) other production sectors. Kunnas' sources included statistics on foreign trade, manufacturing and railways, estimates of population development, numbers of schools, hospitals and social institutions, and studies on wood consumption.[295] The felling-volume estimates were taken as accurate, especially after 1927.[296]

294 Lindberg (1943), pp. 59–60.

295 On studies on wood consumption, see Saari (1934); Osara & Pöntynen & Erkkilä (1948); Pöntynen (1963).

296 Hjerppe & Kauppila (1998), p. 11.

The data on stumpage prices in Kunnas' study were taken from the Finnish Forest Research Institute's statistics, the price data on exported timber, raw timber used by the industry, and timber sold by the National Board of Forestry. The most inaccurate figures in Kunnas' study are suggested to relate to the years 1860–1880 and 1915–1920, mostly because of the lack of statistics. [297] The figures for 1928 could be considered reliable.

Kunnas mainly based his estimates of intermediate inputs (principally fuel, motor oils, office equipment, horse work, and repairs to tractors, machines and buildings) on data on the capital stock of buildings, tractors and other equipment used in forestry, as well as on data on the consumption of fuel and motor oils in different machines.[298] On the whole, the number of machines used in the forestry sector was very low before the Second World War.

The basic data on silviculture in Kunnas' study comprised the statistics on silviculture in state-owned forests (since 1906), on company-owned forests (since 1923), and on private forests around 1910. The information on silviculture gathered by private forest owners was less useful, but it seems that until the beginning of the 1960s such work was relatively insignificant in comparison with that carried out by the state and companies. The calculation of output in silviculture was also hampered by inadequate data on costs incurred.[299]

Kunnas calculated the value of forestry promotion on the basis of bookkeeping figures from 1905, when activity of this type started through the foundation of the Central Forestry Board TAPIO. The volume of production was calculated on the basis of the number of salaried employees and working time. Generally, the estimates of the value and volume of non-wood forestry products were based on rather inaccurate data on the quantities gathered, and on even more inaccurate data on prices.[300]

Kunnas estimated labour input on the basis of production volume, mainly under the assumption of constant productivity. Data was also gathered from the annual reports of the Central Forestry Board, the Finnish Forest and Park Service (*metsähallitus*) as well as the District Forestry Board (*metsänhoitolautakunta*). The wage series were constructed using data on average wages according to the accident statistics.[301]

Criticism of Kunnas' study mainly concerns the consumption of wood for household use, estimates of market felling, and the price data on standing timber. According to Matti Peltonen, developments in machines and other tools were much faster even before the Second World War, and the use of manufactured

297 Ibidem.; Hjerppe (1996), pp. 28–29.
298 Kunnas (1973), p. 59.
299 Ibid., pp. 60–61.
300 Ibid., pp. 61–62.
301 Ibid., pp.55–58.

axes and saws in particular was more already common . Otherwise Peltonen's critics focus on the calculations of developments in the 19th century.[302]

The detailed calculations carried out by Kunnas could be considered reliable. Correcting and re-estimating them would have required a great amount of data as well as good knowledge of the forest industry , and this was not considered a rational option.

Statistical discrepancy

The statistical discrepancy between the supply and use of forestry products was 3.1 percent.

Sources

Hjerppe, Riitta (1996), Finland's Historical National Accounts 1860–1994: Calculation Methods and Statistical Tables. Jyväskylän yliopisto, Suomen historian julkaisuja 24, Jyväskylä.

Hjerppe, Riitta & Kauppila, Jari (1998), Comparing Finnish, Swedish, and Danish Growth Studies. A preliminary report of ongoing work. Nordiske historiske nationalregnskaber – Workshop 3. Kobenhavn.

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Pöntynen, V. (1963), Suomen puun käyttö vuosina 1947–1961. Metsäntutkimuslaitoksen julkaisuja 56.3, Helsinki.

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Soininen, Arvo M (1974), Vanha maataloutemme. Historiallisia tutkimuksia 96,Forssa.

302 Peltonen (1985); Hjerppe (1996), p. 29. Peltonen also criticises the constant productivity assumption in estimating labour input for the pre–First World War period, and in estimating the labour output. The output-per-worker data for the late 19th century, calculated on the basis of Kunnas' material, are disproportionately high. Peltonen also argues that Kunnas underestimated the total cutting volume, i.e. wood consumption, and by the same token overestimated the prices of standing timber. These errors may cancel each other out, but it is not certain how systematically. Compared with the data presented by A. M. Soininen (1974), Kunnas' estimates for the consumption of wood for household use for the years 1860 and 1875 were low, only 59–66% of those made by Soininen.

B Fishing

The calculations on fishery are based on Heikki J. Kunnas' article on the national accounts of hunting and fishing for the years 1928–1969. He obtained his quantity and price data from customs-office statistics, foreign-trade statistics, and agricultural administration. The data was also compared with information obtained from Eino Laurila's study on domestic consumption, and data on retail prices for different varieties of fish were obtained from the Sosiaalinen aikakauskirja.[303]

Kunnas estimated the value of fuel used in fishing based on data on the number of motorboats and the price of petrol. In order to gauge the value of repairs and maintenance costs, Kunnas estimated the capital stock of nets as well as parts of boats based on the data in the statistical yearbook and in other studies.

Information on output, intermediate use and value added was obtained from the above sources. Repairs and maintenance were assumed to consist of repairs to nets and boats.

The combined gross output of hunting and fishing is in line with an estimate presented in a study conducted by Pekka Tiainen on productivity in Finland. The combined gross value added, on the other hand, differs somewhat from an estimate presented in Hjerppe (1996).[304] The difference in the two estimates is explained by the different figures for hunting presented earlier.

It was assumed that no wages were paid in fishing. The figures in Kunnas' study could be considered relatively reliable, and given the relatively small proportion of fishing of the total output in the economy, it was not considered necessary to make any new estimates.

Statistical discrepancy

The statistical discrepancy between the supply and use of fishing was 4.8 percent.

Sources

Hellevaara, E (1927), Kalastuselinkeinon kohottamisesta. Kansantaloudellinen aikakauskirja, kahdeskymmenes kolmas vuosikerta, 1927, pp. 131–142.

Hjerppe, Riitta (1996), Finland's Historical National Accounts 1860–1994: Calculation Methods and Statistical Tables. Jyväskylän yliopisto, Suomen historian julkaisuja 24, Jyväskylä.

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303 Kunnas 1962:8; Laurila (1985); SVT 1 A Ulkomaankauppa 48 1928.
304 Hjerppe (1996), p. 110; Tiainen (1994), p. L122.

C–E *Mining, manufacturing, and electricity, gas and water supply*

The most reliable and extensive sources available for the supply and use tables were for the manufacturing industries. The manufacturing statistics for 1928 give detailed information on the production, intermediate use, labour input, wages and energy sources of all establishments in Finland with more than 10 employees, or a production value of at least 15,000 Finnish marks.[305] The limit for the production valuewas no longer clear after the inflation caused by the First World War, however, and as a result it was abolished in 1920. Furthermore, the limit of 10 employees was also somewhat obscure due to the fact that if an establishment had once been included in the statistics it was very difficult to withdraw it, even if the number of employees had slipped below 10.

There are also some deficiencies in the scope of the manufacturing statistics. The most significant omissions are dairies, slaughterhouses, publishing firms, steam power plants and heating plants. In these cases, separate calculations were carried out based on other sources.

Data on small establishments (with less than 10 employees) are totally lacking from the statistics (so-called industrial handicrafts). It was estimated in the Finnish growth study on manufacturing that the proportion of industrial handicrafts of the total output of manufacturing was 7.6 percent in 1928.[306] Thus, it had a relatively large share of manufacturing industry. Various methods were used to estimate the production structure and output of these establishments.

The compilation of the supply and use tables for manufacturing was carried out in two parts, mainly due to the lack of statistics on industrial handicrafts, as mentioned above. Separate calculations were made for manufacturing (establishments with more than 10 employees) and industrial handicrafts. The calculations for output and raw materials are presented below. In order to estimate intermediate inputs other than raw materials and semi-finished goods, other sources were employed and these calculations are also presented below.

I Manufacturing

Output

The manufacturing statistics of 1928 include detailed information on the output of manufacturing by product group at the level of over 90 industries. The statistics are comprehensive and the figures presented could be considered very reliable.[307] Industries were coded to the three-digit level of the TOL95 classification, and the product groups to the three-digit level of the CPA.

305 SVT XVIII A 45, 1928.

306 Hjerppe et al (1976).

307 In some cases the statistics include a number of products under the same total sales. In these cases it has been assumed that the first product mentioned made most of the sales and the whole output was allocated under this product. If the product was presented as "mixed products", it was coded as belonging to the main product group of the industry in question.

The production value of dairies was calculated based on data obtained from the business statistics of Finnish co-operative dairies (*Suomen osuusmeijereiden liiketilasto*) and the statistical yearbook. Additional information was obtained from Tapani Mauranen's Master's thesis on the development of Finnish co-operative dairies.[308] The output of slaughterhouses was estimated based on the sales data obtained from the Finnish Association of Cattle Producers (*Suomen karjakeskuskunta r.l*), published in the Statistical Yearbook.[309] It was assumed that slaughterhouses produced only their main product.

There are no reliable data on steam power plants and heating plants, or on publishing firms in the official statistics before the year 1954, when they were included in the manufacturing statistics. As a result, in order to calculate the total output of these industries it was assumed that the share of the output of steam power plants and heating plants of the total output of electricity, gas and water supply was the same in 1928 as in 1954. Similarly, the output of publishing firms as a proportion of the total output of the graphic industry was assumed to have remained constant.[310] Even though this method is somewhat crude, it is in line with the estimation presented in Hjerppe et al. (1976).[311]

In the case of government-owned companies (mainly the defence industry), the gross production value is not included in the manufacturing statistics either. The national ammunition factory (*Valtion Patruunatehdas*) was established in 1923, and the national rifle factory (*Valtion Kivääritehdas*) in 1926. In addition, the government-owned shipyard (*Valtion Laivatelakka*), outfitters (*Valtion Pukimo*) and airplane factory (*Valtion Lentokonetehdas*) were in operation in 1928. Lindberg estimated that the output of these industries accounted for 32 million Finnish marks in 1928.[312] This calculation was checked against information on government-owned companies obtained from the national balance sheets, which contained estimates of production by product group for some of the companies.[313] In addition, data on the government-controlled production of alcohol in Alko was obtained from the Sosiaalinen aikakauskirja.[314]

The use of raw materials and semi-finished products

The manufacturing statistics give detailed information on the amount and value of both foreign and domestic raw materials as well as on the semi-finished goods

308 Suomen osuusmeijereiden liiketilasto vuodelta 1928; STV 1929, p. 91, 138; Mauranen (1975).
309 STV 1929, p. 141.
310 SVT XVIII A 70, 1954.
311 Hjerppe et al (1976), pp. 26–27.
312 Jokinen (1988), p. 18; Lindberg 1943, p. 165.
313 Valtion tilinpäätös (Government balance sheets) 1928, pp. 38–67.
314 Sosialinen aikakauskirja 23. Vuosikerta 1929, pp. 288–289.

used in the production at the level of over 90 industries.[315] The data provided by the manufacturing statistics is very extensive, and could be considered very reliable. In the case of industries not included in the statistics, various methods were used, which are described below.

The intermediate use of dairies was estimated from data on the amount of milk needed in the production of butter and cheese. The starting point for the calculation was thus the data on the amount of milk needed in order to produce one kilogram of cheese and butter. Mauranen's (1975) study also includes information on the amount of raw materials used in dairies.[316] Prices of milk for dairies were obtained from the study conducted by Viita.[317] All raw materials were assumed to be domestic, which would seem to be an intuitively correct assumption given the fast pace of contamination of milk products.

The main raw materials for slaughterhouses are, naturally, animals. The basic data on their use in this context was taken from the data presented in the manufacturing statistics from 1954, in which this use was presented for the first time. Thus, it was assumed that the amount of animal meat needed for the production of one unit of processed animal meat held constant over time. Raw materials were classified as domestic or foreign based on data obtained from the foreign trade statistics.[318] Thus, it was assumed that all imported animals were used as raw materials in slaughterhouses while the remaining usage was of domestic origin.

The basis for estimating the use of raw materials in publishing firms was also the data presented in the manufacturing statistics of 1954. It was assumed that the use of raw materials, as well as their division into domestic and foreign, were the same in 1928 as presented for the year 1954.

The manufacturing statistics for 1928 lack information on the intermediate use of all electricity, gas, and waterworks production, and thus there is no data on usage by steam power plants and heating plants either. Due to the lack of any other proper data, information on the intermediate use of electricity, gas, and water in Helsinki was used to describe intermediate use (including steam power plants and heating plants) throughout Finland. The balance sheets of the companies concerned are published in the statistical yearbook of Helsinki.[319]

Data on the intermediate use of government-owned companies was obtained from the same sources as described above concerning calculations of output, and on the intermediate use of Alko obtained from the Sosialinen Aikakauskirja.[320]

315 In some cases the products used were presented as the sum of a number of products. In these cases it was assumed that the first one was of most importance, and the use ascribed to it. If the use was described only as "mixed products" it was assumed that products for intermediate use comprised the main output of the industry.

316 STV 1929, p. 91; Mauranen (1975).

317 Viita (1965).

318 Oksanen & Pihkala (1975), Appendix 2.

319 Helsingin kaupungin tilastollinen vuosikirja 23:1930, pp. 126–131.

320 Sosialinen aikakauskirja 23. Vuosikerta 1929, pp. 288–289. Data on intermediate inputs is presented in quantities. Unit prices for intermediate inputs were calculated from the manufacturing statistics.

Output

The concept of industrial handicrafts is problematic and changes over time. It is defined in this study as manufacturing production that is not included in the manufacturing statistics.

Industrial handicrafts were left out of the manufacturing statistics in 1909. Three separate studies on industrial handicrafts were published after that year – in 1913, 1923 and 1934.[321] These statistics present information on employment, production and total sales in industrial handicrafts, and the statistics from 1934 give information on products produced for sale and customised products (direct orders from customers).

The collection of data for the statistics on industrial handicrafts was difficult in practice, however, because it was not easy to define the whole concept. Therefore, as vaguely stated in the statistics from 1934, an effort was made to include *"all such establishments and craftsmen whose activity can be regarded as industrial activity and of which there is no information available in the annual manufacturing statistics"*.[322]

It was estimated in the study conducted by Hjerppe et al. (1976) that the statistics on industrial handicrafts only accounted for around 70 percent of the total employment in the industry, a calculation that was based on statistics on the population and accidents. Thus, in order to arrive at the total output of industrial handicrafts, Hjerppe et al. used the income approach. They first estimated the total employment and the wages sum for employees and employers, and added to the wages an estimate of capital income, depreciations, repairs and raw materials. This estimate of the total output differs remarkably from the official statistics, according to which the value of output in industrial handicrafts in 1934 was 686 million Finnish marks, while Hjerppe et al. came up with a figure of 936 million Finnish marks.[323]

The starting point for calculating the output of industrial handicrafts in the present study was the statistics from the year 1934, from which the value of products produced by industry was obtained. The level for 1934 was corrected upwards for all industries according to the level of output in 1928 obtained from the study conducted by Hjerppe et al. (1976). Thus, in this study the production *structure* (i.e. what products were produced) was taken from the statistics on industrial handicrafts from the year 1934, while the *level* of output was taken from Hjerppe et al.

The use of raw materials and semi-finished products

The statistics on industrial handicrafts do not include any information on the use of raw materials or other intermediate inputs. There are basically two methods

321 SVT XVIII B 1, 1913; SVT XVIII B 2, 1923; SVT XVIII B 3, 1934.
322 SVT XVIII B 3, 1934, pp. 1–2.
323 Hjerppe et al (1976), pp. 68–73, 206; SVT XVIII B 1934.

available for defining intermediate use,. The business-enterprise calculation from the year 1953 includes information on intermediate use by small enterprises, which could thus be calculated by subtracting data obtained from the manufacturing statistics from the data on the use of all establishments presented in the business-enterprise calculations. This would have resulted in data on the total use of intermediates, however, and not by product group by industry. It would also have presented the intermediate use of industrial handicrafts from the year 1953, which in this case would not have been close enough to that from 1928.

A more logical and reliable solution was thus obtained by using the information on the use of raw materials and semi-finished goods by industry obtained from the manufacturing statistics. It was assumed that the intermediate use of small establishments (industrial handicrafts) would be identical to that in establishments included in the manufacturing statistics. This method could also be considered intuitively reliable, and it is in accordance with the recommendations made by the United Nations on the compilation of supply and use tables.[324]

Thus, in the present study the shares of different raw materials and semi-finished goods of the total output by industry (at the level of 85 industries) were calculated from the manufacturing statistics of 1928, and were used to describe the intermediate use of equivalent industrial handicrafts. In cases in which there was no data available on the use of raw materials in the industry in question, the data on the closest industry in production terms was used.[325]

III Other inputs and value-added components

Other inputs

Companies buy products other than raw materials and semi-finished goods and services from other industries, most notably packaged materials, fuel, lubricants, office equipment, other energy sources, insurance, postage, telephone services and repairs. The manufacturing statistics do not include any information on these purchases until the year 1954, however, when reporting these other inputs according to the following classification: packaging material, fuel, lubricants, other auxiliary substances, electricity, repairs purchased outside, and paid work purchased outside.[326]

The proportion of these other inputs of total output varied quite remarkably. In the case of the production of electricity, the share of raw materials was clearly smaller than that of other inputs, whereas in most industries raw materials

324 United Nations (1999), p. 110.

325 This "nearest neighbour" method was applied to the following industries: 176 (the manufacture of leotard knitting), 332 (the manufacture of measurement and observation equipment), 334 (the manufacture of optical equipment) and 335 (the manufacture of clocks). Data on industry 175 (the manufacture of other textile products) was used for industry 176, and on the intermediate use of industry 331 (the manufacture of medical equipment) for industries 332, 334, and 335.

326 SVT XVIII A 70, 1954.

accounted for the largest share of all intermediate inputs. Altogether, other inputs accounted for 13 percent of the total output in 1954.[327]

The calculation of each input separately for the year 1928 was considered very time consuming and also very difficult due to the lack of data available. Therefore, the starting point for the calculation of other inputs (including repairs and maintenance) was the 1954 data on manufacturing statistics.

The proportion of other inputs of the total output for each industry was first calculated from the 1954 manufacturing statistics. It was then assumed that this had been the same in 1928.The figures for packaging materials and auxiliary substances were left out of the calculations because, according to the 1954 manufacturing statistics, "*the earlier statistics included packaging materials and auxiliary substances in the raw materials which in the 1954 statistics were presented under the general headings packaging materials or auxiliary substances*".[328] The procedure followed in the present study is in line with the method used in the study conducted by Hjerppe et al. except for these items.[329]

The use of fuel was further specified based on the extensive study on the consumption of wood conducted by Eino Saari.[330] Saari's study also gives the use of domestic and foreign fuel broken down into firewood, waste produced by the wood-refining industry, charcoal, peat, other fuels, coal, coke, fuel oil, gas oil, kerosene and gasoline. His figures were based on research conducted by N. Hildén.[331] Other than for fuel, there was no information available on the division between domestic and foreign inputs. All other inputs were therefore assumed to have been domestic.

Value-added components

The 1928 manufacturing statistics include detailed information on the number and wages of employees and other personnel by age group and industry. This data on wages was used as such in order to describe the wages in manufacturing, and the sources mentioned above were also used in order to estimate the wages in industries not included in the statistics.

The statistics on industrial handicrafts, on the other hand, do not include any information on wages, which were therefore estimated using the 1928 data on the number of employees, other personnel and owners. The wages sum by industry was obtained from the average earnings for employees in industrial handicrafts, again obtained from the study conducted by Hjerppe et al., the level being adjusted upwards accordingly. This method could be described as somewhat rough, but new estimates would have required time-consuming data collection, which would have not guaranteed any better estimate of the wages sum.

327 Ibid.
328 SVT XVIII A 70, 1954, p. 21.
329 Hjerppe et al (1976), p. 29.
330 Saari (1934).
331 See Hilden (1930).

Calculations on the consumption of fixed capital were carried out, but because of the uncertainty about the results they are not included in the final tables. There was no real accounting data available from the year 1928 in a form that would have permitted reliable and detailed calculation of the consumption of fixed capital. Statistics on the balance sheets of manufacturing were not collected until 1947, and then they were published only every once in a while.[332]

The 1928 law on the publication of annual accounts obliged companies with a capital stock of over 300,000 Finnish marks to deliver a copy to the Register of Companies (*Kaupparekisteritoimisto*). A.E. Tudeer used this information in his study on the capital relations of some companies. In addition, in 1929 the Economic Advisory Board (*Taloudellinen neuvottelukunta*) sent a questionnaire to all establishments concerning their capital relations, and it was on these data that V. F. Johanson based his study on the financing of manufacturing.[333]

The share of depreciation of total sales in manufacturing increased from 1.1 percent to 5.7 percent between 1948 and 1960, although there were great differences by industry. In food processing, for example, it was still only 3.2 percent in 1960, while in wood processing it accounted for nearly 10 percent.[334]

These sources were used as a basis for the estimation of the consumption of fixed capital. Depreciation-based accounting was used in the estimation, which is not in line with the current method of modelling the stock of fixed capital and calculating depreciation as the difference between investments and change in the net stock of capital.[335] The results were also compared with the figures presented in Tiainen (1994).

However, as already mentioned, these calculations are not presented in this study. Preliminary calculations were also carried out for other components of value added, but due to uncertainties about the results they are not presented in the final tables either.

Statistical discrepancy

The statistical discrepancies between the supply and use of manufacturing by industry were as follows: mining 4.6 percent, food products 0.3 percent, textiles 0.3 percent, leather products 0.8 percent, wood and wood products –6.3 percent, pulp, paper and paper products 1.9 percent, coke and refined petroleum products –4.1 percent, chemical products 6.3 percent, rubber and plastic products 6.4 percent, non-metallic mineral products –0.3 percent, basic metals and fabricated metal products 1.2 percent, machinery and equipment 0.6 percent, electrical and optical equipment –5.2 percent, transport equipment –3.0 percent, other products –0.9 percent, electricity, gas and water supply –4.2 percent.

332 Paukkunen (1954); Paukkunen & Kallinen & Sundgren (1962).

333 Tudeer (1929); Tudeer (1938); Johanson (1931). Responses to the questionnaire sent by the Economic Advisory Board were received from almost 600 manufacturing companies.

334 Paukkunen & Kallinen & Sundgren (1962), p. 87–95.

335 For a description of Finnish BKTL methodology according to ESA95, see http://www.stat.fi/tk/kansantalous_kuvaukset.html

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F Construction

1 House construction

Output

The output figures for house construction were obtained directly from the study conducted by Eero Heikkonen on investments in house construction and building stock.[336] His figures could be considered relatively reliable as they were based on calculations and source materials used in Statistics Finland for the calculation of investments. Heikkonen's working papers give data that is further broken down to the level of residential buildings, agricultural buildings, industrial buildings, commercial buildings, and public and other buildings, as well as repairs.[337]

Intermediate use

Data on the intermediate use of house construction is lacking in the official statistics. Hjerppe (1996) estimated that the proportion of intermediate inputs of the total output increased evenly from 30 percent to 65 percent between 1860 and 1948: in 1928 it was 57.4 percent. According to the national accounts on house construction between 1948 and 1964, the proportion was 64.3 percent in 1948, and 54.0 percent in 1964. These variations are relatively wide, and it was thus necessary to obtain more reliable data.[338]

Mikko Tamminen studied the costs of house construction[339], and found that they were mainly attributable to raw materials, subcontracts, wages, architects' fees and interest. He based his calculations on information obtained on urban construction. Information on the construction costs of government buildings and rural municipal housing appears in an article by N. Mannion from 1931. None of the studies and articles mentioned above give any information on the cost of house construction on the detailed product level, however.[340]

More indirect methods were therefore applied in order to estimate the intermediate use of house construction. There are detailed data available on the production and import of products used for construction purposes.[341] G. Modeen gave the import value of products used for house construction at the level of 14 product groups between 1921 and 1928, and also offered calculations on the share of domestic and foreign cement and bricks used as intermediate inputs. He even obtained additional information from the Finnish Association of Cement Produc-

336 Heikkonen (1977).
337 Ibid., p. 15–16.
338 On Hjerppe's estimates, see Hjerppe (1996); on the national accounts for house construction, see Heikkonen & Valppu (1966).
339 Tamminen (1945).
340 Mannio (1931).
341 Modeen (1930).

ers (Suomen sementinvalmistajain yhdistys) on the consumption of domestic cement, construction lime and brickwork plaster between 1921 and 1928.[342]

Modeen's figures were used in this study, while the manufacturing statistics were used in calculating the unit prices of construction lime and brickwork plaster. Some adjustments were made, however, as Modeen's figures have been criticised for being somewhat too high.[343] Thus, the value of these raw materials was obtained. The production of paint, linseed oil, windows, Dutch tiles, water pipes, wallpapers, and other products used only for house construction were calculated from the manufacturing statistics, and it was assumed that these applied only to house construction.[344]

The use of wood in house construction was significant, but reliable calculations on the value of wood as a raw material were difficult to carry out. Eino Saari's study on the consumption of wood in Finland in 1927 was an effective starting point in that it includes detailed calculations of the use of wood for different purposes, including house construction in towns and the countryside, and the construction of public buildings. Calculation of the use of wood in house construction was based on Saari's estimate.[345] He assesses the use of wood in cubic metres of bark-free wood in towns and the countryside. His figures do not comprehensively include the use of sawn wood, which was calculated from the manufacturing statistics. It was assumed that the total output of sawn wood minus exports was used for construction. The unit prices per cubic metre of bark-free wood and sawn wood were obtained from the manufacturing statistics.

Value-added components

There are only few estimates available on wages in house construction. Hjerppe (1996) based her figures on an estimate of the proportion of wages of value added. The national accounts figures from 1948 onwards also give figures for wages.[346] Hjerppe's calculation was used as a starting point, but it was corrected upwards based on data obtained from the national accounts figures as well as from a study on house construction in Helsinki conducted by Matti Hannikainen.[347] Other value-added components were calculated crudely, but they are not presented in the final tables.

II Land and water construction

The starting point forwater construction calculating land and water construction was the growth study on Finnish land and water construction conducted by

342 Ibid., p. 45–49.
343 Hannikainen (2004); Rakennustaito 19/1937, p. 345.
344 SVT XVIII A 45, 1928; Additional information on the production of paint and varnish, was obtained from the history of the Finnish paint factory, Tikkurila, in *Tikkurilan tehtaat, kehitysvaiheet vv. 1862–1937*. Helsinki 1937.
345 Saari (1934).
346 Hjerppe (1996); Heikkonen & Valppu (1966).
347 Hannikainen (2004).

Pertti Kohi.[348] Other sources included the working papers of the growth-study project that were available from the Eino H. Laurila archive at Statistics Finland. Due to the lack of detailed enough information on intermediate use by product group, new estimations were made for the main part. In order to obtain figures on the output and intermediate use of land and water construction, nine-part calculations were made by purchasing sector as follows: agriculture, forestry, manufacturing, roads, railways, waterways, airports, communications and municipal construction. This method differs somewhat from those recommended by the SNA, but given the available data this approach was considered more appropriate for the year 1928. The calculations of the output, intermediate use and wages in each sector are presented below.

Agriculture

Land and water construction in agriculture mainly comprises the clearing of arable land (fields and pasture) as well as drainage construction and government land and water investments.

The first step in calculating the output was to obtain data on the clearing of arable land. Data on countryside clearance (fields) was obtained from the official statistics, according to which the increase in hectares was one percent in 1928. However, the agricultural report of 1929–1930 states that the increase in 1929 was as high as three percent.[349] Thus, it was assumed that the figure in the official statistics was too low and it was corrected upwards. As a result, it was assumed that the growth of arable land in the countryside was 1.5 percent in 1928.

There was no data available on the clearing of arable land (fields) in towns for the year 1928, although the 1929 report presents its extent in 1929. It was simply assumed that the increase was 1.5 percent in 1928, as in the case of the countryside. Data on the clearing of arable land for pasture as well as for gardens was obtained from the 1929 report. It was again assumed that growth was 1.5 percent.

Thus, a figure for the total extent of the clearing of arable land was produced. The unit price of clearing per hectare was obtained from the committee report on settlement activity, according to which the cost of clearing one hectare of field for settlement purposes was estimated.[350]

The total amount of drain laying in 1928 was estimated based on the 1929 figure. The proportion of the drainage of arable land was then used in order to estimate the level of activity in 1928. The difference was assumed to represent the increase in drain laying in 1928. This figure was further compared with information on the number of drainpipes laid in 1928.[351] The unit value of drainage was obtained from the committee report on agricultural organisations.[352]

348 Kohi (1977).
349 Tutkimuksia maatalouden kannattavaisuudesta 1929–1930.
350 KOM 11:1933, p. 171; see also Hallakorpi (1931).
351 Tutkimuksia Suomen maatalouden kannattavaisuudesta 1928–1929; Leiponen (1981).
352 KOM 6:1932.

Figures on the intermediate use of land and water construction in agriculture were obtained from various sources. In the case of the clearing of arable land, data on the intermediate use of gravel-road construction was obtained from the official statistics on Road and Water Administration (*Tie- ja vesihallitus*). The unit cost of different intermediate inputs per output was calculated from the statistics and used in order to obtain the intermediate use of the clearing of arable land in agriculture.

In the case of drainage, intermediate use was estimated based on data on drain pipes sold in 1928 obtained from the history of the Finnish brick industry.[353] The figures were also compared to the data presented in the manufacturing statistics on the production of drainpipes: wooden pipes were still being used in 1928. The amount of wood used for drain laying was estimated from the data obtained from Eino Saari's study on wood consumption, as well as from the Brick Association.[354] In addition, the value of horse work was calculated on the basis of the unit cost of horse work per output in gravel-road construction.

Figures on wages in land and water construction were obtained from the committee report on agricultural organisations, which presents the proportion of labour costs in clearing one hectare of arable land. This figure was used in this study for both the clearing of arable land and drainage.[355]

Forestry

The output of land and water construction in forestry comprises the drying up of marshland, the digging of forest ditches, and the construction of forest roads. Data on the value of drying up marshland was obtained directly from the official statistics.[356] The value of digging forest ditches was obtained from an article that appeared in Kauppalehti magazine,[357] and that of constructing forest roads was taken from the official statistics on Road and Water Administration.

The average costs per output for constructing government forest and gravel roads were used in order to arrive at the intermediate use of the above activities. The estimation of wages in the drying up of marshland and the digging of forest ditches was based on the proportion used for agricultural land and water construction, and the figure for the construction of forest roads was obtained directly from the official statistics.

Manufacturing

The figures on land and water construction in manufacturing were taken directly from Kohi's calculation. There was one major construction project going on in Finland in 1928, namely that of the Imatra power plant. In calculating intermediate use, data on the construction of the Imatra power plant was used to

353 Leiponen (1981), p. 222.
354 Saari (1934); Leiponen (1981).
355 KOM 6:1932.
356 STV 1929, p. 102.
357 Kauppalehti 26.1.1929.

describe the total use in 1928.[358] Kohi's output estimate was divided into two parts, the construction of the power plant and the construction of power lines. The intermediate use presented in the two studies conducted by Malmi was then used in order to calculate the total intermediate use of land and water construction in manufacturing. The data also presents the proportion of wages in the construction process.

Roads

The output of road construction was divided between roads and bridges constructed and maintained by the government, cities and municipalities. Data on government road and bridge construction was obtained from the official statistics and could be considered very reliable.[359] Road and bridge construction in cities was also based on official statistics from 1928.[360] However, there is no data on municipal construction from the year 1928, so the official statistics from 1930 were used. Additional data on government subsidies for road construction were also obtained from the committee report on developing Road Administration.[361]

Calculations of the intermediate use of road and bridge construction were based on government data. The official statistics were used in order to calculate the average costs and raw materials used in the construction of different types of roads and bridges. In addition, the wages paid per output in road and water construction were calculated, and the data used for all road and bridge construction.[362]

Clearly, the use of 1930 data for municipal road and bridge construction is problematic. However, this was considered more reliable than trying to estimate it through some other inadequate sources. Municipal construction accounted for less than 15 percent of total road and bridge construction.

Railways

The calculations on the construction and maintenance of railways were divided between government railways, private railways and tramlines. Data on the construction and maintenance of the government-owned rail network was obtained from the official statistics on railways. The statistics, which are very extensive, also included data on the private rail network, and detailed information on construction and maintenance, wages and intermediate use at the product level. Additional information was obtained from the committee report on developing Road Administration.[363]

There were tramlines in three cities in 1928: Helsinki, Turku, and Viipuri. Calculations on their construction and maintenance were based on the data

358 Malmi (1949).
359 SVT XIX, 1928.
360 SVT XXXI 6, 1928–1929.
361 SVT XXXI B 1, 1930–1931; KOM 6:1954.
362 SVT XIX, 1928.
363 SVT XX:58, 1928; KOM 6:1954.

obtained from the archive of Eino H. Laurila at Statistics Finland.[364] The growth-study estimates do not include any information on intermediate use however, which was then calculated based on the intermediate use of railway construction. A study by Georg Estlander on the Helsinki Tramway and Omnibus Company Ltd was also used.[365]

Telecommunications

In the case of telecommunications, reliable figures on the output, intermediate use and wages in the construction and maintenance of government telegraph and telephone lines were available from the official statistics as well as from a committee report on telephones.[366]

The official statistics do not include any information on the construction of private telephone lines. However, the committee report on telephones was of great help. It contains calculations on the profitability of a telephone network covering the whole country in case the government were to take over the whole network. There are also estimates on the annual expansion of both long-distance and local area networks. This information was a reliable starting point for the calculation of the extent of the private telephone network, and complemented information on one of the largest private companies, the Southern Finland Long-distance Network (Etelä-Suomen Kaukoverkko), obtained from the study conducted by A.E. Berg.[367] The calculations on the output, intermediate use at the product level, and the wages of the whole telecommunications network were based on these sources.

Waterways

The construction of waterways comprises the construction and maintenance of waterways, canals, lighthouses, pilotage locations, harbours and log-floating channels. Data on government construction and maintenance was taken from the official statistics and they could be considered reliable.[368] The extent of port construction was partly covered in the official statistics on municipal finances, as the ports were mainly operated by the cities.[369] In addition, calculations on the extent of the construction and maintenance of log-floating channels were based on a data obtained from a study conducted by Arvo Kiiskinen.[370]

The data on the average costs and raw materials used in the construction and maintenance of government canals and waterways was used to describe the total intermediate use with a view to estimating the intermediate use by product group.[371]

364 Growth-study working papers.
365 Estlander (1931), p. 160.
366 SVT XIII 44, 1928, p. 43; SVT XX 58 1928, p. 69; KOM 4:1931, p. 11.
367 KOM 4:1931, pp. 11, 24–25; Berg (1935), pp. 110–114.
368 SVT XIX Tie- ja vesirakennukset 1928, pp. 158–160.
369 SVT XXXI Kuntien finanssitilastoa 6, 1928–1929.
370 Kiiskinen (1954), p. 54.
371 SVT XIX Tie- ja vesirakennukset 1928.

Airports

There were no airports constructed in 1928.

Other municipal construction

The calculations described above included municipal road, harbour, street, and bridge construction and maintenance. The remaining municipal land and water construction mainly concerned the construction of water mains, drains, sports grounds and gardens. This output calculation was based mainly on the official statistics on municipalities and cities.[372] Data on intermediate use and wages were scant, and the calculation was based on information on the amount of cement, pipes, horse work and man hours required for one unit of output in Helsinki and in Road Administration.[373]

Statistical discrepancy

The statistical discrepancy between the supply and use of construction was 0.5 percent.

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372 SVT XXXI 6: 1928 Kuntien finanssitilastoa. Kaupunkikuntien finanssit vuosina 1928–1929.

373 Helsinkin kaupungin tilastollinen vuosikirja 1929, p. 18; SVT XIX Tie- ja vesirakennukset 1928. Data for the calculation of the horsework and man hours required per unit was obtained from the accident statistics as well as from the statistical yearbook. See, SVT XXVI A:2 Tapaturmatilasto vuonna 1928, pp. 2, 44, 56–57; STV 1929, p. 264.

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G Trade

One of the most difficult sectors in terms of national accounting must be that of trade, which is usually defined as activities related to the selling and purchasing of goods. It is defined in this study as the economic activity of buying and selling goods other than securities and real estate, however. This corresponds well with

the current definition as stated in TOL 95. Thus, trade includes wholesale and retail trade, as well as agency, commission and brokerage, and the repair of motor vehicles. It is not certain that pharmacies are included in the series of Finnish growth studies, however, and given the lack of information, it is assumed here that they are.[374]

Trade in the Finnish historical national accounts is analysed by Osmo Forssell (1979) in "*Kauppa Suomessa 1860–1960*" (Finland's Domestic Trade 1860–1960), published in the Growth Studies series (Growth Studies X). Tapani Mauranen revised the figures in his studies "*Kotimaankaupan rakennemuutos 1860–1913*" (Restructuring of Domestic Trade, 1860–1913) and "*Kotimaankaupan kasvu ja rakenne 1860–1960*" (The Growth and Structure of Domestic Trade, 1860–1960). A study conducted by Pekka Tiainen also includes an estimate of the total output of trade.[375]

Forssell used data on the sales of the major wholesalers and retailers in order to determine the total sales change. The figures for gross value added were obtained on the basis of; a) wages, salaries, and other labour income, b) income from unincorporated enterprises, c) rents, d) pre-tax corporate profits, e) depreciation, and f) repair and maintenance costs. He used the level obtained from the turnover-tax statistics for 1952–1953 as a starting point. He then linked the series indicating relative change to these absolute figures, thereby obtaining the series for the level of total activity in the trade sector in different years.[376]

Mauranen used income statistics in order to obtain the GDP contribution of trade. He estimated the income of shopkeepers and the wages of assistants, as well as other value-added items. Data was obtained from statistics on cooperative retail and wholesale trade and from tax statistics. The number of trade-sector employees was based on the data in the shopkeepers' lists as well as on the demographic employee statistics, and on statistics on cooperative retail trade and labour inspections.[377]

From the perspective of this study, both Mauranen's and Forssell's study lack important information – that on the use of intermediate inputs by product group, and neither of them includes repairs of motor vehicles. Their method for arriving at trade output is not in accordance with SNA recommendations either, according to which it is defined in terms of gross profit, thus as the difference between the total sales and purchase of goods for retail.

Strict adherence to the SNA recommendations in the case of trade was almost impossible in this study, however. Data was difficult to obtain, and the results of various studies differ remarkably. Forssell, Mauranen, and Tiainen all present calculations on the trade sector, but only Tiainen includes an estimate of the total output. A comparison of the results of these studies, as well as the cal-

374 Forssell 1979, p. 13; Standard industrial Classification 1995.
375 Forssell (1979); Mauranen (1985); Mauranen, Kotimaankaupan kasvu ja rakenne 1860–1960, manuscript; Tiainen (1994), p. L123.
376 Forssell 1979, p. 19.
377 Hjerppe 1996, p. 49.

culations presented in additional studies, would nevertheless suggest that Tiainen's estimate is relatively reliable.[378]

The figures for trade were calculated by combining different approaches, with Tiainen's total output estimate taken as a starting point, whereas Forssell's estimate of the total value of sales was used to arrive at the level of intermediate use. Of the total sales, the value of intermediate inputs was then estimated using data on the sales share of different intermediates obtained from the trade-profitability studies from the 1940s and 1950s.[379] These figures were also compared with figures based on a study conducted by Järvinen & Korpisaari on wholesale trade, which also gave the proportion of intermediate products of total sales.[380] There was even less data available on intermediate use by product group. None of the studies mentioned above give detailed information on the intermediate use of trade, only on components of value added. The profitability studies do give some figures on the cost structure, and given the lack of any other information from 1928, this data was used in order to calculate the average sales share of different intermediate inputs of the total. The data in these studies is presented at the level of six product groups (rents, heating and lighting, insurance, banking services, telephone and postal services and transport services, as well as other costs). In the case of other costs, a rough division between bookkeeping, commercial services, office equipment, machines, pens and paper was made based on data on office costs for government-owned postal offices and railways. The method could be considered an acceptable estimation method: the current calculation method in the Finnish national accounts is based on similar information on the share of intermediates of the total output.

No new estimates were carried out for wages. The figure was taken directly from Forssell's study, in which a great deal of effort was put into estimating the labour input for trade. In order to include the repair of motor vehicles, additional data was taken directly from the manufacturing statistics, which give detailed information on total output, intermediate use and wages.

Statistical discrepancy

The statistical discrepancy between the supply and use of trade was 5.6 percent.

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378 On additional studies, see Järvinen & Korpisaari (1940), which includes information on the gross profit of trade; Tukkukaupan tila 1928 (The state of wholesale trade in 1928).

379 Wiherheimo (1946a); Wiherheimo (1946b); Wiherheimo (1949); Raninen & Kaskimies (1952a); Raninen & Kaskimies (1952b); Raninen & Kaskimies (1953); Raninen & Kaskimies (1954); Virtanen (1954).

380 Järvinen & Korpisaari (1940), p. 276.

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H Hotels and restaurants

The availability of data on hotels and restaurants was somewhat limited. The level of value added, the wages sum and the employment for 1948 are available from the national accounts.[381] Hjerppe based her estimates of the GDP of hotels and restaurants on the national-account level of 1948, and the level of previous years was calculated from estimates of employment. She thus gave her estimates of value added, the wages sum and employment in 1928: the value added was estimated at FIM 171.7 million in 1928.[382]

In addition, Laurila gives an estimate of employment in hotels and restaurants in 1930 in his study on private consumption, and calculated that the value added was around 30–40 percent of total sales during the period under study. He came up with an estimate of FIM 221 million for private consumption in 1928.[383]

None of the above studies includes estimates of total output or intermediate use by the product group of hotels and restaurants, however. This proved to be a difficult gap to fill, as there is only little information available on either of the items. However, new estimates were carried out based on various sources.

Output

First of all, it should be mentioned that the Prohibition Act was still operational in Finland in 1928, and this clearly had an impact on the output of restaurant services.

An effective starting point for the calculations was a committee report on alcohol from 1946. This report includes detailed data on the levels of sales and wages, the numbers of employees, intermediate use, and prices in the restaurant sector in 1938, based on responses to an extensive questionnaire. The restaurants analysed in the report were divided according to whether or not they served alcohol.[384]

The total sales in 1938, obtained from the report, were projected backwards using series on the private consumption of restaurant services at fixed prices, obtained from Laurila's study. This change was assumed also to represent the development of restaurant sales, and the total sales figure for restaurants in 1928 was thus obtained. The correctness of the figure was checked against sales per capita in 1938 and 1928. The results seemed to support the calculations in terms of the direction of change.

The calculation of the output of hotels was an even more difficult task. There is virtually no information on the level of hotel services in 1928, and the output figure should thus be considered a rough estimate.

381 Kaartinen (1970).
382 Hjerppe (1996); Working papers on the Growth Study.
383 Laurila (1985), pp. 317–319.
384 KOM 7:1946 Alkoholikomitean mietintö.

A study on the history of tourism in Finland conducted by Hirn & Markkanen was a very useful starting point.[385] The study includes some estimates of the total income from foreign tourism, as well as of the share of hotels of this income in the 1920s and 1930s. In addition, Hirn & Markkanen's estimate was compared with a calculation done by Statistics Finland in a study on developing tourism policy.[386] These calculations seem to support the output-level estimation.

The above calculation only included foreign tourism income for hotels. Information on the split between domestic and foreign guests exists only from the 1970s, when three quarters of the guests were of domestic origin. It was assumed in this study that the proportions of domestic and foreign guests were the same in 1928. This should be considered not only a very rough estimate, but also an underestimation because the proportion of domestic travellers was probably higher than that of foreign travellers in 1928.

Information on Alko (the state monopoly for alcohol production and sales) is presented in the context of manufacturing industry according to the industrial classification. There are extensive data on the operations of Alko covering both output and intermediate use.[387] This data on the legal production and sales of alcohol was also used in the case of hotel and restaurant services in order to double-check the results obtained on legal sales.

Intermediate use

The committee report on alcohol was used in the estimation of the intermediate use of hotels and restaurants. The questionnaire in the report was mainly directed at restaurants, but also included some hotels. Therefore, the same input structure was assumed for both. This may be somewhat misleading as far as hotels are concerned, but due to the lack of any more accurate information this was considered a reasonable procedure. The report includes detailed information on the proportions of wages, rents, the use of electricity and repairs in restaurants and some hotels in 1938. However, as the Prohibition Act was still in force in 1928, the data on the intermediate use of restaurants serving no alcohol was used. The report also includes data on the gross profits of each sales item (food, drinks etc.), which was used in order to calculate the share of raw materials. The raw materials were also included in the questionnaire by sales item. It was thus possible to obtain quite reliable data on the use of raw materials and semi-finished good, as well as on other inputs used in restaurants. In addition, the proportion of food-related products purchased from the manufacturing and agricultural sectors was estimated based on the proportions of sales in small towns and cities.[388] A study conducted by Merja Sillanpää on the history of restaurant ser-

385 Hirn & Markkanen (1987).
386 Sandberg (1945), p. 60.
387 Sosialinen aikakauskirja 23. Vuosikerta 1929, pp. 288–289. Data on intermediate inputs is presented in quantities. Unit prices for intermediate inputs were calculated from the manufacturing statistics.
388 KOM 7:1946, pp. 451–461.

vices in Finland includes additional information on the working conditions and the operations of restaurants, and this provided an important additional source in the calculation process.[389]

Value-added components

As mentioned above, the committee report's questionnaire included detailed information on wages as well as labour input in the restaurants. The level of wages reported in Hjerppe (1996) was also used in order to check the consistency of the results obtained. The difference in results between Hjerppe's and this study could be attributed to at least two factors. First of all, Hjerppe estimated her value-added figure based on the 1948 level, from which she obtained the 1928 level by using the number of employers as an index. This estimate does not take into account any operational surplus, however – in other words, the owners' income is not included. Secondly, Hjerppe's output estimate does not reflect changes in the purchasing power of consumers. The more detailed calculation of intermediate use in the present study could also have caused some discrepancy.

Statistical discrepancy

The statistical discrepancy between the supply and use of hotels and restaurants was 3.5 percent.

Sources

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I *Transport, storage and post and telecommunications services*

The scope and reliability of the statistics on transport, storage and post and telecommunications services vary remarkably. There are extensive and reliable statistics on railways, for example, whereas the data on buses and heavy-goods vehicles is scant. As a result, different methods were employed in order to estimate the output, intermediate use and wages of different modes of transport. The calculations were carried out at the level of 10 modes, including rail transport, trams, horse transport, buses, taxi services, heavy-goods vehicles, water transport, air transport, communications, and other services related to transport including travel agencies. The calculation methods and sources used for the estimations by mode of transport or service are described below.

Rail transport

Figures on the output and intermediate use of railways were obtained directly from the official statistics. The statistics included detailed information on the total sales of both private and government-operated passenger and goods transport, and there are extensive data on the intermediate use of rail for government-operated transport.[390] Eino Saari's study on wood consumption and the available manufacturing statistics were also used to calculate the use of firewood on trains.[391]

In the case of private railway services, intermediate use was assumed to follow that of the state railways. Privately operated rail transport accounted for only three percent of total rail transport in 1928. The output of telegraph lines operated by the state railways was included in telecommunications.

Trams

There were trams in three cities in 1928: Helsinki, Turku, and Viipuri. Figures on the output of tramway traffic in Helsinki and Turku were obtained from the statistical yearbook of these two cities.[392] There were no statistics available on Viipuri, but according to Leppänen (1973), the output of tramway traffic there was about the same as in Turku. Thus, this was also assumed in the present study.[393]

Estlander (1931) gave some figures on the profitability of Helsinki tramway traffic (Helsingin Raitiotie ja Omnibus Osakeyhtiö), but because there was virtually no other data available on the cost structure of tramway traffic, the structure of the intermediate use of railways was used. Naturally, electricity was used to drive the trams.[394]

390 SVT XX:58, 1928.
391 Saari (1943); SVT XVIII A 45, 1928.
392 Helsingin kaupungin tilastollinen vuosikirja 1929, p. 205; Turun kaupungin tilastollinen vuosikirja 14, 1929, p. 132.
393 Leppänen (1973), p. 37.
394 Estlander (1931), p. 145.

Horse transport

J. Pölönen estimated the level of activity of cabmen and draymen in the relay system and in towns. The significance of horse transport had already decreased significantly by the year 1928 due to the increase in cars, but it still had some relative importance. Pölönen's estimates are presented in Leppänen's growth study.[395]

Pölönen's study on horse transport covers the activities of the cabmen and draymen employed in the relay system and in towns. Statistics on the relay services were obtained mainly from the Official Statistics of Finland, the statutes of relay fare in the Statute Book of Finland, and from estimates of the government committees on average relay lengths. Pölönen gives the total output, intermediate use and wages for horse transport, but there is no information on use by product group. It is assumed in this study that the intermediate use of horse transport was composed of animal feed and cart repairs. This is, naturally, a very crude assumption and should be treated with caution.

Buses

There are no official statistics on bus transport from 1928. Buses were being increasingly used, however, and the 1920s are considered the golden years of bus transport. Therefore, new estimations were carried out based on various other sources.

The starting point for the calculations was information on the service produced by buses (passenger kilometres) and the number of buses in use between 1925 and 1952. This data was obtained from a committee report on developing the Road Administration.[396] Extensive calculations of transport were done in 1934, and this information was also used as a starting point for the calculations presented in the committee report.

The committee report thus estimates bus transportation in passenger kilometres for 1926–1952. The figures are surprising, however, given the increase in the number of buses and the development of the transport system in the 1920s.[397] The year 1928 has been considered a peak year for bus transport, just before the depression of the 1930s set in, but according to the estimation in the committee report, the service output for that year was even smaller than that of 1930. The figure estimated in the committee report for 1928 was adjusted upwards in this study on the basis of the data on average passenger kilometres per bus in 1934.

An index presenting the change in service produced was compiled from the series on passenger kilometres, and one calculated by Törnqvist describing changes in price, and bus-transport prices for the post and telecommunications administration was also used.[398] A value index of the change in the output of bus transport was formed from a combination of these two indices. The level of out-

395 Leppänen (1973).
396 KOM 1954:6.
397 Viitaniemi & Mäkelä (1978).
398 Törnqvist (1952).

put in 1928 was then estimated using the index and the level of output from 1950 obtained from the study conducted by Viitaniemi & Mäkelä.[399]

The intermediate use of bus transport was estimated from data on its profitability. This data was obtained from an article in Kauppalehti magazine from 1939, which gives the use of intermediates (costs) as well as the share of wages, for example, in 1937. This data was directly used to describe intermediate use in 1928 as well. Data on optional and obligatory motor-vehicle insurance premiums was also used.[400]

Taxi services

The calculations concerning taxi services are quite rough due to the lack of official statistics. Information on the number of passenger cars and taxis in 1926 was available from the study conducted by Tapani Mauranen, as well as from the committee report on the development of the Road Administration.[401] The proportions of taxis and passenger cars were assumed to be same in 1928 as in 1926, thus giving the number of taxis in 1928. Tapani Mauranen calculated an average income for taxi services per car of 20,000 Finnish marks in 1928, according to data from the tax archives of Helsinki City. Hence, the number of taxis and the average income were combined in order to produce the output of taxi services.[402]

Leppänen estimated in his growth study on transport that wages accounted for six percent of output in 1928, a figure that was based on information obtained from the Union of Professional Motorists (*Ammattiautoliito*).[403] Mauranen gives quite detailed data on different cost components in taxi services, and this information was also used in the present study.[404] As far as insurance premiums were concerned, the sources were the same as in the case of buses.

Heavy-goods vehicles

The weakest statistics available concerned heavy-goods vehicles. Leppänen gives estimates for output, intermediate use and wages in his growth study on transport, based on V. Lindberg and E. H. Laurila as well as on the reports of the Road Service Committee. Additional data on cost division and prices were obtained from the Union of Professional Drivers, and price data on lorries belonging to the Province of Uudenmaa from the Administrative Board and from the Lorry Transport Association. The number of lorries was estimated from data held at the Ministry of Transport and the Lorry Transport Association. The ton-kilometre quantity driven per lorry was obtained from the committee report

399 Viitaniemi & Mäkelä (1978), s. 331.
400 SVT XXII A 34, 1928, p.120. Motor vehicle insurance is divided among different types of vehicles according to their number.
401 Mauranen (1995).
402 Mauranen (1995).
403 Leppänen (1973), p. 38.
404 Mauranen (1995), p. 273.

on developing road administration.[405] No new estimates were made for heavy-goods vehicles, but Leppänen's estimate on output, intermediate use and wages was used. This data was obtained from the archives of Eino H Laurila at Statistics Finland.[406]

The basis for the calculation of intermediate use by product group was the data on the cost structure of lorry transport in 1950, taken from the committee report on road administration.[407] The data for 1950 was used as such, which is naturally problematic as costs might have changed during the 20 years. On the other hand, the most basic cost components (fuel, tyres, repairs) probably remained relatively constant. The statistics on obligatory motor vehicle insurance were used once again.

Water transport

The concept of seafaring includes overseas transport, transport between foreign ports and between Finnish ports, as well as carrying goods through canals on Finnish ships. The output of water transport was taken from the official statistics on seafaring, which give the value of goods and passengers transported.[408] These data were assumed to include so-called inland water transport, as the names of ports included the inlandharbours. This method differs from the one applied in the growth-study calculations, in which inland water transport was treated separately.[409]

The use of intermediates in water transport was estimated from a number of sources. Data on insurance premiums was taken from the official statistics.[410] According to Lindberg and Leppänen, the value of repairs represented six percent of the value of the fleet, according to the expert estimates from the Maritime Administration.[411] This figure was also used in the present study, while the fleet value was taken from the official statistics. Similarly, Leppänen and Linberg both used an expert estimate of the proportion of administrative costs of gross tonnage carried: their figure of 3.4 percent was also used in this study. Data on transport and port charges were taken from the committee report on waterway charges,[412] and that on charges for ice breaking, pilotage and lighthouses were taken from the government balance sheets.[413] The costs of stevedoring were calculated based on output and the proportion of domestic ships.[414] The use of fuel and lubricants was calculated from a study on the use of wood on ships con-

405 Leppänen (1973), pp. 36–39. On Lindberg, see Lindberg, Valter, Suomen kansantulo 1926–1938, Suomen Pankin suhdannetutkimusosaston julkaisuja, Sarja B:1, Helsinki 1943. On Laurila, see Laurila, Eino H., Suomen kansantulo vuosina 1926–1949, Tilastokatsuksia 1950.
406 Archive of Eino H. Laurila at Statistics Finland.
407 KOM 1954:6.
408 SVT 1B:11a, 1928.
409 Hjerppe (1996), pp.44–48.
410 SVT XXII A 34, 1928, p. 78.
411 Leppänen (1973), pp. 40–41.
412 KOM 3:1932, pp. 60–64.
413 Valtion tilinpäätös (Government balance sheets) 1928.
414 On stevedoring output, see below.

ducted by Pöntynen, a study on the use of firewood and coal in Finland carried out by Holopainen, and one on the use of oil on ships conducted by Valtonen.[415]

Leppänen gave some estimates of the wages of seafaring, and an article by Hoppu describes the income situation from the sailor's perspective.[416] In the present study, however, official data on the number of employees in seafaring and their average earnings were obtained from the accident statistics.[417]

The value of log floating, also included in water transport, was taken directly from the study conducted by Lindberg.[418] The proportion of wages was taken from Kiiskinen's study on the development of the Finnish transport network. The use of intermediate inputs in log floating was roughly estimated from data on the use of firewood in workmen's quarters, and from a study on log floating in the Kemijoki river conducted by Hanna Snellman.[419]

Air transport

The only air-transport company operating in 1928 was Aero Oy. Leppänen made calculations on its output, intermediate use and wages from the balance sheets, and his estimates were used as such. There is further information on the company in the study on the development of Finnish industry.[420] According to a rough estimate made for the present study, intermediates comprised mainly repairs and fuel.

Other services related to transport and travel agencies

Other services related to transport include forwarding, travel agencies, bus transport, stevedoring, canals, ice breaking, port administration and pilotage.

Leppänen calculated figures for output, wages and intermediate use in forwarding, travel agencies and bus transport in his growth study, and these were used in this study. Intermediate use was assumed to follow the same estimated cost structure as for ports. This is a very rough assumption, but due to the lack of any more reliable data and the fact that these industries only comprised a very small proportion of the transport sector, it was seen as a reasonable procedure.[421]

The statistics on water-transport services were more reliable. The committee report on waterway charges, the statistical yearbook and government balance sheets were all used to complement Leppänen's estimates.[422] The information on intermediate use was taken from government balance sheets, which contain

415 Pöntynen (1938); Holopainen (1950); Valtonen (1972).
416 Leppänen (1973); Hoppu (1934).
417 SVT 1B:11a, 1928; SVT XXVI A 2, 1928.
418 Lindberg (1943), p. 86.
419 Kiiskinen (1954), p. 66; Saari (1943), p. 141; Snellman (1996), pp. 147–153.
420 The Eino H. Laurila archives at Statistics Finland; 50 vuotta Suomen teollisuutta ja taloutta.
421 The Eino H. Laurila archives at Statistics Finland. On the caluclation of the intermediate use of harbours, see the methods and sources for land and water construction.
422 KOM 3:1932, pp. 60–64; STV 1929, p. 242; Valtion tilinpäätös (Government balance sheets) 1928.

detailed information on the costs of pilotage, ice-breaking, stevedoring and canal services. Data on the cost structure was also taken from the statistical yearbook,[423] and additional data was obtained from an article on canals in Finland written by E. W. Skogström.[424]

Communications

Reliable, detailed and comprehensive data on the output, wages and intermediate use of public postal and telecommunications services were available in the official statistics.[425] The figures for postal-bus transport, which was included in the bus-transport sector, were deducted, and those for state-railway-operated telegraph services were incorporated.[426] The intermediate use of telegraph services provided by the state railways was assumed to follow that of other telegraph services.

There were few statistical sources of information on privately operated telegraph and telephone services. Leppänen's study includes estimates on these sectors , however, and these were used mainly to describe the extent of the operation.[427]

Further information on the extent, and especially on the intermediate use, of private telephone and telegraph services was obtained from the histories of some telephone companies, committee reports, and a study by E. A. Berg on the telephone tariffs of public and private companies. Berg's study includes calculations on the profitability of telephone companies, and gives valuable data on intermediate use by product group.[428]

Statistical discrepancy

The statistical discrepancy between the supply and use of transport and communications was 1.4 percent.

Sources

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423 Valtion tilinpäätös (Government balance sheets) 1928; Statistical yearbook of Finland 1929.
424 Skogström (1928).
425 SVT XIII:44, 1928.
426 SVT XX:58, 1928.
427 Tilastokeskus, Laurilan työpaperit.
428 Berg (1943), s. 173–175; Eskola (1969), s. 80–81; Turpeinen (1981), s. 73; KOM 4:1931.

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J *Financing and insurance services*

Banking has always been under the tight control of the government, and thus there is relatively good data available. Savings banks statistics (SVT VII C) start from the 1870s, and contain data on bank lending and deposits. Eero Aaku's "Suomen liikepankit 1862–1955" (Finnish Commercial Banks 1862–1955) studies the activities of commercial banks since their inception in 1862.[429] In addition, there are national accounts on banking and insurance services from 1948 onwards.[430]

The figures for financing and insurance services are mainly based on an extensive study conducted by Antti Suvanto on the historical national accounts. Suvanto has not published his study, but his detailed calculations are available in the archives of the growth-study project. The Eino Laurila archive also contains estimates on banking.[431]

The output of banking work is defined in Suvanto's study as interest revenue on lending plus other interest and dividend revenue minus interest paid on deposits. Various fees charged to clients were added to this sum. The calculated value of insurance institutions equals insurance-premium revenue plus income from capital minus indemnities paid minus increases in underwriting reserves. This approach differs somewhat from the current SNA recommendations, but given the lack of any other data, it was used.

Suvanto presents calculations on output, wages, taxes, rents, interest, profits, intermediate use and repairs and maintenance for banks and insurance companies. These figures were used directly in order to obtain output, intermediate use and wages. However, there was little information on intermediate use by product. As this data was not presented in any of the studies or statistics mentioned above, additional sources were sought. The histories of some individual banks and insurance companies were collected in order to obtain more detailed information on intermediate use.[432] An average of different intermediate inputs of total output was calculated and used as an indicator of the proportions of different products as intermediate inputs. In addition, data on government-owned postal services and railways was again used in order to estimate the share of office equipment of intermediate use.

429 Aaku (1956).

430 Leppänen (1965).

431 The archives of Helsinki University, Growth Study working papers; the archives of Statistics Finland, Eino H. Laurila papers.

432 Vakuutusosakeyhtiö Pohjola 1891–1966, pp. 174–175; Jernström (1931), pp. 2–21; Jernström (1932), pp. 2–31; Tudeer (1939), p. 292.

It must be mentioned that the use of intermediate inputs in banking and insurance services was based on very rough estimates, and the figures should be treated with caution.

Statistical discrepancy

The statistical discrepancy between the supply and use of banking and insurance was 0.03 percent.

Sources

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SVT XX:58 Rautatietilastoa 1928

K Housing and business services

Housing

According to the SNA, the concept of housing incorporates contract building. This was included in the calculations made for the present study, but due to the lack of data and the crude methods used for the estimations, even today, the figures are not presented here. It was thus assumed that the house-construction estimates did not include contract building.[433]

The concept of housing also covers the real and calculated business transactions related to people's living in dwellings, and transactions related to other uses of space in houses built as dwellings.

Eero Heikkonen conducted the growth study "*Asuntopalvelukset Suomessa 1860–1965 – Kasvututkimuksia* 3" (Housing in Finland 1860–1965 – Growth

433 The current Finnish accounts for contract construction were estimated under the assumption that 12 percent of investments are covered by contracters, and six percent by repairs.

Studies 3).[434] He estimated the number of dwellings as well as value added and intermediate use, which also served as a basis for the volume calculations concerning the ownership of dwellings in Hjerppe's (1996) study. Heikkonen used the data on rentals to calculate a rental price index, which he used for computing the level of housing costs from 1948 backwards.[435] The level he arrived at seemed too high compared with the corresponding data from other countries, and Sakari Heikkinen therefore computed new housing figures.[436] The corrections produced a new housing-cost series for 1860–1938 that seems more realistic: the levels turned out to be about a third lower than in the series calculated by Heikkonen.

The level of output obtained from Heikkinen's index was used in the present study, while the level of intermediate use was taken directly from Heikkonen's study, as was the case in Hjerppe's study. However, additional calculations were made in order to better reflect the actual cost structure of housing services. Tamminen differentiated heating, water, cleaning, repairs, electricity and insurance costs, as well as wages and taxes, for housing in Helsinki for the period 1933–1938[437], and found that housing costs did not change dramatically during that time. The use of firewood for heating in both urban and non-urban areas was calculated based on an excellent study on the consumption of wood in Finland in 1929 conducted by Eino Saari.[438] The value per cubic metre was obtained from a study conducted by Timo Myllyntaus on the price of energy in Finland.[439] This estimate was compared with the result obtained by Eino Laurila, according to which the use of firewood accounted for 92 percent of the total use of energy in housing.[440] Laurila's figures were also used for estimating the cost of electricity in housing, while Tamminen's figures on cost structure were used for the other items. The value of repairs was based on Heikkonen's estimate, for which he used the number of dwellings. By estimating the use of wood for heating separately it was possible to obtain more reliable figures for housing costs in non-urban areas. Tamminen's figures for other costs accounted for only 16 percent of total intermediate use, while the consumption of wood alone accounted for nearly 60 percent, the use of coal for six percent, and repairs for over 10 percent.

The data on housing services provided by the government were taken directly from the government balance sheets. Wages and other value-added items were taken from Heikkonen's study.

434 Heikkonen (1971).
435 Heikkonen (197), p. 186, 204–205.
436 Hjerppe (1996), p. 54.
437 Tamminen (1945), p. 152, 162.
438 Saari (1934).
439 Myllyntaus (1999).
440 Laurila (1985).

Business services

Detailed data on public business services (research and development as well as technical services) were obtainable from the government balance sheets and from the official statistics on municipal finances.[441] The total output of these services was defined as the sum of wages and intermediate inputs plus the consumption of fixed capital, also according to the SNA.

In the case of private business services, data availability was very limited. Riitta Hjerppe based the estimates of the value of these services (mainly provided by lawyers, chimney sweeps, engineering offices, advertising agencies, and architects) in her Finnish growth study on labour-input figures.[442] These estimates for labour input and the proportion of intermediates are available in the growth-study archives.[443] Hjerppe's estimates were used in the present study for output, intermediate use and wages, but these figures do not give any information on intermediate use by product. It was therefore assumed that the intermediate use of business services was similar to that of both housing and post and telecommunications administration calculated in the present study.

It goes without saying that the method used for estimating intermediate use by product group was nothing more than pure assumption, which could be said about most of the service sector.

Statistical discrepancy

The statistical discrepancy between the supply and use of housing and business services was 1.8 percent.

Sources

Archives of the Helsinki University, Growth Study working papers.

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441 Valtion tilinpäätös (Government balance sheets) 1928; SVT XXXI Kuntien finanssitilastoa 6, 1928–1929; SVT XXXI Kuntien finanssitilastoa B, kauppalain ja maalaiskuntien finanssit 1, 1930–1931.

442 Hjerppe 81996), p.

443 Helsinki University archives, Growth Study working papers.

SVT XXXI Kuntien finanssitilastoa 6, 1928–1929.

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Valtion tilinpäätös vuodelta 1928 (Valtiopäivät asiakirjat 1929).

L Public administration

The output of public administration was calculated as the sum of wages, intermediate inputs and the consumption of fixed capital. There were extensive and reliable data available on both government and municipal administration. In practice, the calculations were carried out using detailed data on over 350 items covering wages and intermediates from the government balance sheets, as well as the official statistics on municipalities. In the case of municipal public administration, additional information on intermediate use was sought from the Statistical Yearbook of the City of Helsinki, which contains more accurate data on the intermediate use of municipal public administration.[444]

Statistical discrepancy

The statistical discrepancy between the supply and use of public services was 3.3 percent.

Sources

Statistical yearbook of Helsinki 1929.

SVT XXXI B1, Kuntien finanssitilastoa, Kauppalain ja maalaiskuntien finanssit vuosina 1930–1931.

SVT XXXI 6, Kuntien finanssitilastoa, Kaupunkikuntien finanssit vuosina 1928–1929.

Valtion tilinpäätös (Government balance sheets) 1928.

M Education

The method for arriving at the output of education was the same as for public administration. Statistics on public education were available in the government balance sheets as well as in the official statistics on municipalities.[445] Thus, both wages

444 Valtion tilinpäätös (Government balance sheets) 1928; SVT XXXI Kuntien finanssitilastoa 6, 1928–1929; SVT XXXI Kuntien finanssitilastoa B, kauppalain ja maalaiskuntien finanssit 1, 1930–1931; Statistical Yearbook of the City of Helsinki, 1929.

445 Valtion tilinpäätös (Government balance sheets) 1928; SVT XXXI Kuntien finanssitilastoa 6, 1928–1929; SVT XXXI Kuntien finanssitilastoa B, kauppalain ja maalaiskuntien finanssit 1, 1930–1931.

and intermediate use at the level of over 300 products were obtained. Additional information on municipal education was sought from the statistical yearbook.

Private education included a few private primary and other preparatory schools, secondary schools (providing general all-round education), vocational schools, folk high schools, and private universities and colleges. Riitta Hjerppe estimated the value added, output and wages of private education based on the number of teachers and their average incomes,[446] and this was used in this study. It was assumed that intermediate use by product group was the same as for municipal schools.

Statistical discrepancy

The statistical discrepancy between the supply and use of education was 4.3 percent.

Sources

Growth study working papers, Archives of the University of Helsinki.

Statistical yearbook of Helsinki 1929.

SVT XXXI B1, Kuntien finanssitilastoa, Kauppalain ja maalaiskuntien finanssit vuosina 1930–1931.

SVT XXXI 6, Kuntien finanssitilastoa, Kaupunkikuntien finanssit vuosina 1928–1929.

Valtion tilinpäätös (Government balance sheets) 1928.

N Health and social work

Data on public health and social work were obtained from the government balance sheets as well as from the official statistics on municipalities.[447] It was, again, very detailed and reliable.

Private-health and medical-care services include those provided by deaconesses, doctors, midwives and the staff of private hospitals. Riitta Hjerppe estimated the value added, output, and wages of these private services from the number of private doctors mentioned in the reports of the National Board of Health, and on the number of private midwives listed in the reports of the district medical officers (Medicinalstyrelsens årsberättelser – Annual Reports of the National Board of Health). The data on private-hospital staff were based on an estimate of patient days in private hospitals obtained from the Statistical Yearbook of Finland. Data on wages was found in the fiscal statistics and government balance sheets.[448] Intermediate use was assumed to have been the same for private health and medical

446 Growth study working papers in the University of Helsinki archives.

447 Valtion tilinpäätös (Government balance sheets) 1928.; SVT XXXI Kuntien finanssitilastoa 6, 1928–1929; SVT XXXI Kuntien finanssitilastoa B, kauppalain ja maalaiskuntien finanssit 1, 1930–1931.

448 Growth-study working papers housed in the University of Helsinki archives.

services as for municipal services. In addition, all figures were compared with data obtained from the committee report on municipal hospitals.[449]

Statistical discrepancy

The statistical discrepancy between the supply and use of health-care services was 4.9 percent.

Sources

Growth study working papers, Archives of the University of Helsinki.

KOM 15:1931 Kunnallissairaalakomitean mietintö.

SVT XXXI B1, Kuntien finanssitilastoa, Kauppalain ja maalaiskuntien finanssit vuosina 1930–1931.

SVT XXXI 6, Kuntien finanssitilastoa, Kaupunkikuntien finanssit vuosina 1928–1929.

Valtion tilinpäätös (Government balance sheets) 1928.

O Other services

Other services comprise religious services, museums, libraries and research institutes, for example. Data on government and municipal services again were reliable and readily available from the government balance sheets and official statistics on municipalities.[450]

The figures for other private services, including saunas, laundries, undertakers, cinemas, orchestras, artists, sports associations and religious organisations, and other organisational services were taken directly from calculations made by Riitta Hjerppe.[451] The estimates of the intermediate use of these services by product group were very rough , and were mainly based on the intermediate use of publicly produced services under the assumption that certain amounts of raw materials were required.

Statistical discrepancy

The statistical discrepancy between the supply and use of other services was 1.1 percent.

Sources

Growth study working papers, Archives of the University of Helsinki.

SVT XXXI B1, Kuntien finanssitilastoa, Kauppalain ja maalaiskuntien finanssit vuosina 1930–1931.

449 KOM 1931:15, Kunnallissairaalakomitean mietintö.

450 Valtion tilinpäätös (Government balance sheets) 1928; SVT XXXI Kuntien finanssitilastoa 6, 1928–1929; SVT XXXI Kuntien finanssitilastoa B, kauppalain ja maalaiskuntien finanssit 1, 1930–1931.

451 Growth study working papers, University of Helsinki archives.

SVT XXXI 6, Kuntien finanssitilastoa, Kaupunkikuntien finanssit vuosina 1928–1929.

Valtion tilinpäätös (Government balance sheets) 1928.

P *Household work*

Riitta Hjerppe's growth-study estimates of the value of household work were based on information on the number of housemaids obtained from the accident statistics, and on average earnings based on a civil servants' salary index. Her figures were used as such to describe the output of and wages for household work. It was assumed that no intermediate inputs were used, and that the value added comprised only wages.[452]

Statistical discrepancy

The statistical discrepancy between the supply and use of paid household work was 1.0 percent.

Sources

Growth study working papers, Archives of the University of Helsinki.

Foreign trade

Historical national-accounts data on foreign trade were compiled in the study *Suomen ulkomaankauppa 1917–1949* (Finnish foreign trade) conducted by Oksanen & Pihkala (1975). Data on both import and export are presented by product group, and are also divided according to the components of demand.

However, the approach chosen for dividing imports and exports into demand components is not described in enough detail in Oksanen & Pihkala's study[453], and it was necessary to collect primary data from the official statistics for the supply and use tables.[454] These statistics list imports at the level of over 600 products, and exports at the level of almost 300 products.

This data was compiled at the three-digit level of commodity classification (CPA) and incorporated into the supply and use tables once the domestic production tables had been finished. Because there were reliable data available on the use of exported products by the manufacturing industries, as well by other main sectors, it was also possible to construct separate use tables for domestic and imported products. The import data is given in c.i.f. prices and the export data in f.o.b. prices.

The data on foreign trade could be considered very reliable given the high-quality statistics available. Service exports and imports are not included in the series, however, and therefore they have not been estimated. It could be assumed, on the

452 Growth study working papers, University of Helsinki archives.
453 Oksanen & Pihkala (1975), p. 30.
454 SVT 1 A Ulkomaankauppa 48, 1928.

other hand, that the level of foreign trade in services in 1928 was not of significance, and therefore the possible error should not be significant either. This assumption also holds when the supply and use of services are compared.

Sources

Oksanen, Heikki & Pihkala, Erkki (1975), Suomen ulkomaankauppa 1917–1949. Kasvututkimuksia VI, Suomen Pankin julkaisuja, Helsinki.

SVT 1 A Ulkomaankauppa 48, 1928.

Private consumption

In the case of private household consumption, Eino H. Laurila used methods similar to input-output in order to estimate the share of consumption in different groups of products. Much attention has been given to factors affecting consumption. Laurila classified these factors into three groups: general factors (structure of society, habits), demand factors (income levels, income distribution), and supply factors (changes in production, imports). Thus, both the supply and demand side are explored to some extent in Laurila's study on private consumption.[455]

A household-consumption survey was carried out in Finland in 1928. There had been similar studies every now and then since 1908, but the 1928 study included as many as 1,224 households and was carried out with more diversified population grouping than before. It provided a solid basis for Laurila's study.[456] As a rule, Laurila did not resort to second-hand sources, and made an effort to employ all possible primary data, official statistics and other comparable material.

Laurila presents data on household consumption at the level of nearly 100 products. When employed in the construction of the supply and use tables this data was again compiled at the three-digit level of the commodity classification used, and was incorporated into the use table at the final stage. The data on household consumption could be considered very reliable for the most part.

Sources

Laurila, Eino H. (1985), Kulutus Suomen kansantaloudessa vuosina 1900–1975. Elinkeinoelämän tutkimuslaitoksen julkaisuja B 42, Helsinki.

Public consumption

The data on public consumption was relatively reliable. The final figures on government consumption were based on the government balance sheet as well as on additional budget material, whereas municipal data was obtained from the offi-

455 Laurila (1985), p. 13–22.
456 Ibidem., p. 37.

cial statistic on municipalities.[457] The basic sources are reliable, but there were difficulties in some cases separating certain items of expenditure due to the way information was presented in the balance sheets. Therefore, additional information was sought from other parliamentary documents. All in all, the data for public consumption could nevertheless be considered reliable.

Sources

SVT XXXI B1, Kuntien finanssitilastoa, Kauppalain ja maalaiskuntien finanssit vuosina 1930–1931.

SVT XXXI 6, Kuntien finanssitilastoa, Kaupunkikuntien finanssit vuosina 1928–1929.

Valtiopäiväasiakirjat 1929.

Valtion tilinpäätös (Government balance sheets) 1928.

Gross fixed capital formation

Of the final-demand components, that of gross fixed capital formation was the most difficult to assess. Hjeppe et al. (1981) and Hjerppe et al. (1984) studied investments, but the source used in the present study for the investment series on residential buildings and other house construction was E. Heikkonen's work on housing in Finland, and data on land and water construction was obtained from Kohi's study.[458] These data could be considered fairly reliable given the availability of data on government construction activity in particular.

Data on investments in machinery and transport equipment, on the other hand, was somewhat limited, and a more indirect approach was therefore used. First, the value of the production of machines and transport equipment was calculated from the manufacturing statistics. Imports of these products were then added, while exports and intermediate use were deducted on the basis of the data on foreign trade and manufacturing. The residual could be considered the value of investments in machinery and transport equipment.

It goes without saying that the method used for estimating gross fixed capital formation was not the best possible. However, given the lacking information on investments in the historical statistics, it was the best solution available, and it corresponds to the methodology used in the historical national accounts.

Sources

Heikkonen, Eero (1971), Asuntopalvelukset Suomessa 1860–1965. Kasvututkimuksia III, Suomen Pankin julkaisuja, Helsinki.

Heikkonen, Eero (1977), Talonrakennusinvestoinnit ja talonrakennuskanta Suomessa 1900–1970. Kasvututkimuksia IX, Suomen Pankin julkaisuja, Helsinki.

457 Valtion tilinpäätös 1928; Valtiopäivät asiakirjat 1929; Kuntien finanssitilastoa 6, 1928–1929; SVT XXXI Kuntien finanssitilastoa B, kauppalain ja maalaiskuntien finanssit 1, 1930–1931.

458 Heikkonen (1971); Heikkonen (1977); Kohi (1977).

Hjerppe, Riitta & Peltonen, Matti & Pihkala, Erkki (1981), Investoinnit ja niiden rahoitus Suomessa 1860–1979. Suomen talous 2010, Erillisselivitykset, SITRA B66, Helsinki.

Hjerppe, Riitta & Peltonen, Matti & Pihkala, Erkki (1984), Investment in Finland, 1860–1979. The Scandinavian Economic History Review 1984:1.

Kohi, Pertti (1977), Maa- ja vesirakennustoiminta Suomessa 1900–1960. Kasvututkimuksia VIII, Suomen Pankin julkaisuja, Helsinki.

SVT XVIII A 45 Teollisuustilastoa, 1928.

Taxes and subsidies

The data on taxes was based on M. Leppo's extensive study on state taxation on consumption in Finland during the post-war years.[459] This study gives detailed information on the taxation structure, its developments and level by product group. It also includes information on the amount of taxes collected.

Data on import and export duties were obtained from the foreign trade statistics. They give the quantity of products imported and exported, as well as the duty imposed, at the level of 900 products. This information was used in order to calculate the duties on products, which again were compiled at the three-digit level of CPA.

According to Hjerppe (1996) and the government balance sheets, there were no subsidies in 1928. All in all, the figures for taxes and subsidies could be considered very reliable.

Sources:

Hjerppe, Riitta (1996), Finland's Historical National Accounts 1860–1994: Calculation Methods and Statistical Tables. Jyväskylän yliopisto, Suomen historian julkaisuja 24, Jyväskylä.

Leppo, Matti (1938), Suomen valtion sodanjälkeisen kulutusverotuksen pääpiirteitä. Kansantaloudellisia tutkimuksia VIII, Helsinki.

SVT 1 A Ulkomaankauppa 48, 1928.

Valtion tilinpäätös (Government balance sheets) 1928.

Trade margins

The SNA recommends that the compilation of trade margins should start from the supply side (trade turnover by industry and product divided between wholesale and retail sales). However, because there was virtually no data available on trade turnover by industry (or product), a use-side approach was adopted instead.

The use of each product (at the level of over 100 product groups) was first calculated from the use table at purchasers' prices and divided between interme-

459 Leppo (1938).

diate use, consumption, exports and investments. For every single element in the use table the proportion of purchases that had been bought via trade was then estimated.

In the cases of intermediate consumption, export and investments it was assumed that all sales went through wholesale trade. Additional sources on agriculture were employed in order to estimate the share of production consumed by farms for their own use.[460] For the rest of the final-demand components it was assumed that 50 per cent of sales went through retail, a figure that was based partly on the information available on consumption by farms for their own use.

Next, data on trade margins by product was utilised in order to estimate the extent of the trade margin in the use of products at purchasers' prices. There is little or no information on *actual* trade margins by product available even today, however, and additional data was therefore sought. During the Second World War, the Ministry of Supply (*kansanhuoltoministeriö*) issued regulations on the maximum trade margin allowed for different products.[461] This data includes margins for both retail and wholesale trade at the level of 760 products, and it was used in order to calculate the trade margins included in the use of products at purchasers' prices.

It goes without saying that the data on trade margins obtained from the Ministry of Supply does not represent the margins that applied in 1928. In order to check the reliability of the 1928 figures , therefore, additional data covering the 1920s and 1930s were used. The Wholesaler's Union was founded in 1920, and there is business data from 1928 onwards, when the union started to publish annual statistics. More importantly, there is information on the average gross profit by product group that was considered *reasonable* by the union. Additional data on trade margins was sought from the newspapers of the different trade organisations.[462]

It goes without saying that the result obtained should be considered only relatively reliable as the actual trade margins probably differed from the estimated reasonable gross profits. However, the information on average trade margins that is available supports the data obtained from the Ministry of Supply. Average profit percentages also varied considerably by product group, which is also the situation in reality.

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Transport margins

According to ESA 95, the calculation of transport margins should start from the supply side with the identification of the transport services produced. However, it should only include transport services that contribute to the difference between the supply of products at basic prices and their use at purchasers' prices. Thus, only transport services that are arranged by the seller and invoiced separately to the purchaser should be considered transport margins.[463]

Data on goods transportation by different means was utilised in the estimation of transport margins. There is extensive data available on goods transported by rail as well as transport tariffs by product group and distance transported.[464] As far as road and inland-water transport are concerned, information on the division of transport services by different product groups is given in a study conducted by A. Kiiskinen.[465] In addition, information on the value of log floating was obtained from the growth study on forestry.[466]

The value of transport services by product group was thus obtained at the level of 50 products. It was estimated that only five percent of the value could be classified as transport margin according to the ESA 95 definition. This assumption was based on information available on how transport services were organised during the 1920s and 1930s.[467]

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Appendix 3.
Statistical tables

List of tables:

Table 1. Supply table for 1928 at basic prices, including transformation into purchasers' prices (FIM 1,000,000 at current prices) 228

Table 2. Use table for 1928 at purchasers' prices (FIM 1,000,000 at current prices) 234

Table 3. Use table for domestic products in 1928 at basic prices (FIM 1,000,000 at current prices) 240

Table 4. Use table for imports in 1928 at basic prices (FIM 1,000,000 at current prices) 246

Table 5. Input-output table for 1928 at basic prices (FIM 1,000,000 at current prices) 252

Table 6. Input coefficients for 1928 258

Table 7. Inverse matrix for 1928 264

Table 8. Labour input and labour-input coefficients for 1928. 269

Table 9. Capital input and capital input coefficients for 1928. 270

Table 1. Supply table for 1928 at basic prices, including a transformation into purchasers' prices (FIM 1,000,000 at current prices)

	Output of industries					
	Agri-culture, hunting	Forestry	Fishing	Mining	Manuf. of food products	Manuf. of textiles
Products	**A1**	**A2**	**B**	**C**	**DA**	**DB**
A1 Agriculture, hunting	9,316					2
A2 Forestry	2	3,768				
B Fishing			181			
C Mining				175		
DA Manuf. of food products	925				3,934	
DB Manuf. of textiles						1,649
DC Manuf. of leather products						35
DD Manuf. of wood and wood products						
DE Manuf. of pulp, paper and paper products				1	0	
DF Manuf. of coke and refined petroleum products				7		
DG Manuf. of chemical products					11	
DH Manuf. of rubber and plastic products						
DI Manuf. of non-metallic mineral products						
DJ Manuf. of basic metals and fabricated metal products						
DK Manuf. of machinery and equipment						
DL Manuf. of electrical and optical equipment				0		
DM Manuf. of transport equipment						
DN Manuf. of other products						
E Electricity, gas and water supply						
F Construction						
G Trade						
H Hotels and restaurants						
I Transport, storage, post and telecomm. services	467					
J Financial and insurance services						
K Housing and business services						
L Public administration						
M Education						
N Health and social-work services						
O Other services						
P Household work						
Total output	**10,710**	**3,768**	**181**	**183**	**3,945**	**1,685**

Table 1. Supply table for 1928 at basic prices, including a transformation into purchasers' prices (FIM 1,000,000 at current prices)

Output of industries						
Manuf. of leather products	Manuf. of wood and wood products	Manuf. of pulp, paper and paper products	Manuf. of coke and refined petroleum products	Manuf. Of chemical products	Manuf. of rubber and plastic products	
DC	DD	DE	DF	DG	DH	Products
1						A1 Agriculture, hunting
						A2 Forestry
						B Fishing
						C Mining
				36		DA Manuf. of food products
2		1				DB Manuf. of textiles
813					73	DC Manuf. of leather products
	3,321					DD Manuf. of wood and wood products
	0	2,813		1		DE Manuf. of pulp, paper and paper products
				5		DF Manuf. of coke and refined petroleum products
1		4		322		DG Manuf. of chemical products
					34	DH Manuf. of rubber and plastic products
					0	DI Manuf. of non-metallic mineral products
	0				0	DJ Manuf. of basic metals and fabricated metal products
	1					DK Manuf. of machinery and equipment
		0				DL Manuf. of electrical and optical equipment
	0					DM Manuf. of transport equipment
0	174	0		1	0	DN Manuf. of other products
				0		E Electricity, gas and water supply
						F Construction
						G Trade
						H Hotels and restaurants
						I Transport, storage, post and telecomm. services
						J Financial and insurance services
						K Housing and business services
						L Public administration
						M Education
						N Health and social-work services
						O Other services
						P Household work
818	**3,497**	**2,818**		**366**	**107**	**Total output**

Table 1. Supply table for 1928 at basic prices, including a transformation into purchasers' prices (FIM 1,000,000 at current prices)

		Output of industries					
		Manuf. of non-metallic mineral products	Manuf. of basic metals and fabricated metal products	Manuf. of machinery and equipment	Manuf. of electrical and optical equipment	Manuf. of transport equipment	Manuf. of other products
Products		**DI**	**DJ**	**DK**	**DL**	**DM**	**DN**
A1	Agriculture, hunting						
A2	Forestry		9				
B	Fishing						
C	Mining	2					
DA	Manuf. of food products						
DB	Manuf. of textiles			2			
DC	Manuf. of leather products				1		
DD	Manuf. of wood and wood products		10				0
DE	Manuf. of pulp, paper and paper products	14	10				
DF	Manuf. of coke and refined petroleum products						
DG	Manuf. of chemical products	0		7			
DH	Manuf. of rubber and plastic products	1					0
DI	Manuf. of non-metallic mineral products	517	22				
DJ	Manuf. of basic metals and fabricated metal products	0	674		1		1
DK	Manuf. of machinery and equipment		81	513	0		
DL	Manuf. of electrical and optical equipment	1	44	26	89		
DM	Manuf. of transport equipment		17	7		282	
DN	Manuf. of other products		19				283
E	Electricity, gas and water supply						
F	Construction						
G	Trade						
H	Hotels and restaurants						
I	Transport, storage, post and telecomm. services						
J	Financial and insurance services						
K	Housing and business services						
L	Public administration						
M	Education						
N	Health and social-work services						
O	Other services						
P	Household work						
Total output		**535**	**886**	**555**	**91**	**282**	**285**

Table 1. Supply table for 1928 at basic prices, including a transformation into purchasers' prices (FIM 1,000,000 at current prices)

Output of industries							
Electricity, gas and water supply	Construc-tion	Trade	Hotels and restaurants	Transport, storage, post and telec. services	Financial and insurance services		
E	F	G	H	I	J		Products
						A1	Agriculture, hunting
						A2	Forestry
						B	Fishing
						C	Mining
						DA	Manuf. of food products
						DB	Manuf. of textiles
						DC	Manuf. of leather products
						DD	Manuf. of wood and wood products
						DE	Manuf. of pulp, paper and paper products
14						DF	Manuf. of coke and refined petroleum products
0						DG	Manuf. of chemical products
						DH	Manuf. of rubber and plastic products
0						DI	Manuf. of non-metallic mineral products
						DJ	Manuf. of basic metals and fabricated metal products
						DK	Manuf. of machinery and equipment
						DL	Manuf. of electrical and optical equipment
						DM	Manuf. of transport equipment
						DN	Manuf. of other products
482						E	Electricity, gas and water supply
	4,522					F	Construction
		3,572				G	Trade
			655			H	Hotels and restaurants
				2,923		I	Transport, storage, post and telecomm. services
					1,013	J	Financial and insurance services
						K	Housing and business services
						L	Public administration
						M	Education
						N	Health and social-work services
						O	Other services
						P	Household work
496	**4,522**	**3,572**	**655**	**2,923**	**1,013**	**Total output**	

Table 1. Supply table for 1928 at basic prices, including a transformation into purchasers' prices (FIM 1,000,000 at current prices)

	Output of industries					
	Housing and business services	Public adminis-tration	Education	Health and social-work services	Other services	Household work
Products	**K**	**L**	**M**	**N**	**O**	**P**
A1 Agriculture, hunting						
A2 Forestry						
B Fishing						
C Mining						
DA Manuf. of food products						
DB Manuf. of textiles						
DC Manuf. of leather products						
DD Manuf. of wood and wood products						
DE Manuf. of pulp, paper and paper products						
DF Manuf. of coke and refined petroleum products						
DG Manuf. of chemical products						
DH Manuf. of rubber and plastic products						
DI Manuf. of non-metallic mineral products						
DJ Manuf. of basic metals and fabricated metal products						
DK Manuf. of machinery and equipment						
DL Manuf. of electrical and optical equipment						
DM Manuf. of transport equipment						
DN Manuf. of other products						
E Electricity, gas and water supply						
F Construction						
G Trade						
H Hotels and restaurants						
I Transport, storage, post and telecomm. services						
J Financial and insurance services						
K Housing and business services	3,163					
L Public administration		1,045				
M Education			790			
N Health and social-work services				694		
O Other services					320	
P Household work						301
Total output	**3,163**	**1,045**	**790**	**694**	**320**	**301**

Table 1. **Supply table for 1928 at basic prices, including a transformation into purchasers' prices (FIM 1,000,000 at current prices)**

Total domestic supply	Imports	Total supply at basic prices	Price formation: Trade margins	Price formation: Transport margins	Price formation: Taxes and subsidies	Total supply at purchasers' prices		Products
9,320	1,450	**10,770**	756	2	356	**11,883**	A1	Agriculture, hunting
3,779	42	**3,821**	231	38	3	**4,093**	A2	Forestry
181	4	**184**	12	0	9	**205**	B	Fishing
177	219	**396**	41	3	0	**440**	C	Mining
4,895	1,775	**6,671**	845	5	746	**8,267**	DA	Manuf. of food products
1,654	1,061	**2,714**	175	1	158	**3,049**	DB	Manuf. of textiles
922	160	**1,081**	92	0	11	**1,184**	DC	Manuf. of leather products
3,330	31	**3,361**	381	10	11	**3,763**	DD	Manuf. of wood and wood products
2,839	59	**2,898**	281	8	5	**3,192**	DE	Manuf. of pulp, paper and paper products
25	251	**276**	56	1	59	**393**	DF	Manuf. of coke and refined petroleum products
346	472	**818**	75	2	20	**914**	DG	Manuf. of chemical products
35	92	**128**	6		35	**168**	DH	Manuf. of rubber and plastic products
539	188	**727**	76	1	21	**825**	DI	Manuf. of non-metallic mineral products
677	893	**1,569**	143	3	89	**1,804**	DJ	Manuf. of basic metals and fabricated metal products
595	399	**995**	132	0	12	**1,138**	DK	Manuf. of machinery and equipment
160	305	**465**	65	1	28	**559**	DL	Manuf. of electrical and optical equipment
305	506	**811**	56		46	**913**	DM	Manuf. of transport equipment
479	104	**583**	109	1	47	**739**	DN	Manuf. of other products
483		**483**				**483**	E	Electricity, gas and water supply
4,522		**4,522**				**4,522**	F	Construction
3,572		**3,572**	−3,532			**40**	G	Trade
655		**655**				**655**	H	Hotels and restaurants
3,390		**3,390**		−76		**3,314**	I	Transport, storage, post and telecomm. services
1,013		**1,013**				**1,013**	J	Financial and insurance services
3,163		**3,163**				**3,163**	K	Housing and business services
1,045		**1,045**				**1,045**	L	Public administration
790		**790**				**790**	M	Education
694		**694**				**694**	N	Health and social-work services
320	2	**322**			30	**353**	O	Other services
301		**301**				**301**	P	Household work
50,205	**8,011**	**58,216**	**0**	**0**	**1,685**	**59,901**	**Total output**	

Table 2. Use table for 1928 at purchasers' prices (FIM 1,000,000 at current prices)

	Input of industries					
	Agri-culture, hunting	Forestry	Fishing	Mining	Manuf. of food products	Manuf. of textiles
Products	**A1**	**A2**	**B**	**C**	**DA**	**DB**
A1 Agriculture, hunting	4,404				1,563	324
A2 Forestry	7			0	17	6
B Fishing					8	
C Mining				19	13	10
DA Manuf. of food products	133				1,065	
DB Manuf. of textiles			1			577
DC Manuf. of leather products						27
DD Manuf. of wood and wood products				0	3	3
DE Manuf. of pulp, paper and paper products				0	22	0
DF Manuf. of coke and refined petroleum products	40	13	27	0	1	1
DG Manuf. of chemical products	206			0	7	29
DH Manuf. of rubber and plastic products						
DI Manuf. of non-metallic mineral products					1	
DJ Manuf. of basic metals and fabricated metal products		1			2	
DK Manuf. of machinery and equipment	116	1		2	6	9
DL Manuf. of electrical and optical equipment						
DM Manuf. of transport equipment			3			
DN Manuf. of other products	34	1				1
E Electricity, gas and water supply	30			3	7	15
F Construction	120	1				
G Trade						
H Hotels and restaurants						
I Transport, storage, post and telecomm. services	97	266		1	62	23
J Financial and insurance services	33			0	0	0
K Housing and business services						
L Public administration						
M Education						
N Health and social-work services	68					
O Other services	24					
P Household work						
Intermediate consumption at purchasers' prices	**5,312**	**282**	**31**	**25**	**2,777**	**1,025**
Compensation to employees	1,661	1,141		45	252	334
Other value added components	3,737	2,345	150	113	916	327
Value added at basic prices	**5,398**	**3,486**	**150**	**158**	**1,168**	**661**
Output at basic prices	**10,710**	**3,768**	**181**	**183**	**3,945**	**1,685**

Table 2. Use table for 1928 at purchasers' prices (FIM 1,000,000 at current prices)

Input of industries							
Manuf. of leather products	Manuf. of wood and wood products	Manuf. of pulp, paper and paper products	Manuf. of coke and refined petroleum products	Manuf. Of chemical products	Manuf. of rubber and plastic products		
DC	DD	DE	DF	DG	DH		Products
265		0		21		A1	Agriculture, hunting
2	2,138	525		7	17	A2	Forestry
						B	Fishing
1	2	15		14	0	C	Mining
	16			47		DA	Manuf. of food products
17	0	10		0	18	DB	Manuf. of textiles
247						DC	Manuf. of leather products
3	202	175		2	1	DD	Manuf. of wood and wood products
1	0	397		0		DE	Manuf. of pulp, paper and paper products
0		1		1	1	DF	Manuf. of coke and refined petroleum products
31	4	112		115	3	DG	Manuf. of chemical products
					5	DH	Manuf. of rubber and plastic products
	0	21		2		DI	Manuf. of non-metallic mineral products
	2					DJ	Manuf. of basic metals and fabricated metal products
1	30	49		1	1	DK	Manuf. of machinery and equipment
		0				DL	Manuf. of electrical and optical equipment
						DM	Manuf. of transport equipment
						DN	Manuf. of other products
2	30	61		2	1	E	Electricity, gas and water supply
						F	Construction
						G	Trade
						H	Hotels and restaurants
8	325	216		9	3	I	Transport, storage, post and telecomm. services
0	0	2		0	0	J	Financial and insurance services
						K	Housing and business services
						L	Public administration
						M	Education
						N	Health and social-work services
						O	Other services
						P	Household work
579	**2,752**	**1,585**		**221**	**52**		**Intermediate consumption at purchasers' prices**
133	666	381		24	18		Compensation to employees
106	78	853		121	38		Other value added components
239	**745**	**1,233**		**145**	**56**		**Value added at basic prices**
818	**3,497**	**2,818**		**366**	**107**		**Output at basic prices**

Table 2. Use table for 1928 at purchasers' prices (FIM 1,000,000 at current prices)

		Input of industries					
		Manuf. of non-metallic mineral products	Manuf. of basic metals and fabricated metal products	Manuf. of machinery and equipment	Manuf. of electrical and optical equipment	Manuf. of transport equipment	Manuf. of other products
Products		**DI**	**DJ**	**DK**	**DL**	**DM**	**DN**
A1	Agriculture, hunting						1
A2	Forestry	15	16	3	0	0	8
B	Fishing						
C	Mining	88	6	1	0	0	0
DA	Manuf. of food products						0
DB	Manuf. of textiles	6					19
DC	Manuf. of leather products				0		8
DD	Manuf. of wood and wood products	10	8	9	0	11	4
DE	Manuf. of pulp, paper and paper products	1					3
DF	Manuf. of coke and refined petroleum products	1	6	3	0	3	3
DG	Manuf. of chemical products	14	8	5	0	3	4
DH	Manuf. of rubber and plastic products		0	0		0	
DI	Manuf. of non-metallic mineral products	43	3				
DJ	Manuf. of basic metals and fabricated metal products	3	380	150	10	62	48
DK	Manuf. of machinery and equipment	5	47	30	1	15	1
DL	Manuf. of electrical and optical equipment				17		
DM	Manuf. of transport equipment		7	12		14	
DN	Manuf. of other products						26
E	Electricity, gas and water supply	9	15	2	1	0	1
F	Construction						
G	Trade						
H	Hotels and restaurants						
I	Transport, storage, post and telecomm. services	17	29	4	0	3	5
J	Financial and insurance services	0	0	0	0	0	0
K	Housing and business services						
L	Public administration						
M	Education						
N	Health and social-work services						
O	Other services						
P	Household work						
Intermediate consumption at purchasers' prices		**213**	**525**	**218**	**28**	**112**	**132**
Compensation to employees		135	198	225	21	88	63
Other value added components		187	162	112	42	81	90
Value added at basic prices		**322**	**360**	**337**	**63**	**170**	**153**
Output at basic prices		**535**	**886**	**555**	**91**	**282**	**285**

Table 2. Use table for 1928 at purchasers' prices (FIM 1,000,000 at current prices)

Input of industries							
Electricity, gas and water supply	Construc-tion	Trade	Hotels and restaurants	Transport, storage, post and telec. services	Financial and insurance services		
E	F	G	H	I	J		Products
			41	15		A1	Agriculture, hunting
0	16	55		118	55	A2	Forestry
			5			B	Fishing
75	89			32	7	C	Mining
			233	12		DA	Manuf. of food products
	100		17			DB	Manuf. of textiles
				3		DC	Manuf. of leather products
	356			3		DD	Manuf. of wood and wood products
	18	120	17	13	14	DE	Manuf. of pulp, paper and paper products
0	13			162	6	DF	Manuf. of coke and refined petroleum products
2	63			10		DG	Manuf. of chemical products
				101		DH	Manuf. of rubber and plastic products
4	630					DI	Manuf. of non-metallic mineral products
11	897	1		13		DJ	Manuf. of basic metals and fabricated metal products
	70			69		DK	Manuf. of machinery and equipment
	238	22		6	9	DL	Manuf. of electrical and optical equipment
	3	12		140		DM	Manuf. of transport equipment
	46	11	20	9	0	DN	Manuf. of other products
6	28		14	23	23	E	Electricity, gas and water supply
5	27		9	104	23	F	Construction
				34		G	Trade
						H	Hotels and restaurants
	47	129		140		I	Transport, storage, post and telecomm. services
		81		56		J	Financial and insurance services
	3	282	53	25	78	K	Housing and business services
				0		L	Public administration
						M	Education
	0					N	Health and social-work services
				8		O	Other services
						P	Household work
104	**2,644**	**714**	**408**	**1,097**	**215**		**Intermediate consumption at purchasers' prices**
72	1,603	886	101	1,094	237		Compensation to employees
321	275	1,971	146	732	560		Other value added components
393	**1,878**	**2,858**	**247**	**1,826**	**798**		**Value added at basic prices**
496	**4,522**	**3,572**	**655**	**2,923**	**1,013**		**Output at basic prices**

Table 2. Use table for 1928 at purchasers' prices (FIM 1,000,000 at current prices)

	Input of industries						
	Housing and business services	Public administration	Education	Health and social-work services	Other services	Household work	Total intermediate use
Products	**K**	**L**	**M**	**N**	**O**	**P**	
A1 Agriculture, hunting		33	6	14			**6,688**
A2 Forestry	748	31	46	70	10		**3,912**
B Fishing							**12**
C Mining	5	3	7	15			**403**
DA Manuf. of food products		64	44	101			**1,716**
DB Manuf. of textiles		39		43	2		**849**
DC Manuf. of leather products		2					**287**
DD Manuf. of wood and wood products		0					**788**
DE Manuf. of pulp, paper and paper products	1	12	39	0	0		**659**
DF Manuf. of coke and refined petroleum products	67	8	3	7			**367**
DG Manuf. of chemical products	0	4	0	18	2		**641**
DH Manuf. of rubber and plastic products							**107**
DI Manuf. of non-metallic mineral products	0		1	1			**705**
DJ Manuf. of basic metals and fabricated metal products	0	3	0	1	1		**1,586**
DK Manuf. of machinery and equipment	0	44	0	0			**500**
DL Manuf. of electrical and optical equipment	1	7	1	34	1		**337**
DM Manuf. of transport equipment		30		0			**221**
DN Manuf. of other products	1	19	43	2	1		**214**
E Electricity, gas and water supply	142	13	36	33	6		**503**
F Construction	167	22	50	3	8		**542**
G Trade							**34**
H Hotels and restaurants							
I Transport, storage, post and telecomm. services	1	22	1	1	0		**1,408**
J Financial and insurance services	22						**195**
K Housing and business services	5	7	43	38	4		**538**
L Public administration							**0**
M Education		0					**0**
N Health and social-work services		3	0	0			**72**
O Other services	27		0				**59**
P Household work							
Intermediate consumption at purchasers' prices	**1,187**	**369**	**322**	**380**	**37**		**23,344**
Compensation to employees	1,593	677	459	240	283	301	**12,931**
Other value added components	382		9	75			**13,930**
Value added at basic prices	**1,975**	**677**	**468**	**315**	**283**	**301**	**26,861**
Output at basic prices	**3,163**	**1,045**	**790**	**694**	**320**	**301**	**50,205**

Table 2. Use table for 1928 at purchasers' prices (FIM 1,000,000 at current prices)

Final uses								
Household consumption	Government final consumption	Gross fixed capital formation	Exports	Total use	Statistical discrepancy + inventory change	Total supply		
								Products
5,068			128	**11,884**	0	**11,883**	A1	Agriculture, hunting
			307	**4,219**	−126	**4,093**	A2	Forestry
195			8	**215**	−10	**205**	B	Fishing
			17	**420**	20	**440**	C	Mining
6,001			529	**8,246**	21	**8,267**	DA	Manuf. of food products
2,165			27	**3,041**	8	**3,049**	DB	Manuf. of textiles
885			2	**1,175**	10	**1,184**	DC	Manuf. of leather products
29			3,181	**3,999**	−237	**3,763**	DD	Manuf. of wood and wood products
600			1,871	**3,130**	62	**3,192**	DE	Manuf. of pulp, paper and paper products
42			0	**409**	−16	**393**	DF	Manuf. of coke and refined petroleum products
179			36	**857**	57	**914**	DG	Manuf. of chemical products
51				**158**	11	**168**	DH	Manuf. of rubber and plastic products
112			10	**827**	−2	**825**	DI	Manuf. of non-metallic mineral products
175			21	**1,782**	22	**1,804**	DJ	Manuf. of basic metals and fabricated metal products
86		530	15	**1,131**	7	**1,138**	DK	Manuf. of machinery and equipment
250			0	**588**	−29	**559**	DL	Manuf. of electrical and optical equipment
173		540	7	**940**	−28	**913**	DM	Manuf. of transport equipment
502			29	**746**	−7	**739**	DN	Manuf. of other products
				503	−20	**483**	E	Electricity, gas and water supply
		4,004		**4,546**	−23	**4,522**	F	Construction
8				**42**	−2	**40**	G	Trade
442			190	**632**	23	**655**	H	Hotels and restaurants
1,348			603	**3,359**	−45	**3,314**	I	Transport, storage, post and telecomm. services
818				**1,013**	0	**1,013**	J	Financial and insurance services
2,568				**3,105**	57	**3,163**	K	Housing and business services
	1,080			**1,080**	−35	**1,045**	L	Public administration
108	648			**756**	34	**790**	M	Education
200	456			**728**	−34	**694**	N	Health and social-work services
297			0	**356**	−4	**353**	O	Other services
304				**304**	−3	**301**	P	Household work
22,605	**2,184**	**5,074**	**6,984**	**60,191**	**−290**	**59,901**		**Total use of products at purchasers' prices**

Table 3. Use table for domestic products in 1928 at basic prices (FIM 1,000,000 at current prices)

	Input of industries					
	Agri-culture, hunting	Forestry	Fishing	Mining	Manuf. of food products	Manuf. of textiles
Products	**A1**	**A2**	**B**	**C**	**DA**	**DB**
A1 Agriculture, hunting	3,918				835	35
A2 Forestry	7			0	16	6
B Fishing					3	
C Mining				15	0	
DA Manuf. of food products	114				287	
DB Manuf. of textiles			1			236
DC Manuf. of leather products						7
DD Manuf. of wood and wood products				0	2	1
DE Manuf. of pulp, paper and paper products				0	18	
DF Manuf. of coke and refined petroleum products		1	3			0
DG Manuf. of chemical products	56			0	3	2
DH Manuf. of rubber and plastic products						
DI Manuf. of non-metallic mineral products					1	
DJ Manuf. of basic metals and fabricated metal products		0			0	
DK Manuf. of machinery and equipment	100	0		2	6	8
DL Manuf. of electrical and optical equipment						
DM Manuf. of transport equipment			1			
DN Manuf. of other products	28	1				
E Electricity, gas and water supply	30			3	7	15
F Construction	120	1				
G Trade	343	2	4	2	201	58
H Hotels and restaurants						
I Transport, storage, post and telecomm. services	98	266	0	1	63	23
J Financial and insurance services	33			0	0	0
K Housing and business services						
L Public administration						
M Education						
N Health and social-work services	68					
O Other services	22					
P Household work	0					
Use of domestic products at basic prices	**4,937**	**271**	**9**	**23**	**1,443**	**391**
Use of imported products	316	9	18	2	1,032	537
Product taxes	59	2	4	0	303	96
Intermediate consumption at purchasers' prices	**5,312**	**282**	**31**	**25**	**2,777**	**1,025**
Compensation to employees	1,661	1,141		45	252	334
Other value added components	3,737	2,345	150	113	916	327
Value added at basic prices	**5,398**	**3,486**	**150**	**158**	**1,168**	**661**
Output at basic prices	**10,710**	**3,768**	**181**	**183**	**3,945**	**1,685**

Table 3. Use table for domestic products in 1928 at basic prices (FIM 1,000,000 at current prices)

Input of industries							
Manuf. of leather products	Manuf. of wood and wood products	Manuf. of pulp, paper and paper products	Manuf. of coke and refined petroleum products	Manuf. Of chemical products	Manuf. of rubber and plastic products		
DC	DD	DE	DF	DG	DH		Products
29		0		2		A1	Agriculture, hunting
2	1,975	491		6	1	A2	Forestry
						B	Fishing
0	0	9		0	0	C	Mining
	2			8		DA	Manuf. of food products
13	0	4			7	DB	Manuf. of textiles
125						DC	Manuf. of leather products
3	161	157		1	1	DD	Manuf. of wood and wood products
	0	340		0		DE	Manuf. of pulp, paper and paper products
				0	0	DF	Manuf. of coke and refined petroleum products
2	4	6		39	0	DG	Manuf. of chemical products
					1	DH	Manuf. of rubber and plastic products
	0	16		2		DI	Manuf. of non-metallic mineral products
	1					DJ	Manuf. of basic metals and fabricated metal products
1	27	43		1	1	DK	Manuf. of machinery and equipment
		0				DL	Manuf. of electrical and optical equipment
						DM	Manuf. of transport equipment
						DN	Manuf. of other products
2	30	61		2	1	E	Electricity, gas and water supply
						F	Construction
38	142	100		18	3	G	Trade
						H	Hotels and restaurants
8	345	223		10	3	I	Transport, storage, post and telecomm. services
0	0	2		0	0	J	Financial and insurance services
						K	Housing and business services
						L	Public administration
						M	Education
						N	Health and social-work services
						O	Other services
						P	Household work
224	**2,688**	**1,452**		**90**	**17**		**Use of domestic products at basic prices**
304	57	125		116	32		Use of imported products
52	8	7		15	3		Product taxes
579	**2,752**	**1,585**		**221**	**52**		**Intermediate consumption at purchasers' prices**
133	666	381		24	18		Compensation to employees
106	78	853		121	38		Other value added components
239	**745**	**1,233**		**145**	**56**		**Value added at basic prices**
818	**3,497**	**2,818**		**366**	**107**		**Output at basic prices**

Table 3. Use table for domestic products in 1928 at basic prices (FIM 1,000,000 at current prices)

	Input of industries					
	Manuf. of non-metallic mineral products	Manuf. of basic metals and fabricated metal products	Manuf. of machinery and equipment	Manuf. of electrical and optical equipment	Manuf. of transport equipment	Manuf. of other products
Products	**DI**	**DJ**	**DK**	**DL**	**DM**	**DN**
A1 Agriculture, hunting						1
A2 Forestry	14	15	3	0	0	8
B Fishing						
C Mining	30	1	0			
DA Manuf. of food products						
DB Manuf. of textiles	6					8
DC Manuf. of leather products				0		
DD Manuf. of wood and wood products	9	7	8	0	9	4
DE Manuf. of pulp, paper and paper products	1					3
DF Manuf. of coke and refined petroleum products		1	1		1	
DG Manuf. of chemical products	4	5	2	0	1	1
DH Manuf. of rubber and plastic products		0	0		0	
DI Manuf. of non-metallic mineral products	23	0				
DJ Manuf. of basic metals and fabricated metal products	1	131	56	7	20	1
DK Manuf. of machinery and equipment	5	17	13	0	7	1
DL Manuf. of electrical and optical equipment				3		
DM Manuf. of transport equipment		0	0		3	
DN Manuf. of other products						12
E Electricity, gas and water supply	9	15	2	1	0	1
F Construction						
G Trade	17	40	18	3	9	11
H Hotels and restaurants						
I Transport, storage, post and telecomm. services	18	30	4	0	3	5
J Financial and insurance services	0	0	0	0	0	0
K Housing and business services						
L Public administration						
M Education						
N Health and social-work services						
O Other services						
P Household work						
Use of domestic products at basic prices	**136**	**262**	**108**	**14**	**54**	**56**
Use of imported products	75	241	101	13	53	66
Product taxes	2	22	9	1	5	9
Intermediate consumption at purchasers' prices	**213**	**525**	**218**	**28**	**112**	**132**
Compensation to employees	135	198	225	21	88	63
Other value added components	187	162	112	42	81	90
Value added at basic prices	**322**	**360**	**337**	**63**	**170**	**153**
Output at basic prices	**535**	**886**	**555**	**91**	**282**	**285**

Table 3. Use table for domestic products in 1928 at basic prices (FIM 1,000,000 at current prices)

Input of industries							
Electricity, gas and water supply	Construc-tion	Trade	Hotels and restaurants	Transport, storage, post and telec. services	Financial and insurance services		
E	F	G	H	I	J		Products
			35	13		A1	Agriculture, hunting
0	15	52		110	51	A2	Forestry
			4			B	Fishing
	48			18	4	C	Mining
			144	8		DA	Manuf. of food products
	94		9			DB	Manuf. of textiles
				3		DC	Manuf. of leather products
	311			3		DD	Manuf. of wood and wood products
	15	103	14	11	12	DE	Manuf. of pulp, paper and paper products
0	1			18	1	DF	Manuf. of coke and refined petroleum products
	46			4		DG	Manuf. of chemical products
				15		DH	Manuf. of rubber and plastic products
0	425					DI	Manuf. of non-metallic mineral products
	404	1		1		DJ	Manuf. of basic metals and fabricated metal products
	30			30		DK	Manuf. of machinery and equipment
	116	5		1	2	DL	Manuf. of electrical and optical equipment
	1			51		DM	Manuf. of transport equipment
	8	8	14	6	0	DN	Manuf. of other products
6	28		14	23	23	E	Electricity, gas and water supply
5	27		9	104	23	F	Construction
8	230	19	32	94	7	G	Trade
						H	Hotels and restaurants
0	52	130	0	142	1	I	Transport, storage, post and telecomm. services
		81		56		J	Financial and insurance services
	3	282	53	25	78	K	Housing and business services
				0	. .	L	Public administration
						M	Education
	0					N	Health and social-work services
				7		O	Other services
						P	Household work
20	**1,856**	**679**	**329**	**742**	**201**		**Use of domestic products at basic prices**
82	715	31	56	298	12		Use of imported products
1	74	3	23	57	1		Product taxes
104	**2,644**	**714**	**408**	**1,097**	**215**		**Intermediate consumption at purchasers' prices**
72	1,603	886	101	1,094	237		Compensation to employees
321	275	1,971	146	732	560		Other value added components
393	**1,878**	**2,858**	**247**	**1,826**	**798**		**Value added at basic prices**
496	**4,522**	**3,572**	**655**	**2,923**	**1,013**		**Output at basic prices**

Table 3. Use table for domestic products in 1928 at basic prices (FIM 1,000,000 at current prices)

		Input of industries						
		Housing and business services	Public administration	Education	Health and social-work services	Other services	Household work	Total intermediate use
Products		**K**	**L**	**M**	**N**	**O**	**P**	
A1	Agriculture, hunting		28	5	12	0		**4,913**
A2	Forestry	700	29	43	65	10		**3,618**
B	Fishing							**7**
C	Mining	3	2	4	8			**142**
DA	Manuf. of food products		40	27	62			**692**
DB	Manuf. of textiles		22		24	1		**424**
DC	Manuf. of leather products		2					**137**
DD	Manuf. of wood and wood products		0					**677**
DE	Manuf. of pulp, paper and paper products	1	10	34	0	0		**564**
DF	Manuf. of coke and refined petroleum products	7	1	0	1			**37**
DG	Manuf. of chemical products	0	2	0	7	1		**184**
DH	Manuf. of rubber and plastic products							**17**
DI	Manuf. of non-metallic mineral products	0		0	0			**467**
DJ	Manuf. of basic metals and fabricated metal products	0	0	0	0	0		**625**
DK	Manuf. of machinery and equipment	0	19	0	0			**311**
DL	Manuf. of electrical and optical equipment	0	1	0	7	0		**136**
DM	Manuf. of transport equipment		11		0			**67**
DN	Manuf. of other products	1	13	29	1	1		**121**
E	Electricity, gas and water supply	142	13	36	33	6		**503**
F	Construction	167	22	50	3	8		**542**
G	Trade	51	27	19	26	1		**1,523**
H	Hotels and restaurants							**0**
I	Transport, storage, post and telecomm. services	8	22	1	2	1		**1,459**
J	Financial and insurance services	22						**195**
K	Housing and business services	5	7	43	38	4		**538**
L	Public administration							**0**
M	Education		0					**0**
N	Health and social-work services		3	0	0			**72**
O	Other services	24		0				**54**
P	Household work							**0**
Use of domestic products at basic prices		**1,131**	**274**	**293**	**290**	**33**		**18,023**
Use of imported products		44	81	21	75	4		**4,516**
Product taxes		13	13	7	15	0		**805**
Intermediate consumption at purchasers' prices		**1,187**	**369**	**322**	**380**	**37**		**23,344**
Compensation to employees		1,593	677	459	240	283	301	**12,931**
Other value added components		382		9	75			**13,930**
Value added at basic prices		**1,975**	**677**	**468**	**315**	**283**	**301**	**26,861**
Output at basic prices		**3,163**	**1,045**	**790**	**694**	**320**	**301**	**50,205**

Table 3. Use table for domestic products in 1928 at basic prices (FIM 1,000,000 at current prices)

Final uses								
House-hold con-sumption	Govern-ment final con-sumption	Gross fixed capital forma-tion	Exports	Total use	Statisti-cal dis-crepancy + inven-tory change	Total supply		Products
4,287			119	9,320	0	9,320	A1	Agriculture, hunting
			287	3,905	−126	3,779	A2	Forestry
176			8	190	−10	181	B	Fishing
			15	157	20	177	C	Mining
3,711			471	4,874	21	4,895	DA	Manuf. of food products
1,197			25	1,646	8	1,654	DB	Manuf. of textiles
773			2	912	10	922	DC	Manuf. of leather products
25			2,865	3,567	−237	3,330	DD	Manuf. of wood and wood products
516			1,698	2,777	62	2,839	DE	Manuf. of pulp, paper and paper products
5			0	41	−16	25	DF	Manuf. of coke and refined petroleum products
71			33	288	57	346	DG	Manuf. of chemical products
8				24	11	35	DH	Manuf. of rubber and plastic products
65			9	541	−2	539	DI	Manuf. of non-metallic mineral products
11			19	655	22	677	DJ	Manuf. of basic metals and fabricated metal products
37		227	14	588	7	595	DK	Manuf. of machinery and equipment
52			0	189	−29	160	DL	Manuf. of electrical and optical equipment
63		196	6	332	−28	305	DM	Manuf. of transport equipment
341			25	486	−7	479	DN	Manuf. of other products
				503	−20	483	E	Electricity, gas and water supply
		4,004		4,546	−23	4,522	F	Construction
1,386		94	571	3,574	−2	3,572	G	Trade
442			190	632	23	655	H	Hotels and restaurants
1,357		0	619	3,435	−45	3,390	I	Transport, storage, post and telecomm. services
818				1,013	0	1,013	J	Financial and insurance services
2,568				3,105	57	3,163	K	Housing and business services
	1,080			1,080	−35	1,045	L	Public administration
108	648			756	34	790	M	Education
200	456			728	−34	694	N	Health and social-work services
270			0	324	−4	320	O	Other services
304				304	−3	301	P	Household work
18,788	**2,184**	**4,521**	**6,978**	**50,494**	**−290**	**50,205**		**Use of domestic products at basic prices**
2,975		520		8,011		8,011		Use of imported products
842		33	6	1,685		1,685		Product taxes
22,605	**2,184**	**5,074**	**6,984**	**60,191**	**−290**	**59,901**		**Total use of products at purchasers' prices**

Table 4. Use table for imports in 1928 at basic prices (FIM 1,000,000 at current prices)

		Input of industries					
		Agri-culture, hunting	Forestry	Fishing	Mining	Manuf. of food products	Manuf. of textiles
Products		**A1**	**A2**	**B**	**C**	**DA**	**DB**
A1	Agriculture, hunting	160				508	218
A2	Forestry						
B	Fishing					1	
C	Mining				2	12	9
DA	Manuf. of food products					503	
DB	Manuf. of textiles			0			268
DC	Manuf. of leather products						17
DD	Manuf. of wood and wood products						2
DE	Manuf. of pulp, paper and paper products					1	
DF	Manuf. of coke and refined petroleum products	28	8	16	0	1	0
DG	Manuf. of chemical products	126				4	24
DH	Manuf. of rubber and plastic products						
DI	Manuf. of non-metallic mineral products					0	
DJ	Manuf. of basic metals and fabricated metal products		1			2	
DK	Manuf. of machinery and equipment	2	0				
DL	Manuf. of electrical and optical equipment						
DM	Manuf. of transport equipment			1			
DN	Manuf. of other products		0				0
E	Electricity, gas and water supply						
F	Construction						
G	Trade						
H	Hotels and restaurants						
I	Transport, storage, post and telecomm. services						
J	Financial and insurance services						
K	Housing and business services						
L	Public administration						
M	Education						
N	Health and social-work services						
O	Other services						
P	Household work						
Use of imported products at basic prices		**316**	**9**	**18**	**2**	**1,032**	**537**

Table 4. Use table for imports in 1928 at basic prices (FIM 1,000,000 at current prices)

Input of industries							
Manuf. of leather products	Manuf. of wood and wood products	Manuf. of pulp, paper and paper products	Manuf. of coke and refined petroleum products	Manuf. Of chemical products	Manuf. of rubber and plastic products		
DC	DD	DE	DF	DG	DH		Products
178				14		A1	Agriculture, hunting
	26				15	A2	Forestry
						B	Fishing
1	2	5		12	0	C	Mining
	10			26		DA	Manuf. of food products
3	0	5		0	9	DB	Manuf. of textiles
96						DC	Manuf. of leather products
	19					DD	Manuf. of wood and wood products
1	0	20				DE	Manuf. of pulp, paper and paper products
0		0		0	1	DF	Manuf. of coke and refined petroleum products
25	0	93		63	3	DG	Manuf. of chemical products
					3	DH	Manuf. of rubber and plastic products
	0	3		0		DI	Manuf. of non-metallic mineral products
	0					DJ	Manuf. of basic metals and fabricated metal products
						DK	Manuf. of machinery and equipment
		0				DL	Manuf. of electrical and optical equipment
						DM	Manuf. of transport equipment
						DN	Manuf. of other products
						E	Electricity, gas and water supply
						F	Construction
						G	Trade
						H	Hotels and restaurants
						I	Transport, storage, post and telecomm. services
						J	Financial and insurance services
						K	Housing and business services
						L	Public administration
						M	Education
						N	Health and social-work services
						O	Other services
						P	Household work
304	**57**	**125**		**116**	**32**		**Use of imported products at basic prices**

Table 4. Use table for imports in 1928 at basic prices (FIM 1,000,000 at current prices)

		Input of industries					
		Manuf. of non-metallic mineral products	Manuf. of basic metals and fabricated metal products	Manuf. of machinery and equipment	Manuf. of electrical and optical equipment	Manuf. of transport equipment	Manuf. of other products
Products		**DI**	**DJ**	**DK**	**DL**	**DM**	**DN**
A1	Agriculture, hunting						
A2	Forestry		0				
B	Fishing						
C	Mining	49	5	1	0	0	0
DA	Manuf. of food products						0
DB	Manuf. of textiles						8
DC	Manuf. of leather products				0		7
DD	Manuf. of wood and wood products		0	0		1	0
DE	Manuf. of pulp, paper and paper products	0					
DF	Manuf. of coke and refined petroleum products	1	3	1	0	2	2
DG	Manuf. of chemical products	9	2	2	0	1	2
DH	Manuf. of rubber and plastic products		0	0		0	
DI	Manuf. of non-metallic mineral products	14	2				
DJ	Manuf. of basic metals and fabricated metal products	2	198	74	2	33	39
DK	Manuf. of machinery and equipment		24	12	0	6	
DL	Manuf. of electrical and optical equipment				11		
DM	Manuf. of transport equipment		6	10		9	
DN	Manuf. of other products						7
E	Electricity, gas and water supply						
F	Construction						
G	Trade						
H	Hotels and restaurants						
I	Transport, storage, post and telecomm. services						
J	Financial and insurance services						
K	Housing and business services						
L	Public administration						
M	Education						
N	Health and social-work services						
O	Other services						
P	Household work						
Use of imported products at basic prices		**75**	**241**	**101**	**13**	**53**	**66**

Table 4. Use table for imports in 1928 at basic prices (FIM 1,000,000 at current prices)

Input of industries							
Electricity, gas and water supply	Construc-tion	Trade	Hotels and restaurants	Transport, storage, post and telec. services	Financial and insurance services		
E	F	G	H	I	J		Products
			3	1		A1	Agriculture, hunting
0						A2	Forestry
			0			B	Fishing
67	31			11	2	C	Mining
			45	2		DA	Manuf. of food products
			6			DB	Manuf. of textiles
				0		DC	Manuf. of leather products
	8			0		DD	Manuf. of wood and wood products
	1	5	1	1	1	DE	Manuf. of pulp, paper and paper products
0	8			99	3	DF	Manuf. of coke and refined petroleum products
2	10			5		DG	Manuf. of chemical products
				59		DH	Manuf. of rubber and plastic products
3	132					DI	Manuf. of non-metallic mineral products
10	381			10		DJ	Manuf. of basic metals and fabricated metal products
	31			31		DK	Manuf. of machinery and equipment
	87	14		4	6	DL	Manuf. of electrical and optical equipment
	2	11		74		DM	Manuf. of transport equipment
	25	1	2	1	0	DN	Manuf. of other products
						E	Electricity, gas and water supply
						F	Construction
						G	Trade
						H	Hotels and restaurants
						I	Transport, storage, post and telecomm. services
						J	Financial and insurance services
						K	Housing and business services
						L	Public administration
						M	Education
						N	Health and social-work services
				0		O	Other services
						P	Household work
82	**715**	**31**	**56**	**298**	**12**		**Use of imported products at basic prices**

Table 4. Use table for imports in 1928 at basic prices (FIM 1,000,000 at current prices)

		Input of industries						
		Housing and business services	Public administration	Education	Health and social-work services	Other services	Household work	Total intermediate use
Products		**K**	**L**	**M**	**N**	**O**	**P**	
A1	Agriculture, hunting		2	0	1			**1,086**
A2	Forestry							**42**
B	Fishing							**1**
C	Mining	2	1	2	5			**219**
DA	Manuf. of food products		12	8	19			**625**
DB	Manuf. of textiles		13		14	1		**328**
DC	Manuf. of leather products		0					**120**
DD	Manuf. of wood and wood products		0					**30**
DE	Manuf. of pulp, paper and paper products	0	1	2	0	0		**32**
DF	Manuf. of coke and refined petroleum products	40	5	2	4			**225**
DG	Manuf. of chemical products	0	2	0	9	1		**384**
DH	Manuf. of rubber and plastic products							**62**
DI	Manuf. of non-metallic mineral products	0		0	0			**155**
DJ	Manuf. of basic metals and fabricated metal products	0	3	0	0	1		**755**
DK	Manuf. of machinery and equipment	0	19	0	0			**127**
DL	Manuf. of electrical and optical equipment	1	4	1	21	1		**149**
DM	Manuf. of transport equipment		16		0			**129**
DN	Manuf. of other products		2	5	0	0		**45**
E	Electricity, gas and water supply							
F	Construction							
G	Trade							
H	Hotels and restaurants							
I	Transport, storage, post and telecomm. services							
J	Financial and insurance services							
K	Housing and business services							
L	Public administration							
M	Education							
N	Health and social-work services							
O	Other services	0		0				**0**
P	Household work							
Use of imported products at basic prices		**44**	**81**	**21**	**75**	**4**	**0**	**4,516**

Table 4. Use table for imports in 1928 at basic prices (FIM 1,000,000 at current prices)

Final uses								
House-hold con-sumption	Govern-ment final con-sumption	Gross fixed capital forma-tion	Exports	Total use	Statisti-cal dis-crepancy + inven-tory change	Total supply		Products
364				1,450		1,450	A1	Agriculture, hunting
				42		42	A2	Forestry
2				4		4	B	Fishing
				219		219	C	Mining
1,150				1,775		1,775	DA	Manuf. of food products
733				1,061		1,061	DB	Manuf. of textiles
39				160		160	DC	Manuf. of leather products
1				31		31	DD	Manuf. of wood and wood products
27				59		59	DE	Manuf. of pulp, paper and paper products
26				251		251	DF	Manuf. of coke and refined petroleum products
88				472		472	DG	Manuf. of chemical products
30				92		92	DH	Manuf. of rubber and plastic products
33				188		188	DI	Manuf. of non-metallic mineral products
137				893		893	DJ	Manuf. of basic metals and fabricated metal products
38		235		399		399	DK	Manuf. of machinery and equipment
156				305		305	DL	Manuf. of electrical and optical equipment
91		285		506		506	DM	Manuf. of transport equipment
59				104		104	DN	Manuf. of other products
							E	Electricity, gas and water supply
							F	Construction
							G	Trade
							H	Hotels and restaurants
							I	Transport, storage, post and telecomm. services
							J	Financial and insurance services
							K	Housing and business services
							L	Public administration
							M	Education
							N	Health and social-work services
2				2		2	O	Other services
							P	Household work
2,975		520		8,011		8,011	**Use of imported products at basic prices**	

Table 5. Input-output table for 1928 at basic prices (FIM 1,000,000, at current prices)

	Input of industries					
	Agri-culture, hunting	Forestry	Fishing	Mining	Manuf. of food products	Manuf. of textiles
Products	**A1**	**A2**	**B**	**C**	**DA**	**DB**
A1 Agriculture, hunting	3,951	36	0	0	898	38
A2 Forestry	7			0	16	6
B Fishing					3	
C Mining		0	0	15	0	0
DA Manuf. of food products	94			0	230	0
DB Manuf. of textiles	1		1		0	236
DC Manuf. of leather products	1	0	0	0	0	6
DD Manuf. of wood and wood products	10	0	0	0	2	1
DE Manuf. of pulp, paper and paper products	1	0	0	0	18	0
DF Manuf. of coke and refined petroleum products		1	1			0
DG Manuf. of chemical products	52	0	0	0	4	2
DH Manuf. of rubber and plastic products	0	0			0	1
DI Manuf. of non-metallic mineral products	0	0		0	1	0
DJ Manuf. of basic metals and fabricated metal products	15	0	0	0	1	1
DK Manuf. of machinery and equipment	88	0	0	1	5	7
DL Manuf. of electrical and optical equipment	0	0		0	0	0
DM Manuf. of transport equipment			1			
DN Manuf. of other products	17	1		0	0	0
E Electricity, gas and water supply	30	0	1	3	7	15
F Construction	120	1				
G Trade	343	2	4	2	201	58
H Hotels and restaurants						
I Transport, storage, post and telecomm. services	85	230	0	1	55	20
J Financial and insurance services	33			0	0	0
K Housing and business services						
L Public administration						
M Education						
N Health and social-work services	68					
O Other services	22					
P Household work						
Use of domestic products at basic prices	**4,937**	**271**	**9**	**23**	**1,443**	**391**
Use of imported products	316	9	18	2	1,032	537
Product taxes	59	2	4	0	303	96
Intermediate consumption at purchasers' prices	**5,312**	**282**	**31**	**25**	**2,777**	**1,025**
Compensation to employees	1,661	1,141		45	252	334
Other value added components	3,737	2,345	150	113	916	327
Value added at basic prices	**5,398**	**3,486**	**150**	**158**	**1,168**	**661**
Output at basic prices	**10,710**	**3,768**	**181**	**183**	**3,945**	**1,685**

Table 5. Input-output table for 1928 at basic prices (FIM 1,000,000, at current prices)

Input of industries							
Manuf. of leather products	Manuf. of wood and wood products	Manuf. of pulp, paper and paper products	Manuf. of coke and refined petroleum products	Manuf. Of chemical products	Manuf. of rubber and plastic products		
DC	DD	DE	DF	DG	DH		Products
30	48	31		5	0	A1	Agriculture, hunting
2	1,969	490		6	1	A2	Forestry
						B	Fishing
0	0	9		0	0	C	Mining
0	2	0		8	0	DA	Manuf. of food products
17	0	4		0	6	DB	Manuf. of textiles
110	0	0		0	0	DC	Manuf. of leather products
3	161	157		1	1	DD	Manuf. of wood and wood products
0	0	336		1	0	DE	Manuf. of pulp, paper and paper products
				0	0	DF	Manuf. of coke and refined petroleum products
2	4	6		36	0	DG	Manuf. of chemical products
10	0	0		0	1	DH	Manuf. of rubber and plastic products
0	0	17		2	0	DI	Manuf. of non-metallic mineral products
0	10	9		0	0	DJ	Manuf. of basic metals and fabricated metal products
1	23	37		2	1	DK	Manuf. of machinery and equipment
0	0	0		0	0	DL	Manuf. of electrical and optical equipment
0	0	0		0	0	DM	Manuf. of transport equipment
						DN	Manuf. of other products
2	30	61		2	1	E	Electricity, gas and water supply
						F	Construction
38	142	100		18	3	G	Trade
						H	Hotels and restaurants
7	298	193		8	3	I	Transport, storage, post and telecomm. services
0	0	2		0	0	J	Financial and insurance services
						K	Housing and business services
						L	Public administration
						M	Education
						N	Health and social-work services
						O	Other services
						P	Household work
224	**2,688**	**1,452**		**90**	**17**		**Use of domestic products at basic prices**
304	57	125		116	32		Use of imported products
52	8	7		15	3		Product taxes
579	**2,752**	**1,585**		**221**	**52**		**Intermediate consumption at purchasers' prices**
133	666	381		24	18		Compensation to employees
106	78	853		121	38		Other value added components
239	**745**	**1,233**		**145**	**56**		**Value added at basic prices**
818	**3,497**	**2,818**		**366**	**107**		**Output at basic prices**

Table 5. Input-output table for 1928 at basic prices (FIM 1,000,000, at current prices)

		Input of industries					
		Manuf. of non-metallic mineral products	Manuf. of basic metals and fabricated metal products	Manuf. of machinery and equipment	Manuf. of electrical and optical equipment	Manuf. of transport equipment	Manuf. of other products
	Products	**DI**	**DJ**	**DK**	**DL**	**DM**	**DN**
A1	Agriculture, hunting	2	4	1	0	0	2
A2	Forestry	14	14	3	0	0	8
B	Fishing						
C	Mining	29	1	0	0	0	0
DA	Manuf. of food products	0		0	0	0	0
DB	Manuf. of textiles	6			0		8
DC	Manuf. of leather products	0	0	0	0	0	0
DD	Manuf. of wood and wood products	9	7	8	0	9	8
DE	Manuf. of pulp, paper and paper products	1	0	0	0	0	3
DF	Manuf. of coke and refined petroleum products		0	0		0	
DG	Manuf. of chemical products	3	5	2	0	1	1
DH	Manuf. of rubber and plastic products	0	0	0	0	0	0
DI	Manuf. of non-metallic mineral products	22	0	0	0	0	0
DJ	Manuf. of basic metals and fabricated metal products	3	133	58	8	21	2
DK	Manuf. of machinery and equipment	4	15	12	1	6	1
DL	Manuf. of electrical and optical equipment	0	0	0	2	0	0
DM	Manuf. of transport equipment		0	0		3	
DN	Manuf. of other products	0	0	0	0	0	7
E	Electricity, gas and water supply	9	16	2	1	1	1
F	Construction						
G	Trade	17	40	18	3	9	11
H	Hotels and restaurants						
I	Transport, storage, post and telecomm. services	15	26	3	0	3	4
J	Financial and insurance services	0	0	0	0	0	0
K	Housing and business services						
L	Public administration						
M	Education						
N	Health and social-work services						
O	Other services						
P	Household work						
Use of domestic products at basic prices		**136**	**262**	**108**	**14**	**54**	**56**
Use of imported products		75	241	101	13	53	66
Product taxes		2	22	9	1	5	9
Intermediate consumption at purchasers' prices		**213**	**525**	**218**	**28**	**112**	**132**
Compensation to employees		135	198	225	21	88	63
Other value added components		187	162	112	42	81	90
Value added at basic prices		**322**	**360**	**337**	**63**	**170**	**153**
Output at basic prices		**535**	**886**	**555**	**91**	**282**	**285**

Table 5. Input-output table for 1928 at basic prices (FIM 1,000,000, at current prices)

Input of industries							
Electricity, gas and water supply	Construc-tion	Trade	Hotels and restaurants	Transport, storage, post and telec. services	Financial and insurance services		
E	F	G	H	I	J		Products
0	7	18	62	33	0	A1	Agriculture, hunting
0	14	52		110	51	A2	Forestry
			4			B	Fishing
0	48	0	0	21	4	C	Mining
	2	0	116	6	0	DA	Manuf. of food products
	94		9	0		DB	Manuf. of textiles
	0	0	0	2	0	DC	Manuf. of leather products
	314	3	5	5	0	DD	Manuf. of wood and wood products
	16	102	14	11	12	DE	Manuf. of pulp, paper and paper products
0	1			7	0	DF	Manuf. of coke and refined petroleum products
0	42	0	1	6	0	DG	Manuf. of chemical products
0	0	0	0	15	0	DH	Manuf. of rubber and plastic products
0	409	1	0	1	0	DI	Manuf. of non-metallic mineral products
0	452	3	1	8	1	DJ	Manuf. of basic metals and fabricated metal products
	43	1	0	27	0	DK	Manuf. of machinery and equipment
	73	3		1	1	DL	Manuf. of electrical and optical equipment
	1			47		DM	Manuf. of transport equipment
	5	5	8	4	0	DN	Manuf. of other products
6	29		14	29	23	E	Electricity, gas and water supply
5	27		9	104	23	F	Construction
8	230	19	32	94	7	G	Trade
						H	Hotels and restaurants
0	45	112	0	123	1	I	Transport, storage, post and telecomm. services
		81		56		J	Financial and insurance services
	3	282	53	25	78	K	Housing and business services
				0		L	Public administration
						M	Education
	0					N	Health and social-work services
				7		O	Other services
						P	Household work
20	**1,856**	**679**	**329**	**742**	**201**		**Use of domestic products at basic prices**
82	715	31	56	298	12		Use of imported products
1	74	3	23	57	1		Product taxes
104	**2,644**	**714**	**408**	**1,097**	**215**		**Intermediate consumption at purchasers' prices**
72	1,603	886	101	1,094	237		Compensation to employees
321	275	1,971	146	732	560		Other value added components
393	**1,878**	**2,858**	**247**	**1,826**	**798**		**Value added at basic prices**
496	**4,522**	**3,572**	**655**	**2,923**	**1,013**		**Output at basic prices**

Table 5. Input-output table for 1928 at basic prices (FIM 1,000,000, at current prices)

		Input of industries						
		Housing and business services	Public administration	Education	Health and social-work services	Other services	Household work	Total intermediate use
Products		**K**	**L**	**M**	**N**	**O**	**P**	
A1	Agriculture, hunting	1	38	11	24	0		5,242
A2	Forestry	698	29	43	65	10		3,608
B	Fishing							7
C	Mining	4	2	4	8	0		146
DA	Manuf. of food products	0	32	22	50	0		563
DB	Manuf. of textiles		22	0	24	1		429
DC	Manuf. of leather products	0	2	0	0	0		123
DD	Manuf. of wood and wood products	0	5	10	0	0		719
DE	Manuf. of pulp, paper and paper products	1	10	34	0	0		561
DF	Manuf. of coke and refined petroleum products	3	0	0	0			14
DG	Manuf. of chemical products	1	2	0	7	1		180
DH	Manuf. of rubber and plastic products	0	0	0	0	0		27
DI	Manuf. of non-metallic mineral products	0	0	1	1	0		454
DJ	Manuf. of basic metals and fabricated metal products	2	4	1	2	0		736
DK	Manuf. of machinery and equipment	0	17	0	1	0		293
DL	Manuf. of electrical and optical equipment	0	1	0	4	0		86
DM	Manuf. of transport equipment		10		0			62
DN	Manuf. of other products	0	8	17	1	1		73
E	Electricity, gas and water supply	144	13	36	33	6		515
F	Construction	167	22	50	3	8		542
G	Trade	51	27	19	26	1		1,523
H	Hotels and restaurants							
I	Transport, storage, post and telecomm. services	7	19	1	1	0		1,261
J	Financial and insurance services	22						195
K	Housing and business services	5	7	43	38	4		538
L	Public administration							0
M	Education		0					0
N	Health and social-work services		3	0	0			72
O	Other services	24		0				54
P	Household work							
Use of domestic products at basic prices		**1,131**	**274**	**293**	**290**	**33**		**18,023**
Use of imported products		44	81	21	75	4		4,516
Product taxes		13	13	7	15	0		805
Intermediate consumption at purchasers' prices		**1,187**	**369**	**322**	**380**	**37**		**23,344**
Compensation to employees		1,593	677	459	240	283	301	12,931
Other value added components		382		9	75			13,930
Value added at basic prices		**1,975**	**677**	**468**	**315**	**283**	**301**	**26,861**
Output at basic prices		**3,163**	**1,045**	**790**	**694**	**320**	**301**	**50,205**

Table 5. Input-output table for 1928 at basic prices (FIM 1,000,000, at current prices)

Final uses								
House-hold con-sumption	Govern-ment final con-sumption	Gross fixed capital forma-tion	Exports	Total use	Statisti-cal dis-crepancy + inven-tory change	Total supply		
								Products
5,174		0	293	**10,710**	0	**10,710**	A1	Agriculture, hunting
			287	**3,895**	−126	**3,768**	A2	Forestry
176			8	**190**	−10	**181**	B	Fishing
1			15	**163**	20	**183**	C	Mining
2,982			379	**3,924**	21	**3,945**	DA	Manuf. of food products
1,223			25	**1,677**	8	**1,685**	DB	Manuf. of textiles
684			2	**809**	10	**818**	DC	Manuf. of leather products
147		0	2,866	**3,733**	−237	**3,497**	DD	Manuf. of wood and wood products
513			1,682	**2,756**	62	**2,818**	DE	Manuf. of pulp, paper and paper products
2			0	**16**	−16		DF	Manuf. of coke and refined petroleum products
95			34	**308**	57	**366**	DG	Manuf. of chemical products
69			0	**97**	11	**107**	DH	Manuf. of rubber and plastic products
65			18	**537**	−2	**535**	DI	Manuf. of non-metallic mineral products
49		41	37	**863**	22	**886**	DJ	Manuf. of basic metals and fabricated metal products
43		199	13	**548**	7	**555**	DK	Manuf. of machinery and equipment
34		0	0	**120**	−29	**91**	DL	Manuf. of electrical and optical equipment
58		182	6	**309**	−28	**282**	DM	Manuf. of transport equipment
203			15	**292**	−7	**285**	DN	Manuf. of other products
2			0	**517**	−20	**496**	E	Electricity, gas and water supply
		4,004		**4,546**	−23	**4,522**	F	Construction
1,386		94	571	**3,574**	−2	**3,572**	G	Trade
442			190	**632**	23	**655**	H	Hotels and restaurants
1,172		0	535	**2,969**	−45	**2,923**	I	Transport, storage, post and telecomm. services
818				**1,013**	0	**1,013**	J	Financial and insurance services
2,568				**3,105**	57	**3,163**	K	Housing and business services
	1,080			**1,080**	−35	**1,045**	L	Public administration
108	648			**756**	34	**790**	M	Education
200	456			**728**	−34	**694**	N	Health and social-work services
270			0	**324**	−4	**320**	O	Other services
304				**304**	−3	**301**	P	Household work
18,788	**2,184**	**4,521**	**6,978**	**50,494**	**−290**	**50,205**	**Use of domestic products at basic prices**	
2,975		520		**8,011**		**8,011**	Use of imported products	
842		33	6	**1,685**		**1,685**	Product taxes	
22,605	**2,184**	**5,074**	**6,984**	**60,191**	**−290**	**59,901**	**Total use of products at purchasers' prices**	

Table 6. Input coefficients for 1928

	Input of industries					
	Agri-culture, hunting	Forestry	Fishing	Mining	Manuf. of food products	Manuf. of textiles
Products	**A1**	**A2**	**B**	**C**	**DA**	**DB**
A1 Agriculture, hunting	0.3689	0.0093	0.0001	0.0005	0.2289	0.0228
A2 Forestry	0.0006	0.0000	0.0000	0.0011	0.0041	0.0034
B Fishing	0.0000	0.0000	0.0000	0.0000	0.0007	0.0000
C Mining	0.0000	0.0001	0.0025	0.0924	0.0000	0.0000
DA Manuf. of food products	0.0087	0.0000	0.0000	0.0000	0.0587	0.0001
DB Manuf. of textiles	0.0001	0.0000	0.0035	0.0000	0.0000	0.1406
DC Manuf. of leather products	0.0001	0.0000	0.0000	0.0000	0.0000	0.0038
DD Manuf. of wood and wood products	0.0009	0.0001	0.0000	0.0008	0.0006	0.0005
DE Manuf. of pulp, paper and paper products	0.0001	0.0000	0.0000	0.0008	0.0046	0.0001
DF Manuf. of coke and refined petroleum products	0.0000	0.0001	0.0059	0.0000	0.0000	0.0001
DG Manuf. of chemical products	0.0049	0.0000	0.0018	0.0009	0.0011	0.0013
DH Manuf. of rubber and plastic products	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003
DI Manuf. of non-metallic mineral products	0.0000	0.0000	0.0000	0.0010	0.0002	0.0000
DJ Manuf. of basic metals and fabricated metal products	0.0014	0.0000	0.0003	0.0013	0.0003	0.0007
DK Manuf. of machinery and equipment	0.0082	0.0001	0.0001	0.0080	0.0013	0.0043
DL Manuf. of electrical and optical equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
DM Manuf. of transport equipment	0.0000	0.0000	0.0050	0.0000	0.0000	0.0000
DN Manuf. of other products	0.0015	0.0001	0.0000	0.0000	0.0000	0.0000
E Electricity, gas and water supply	0.0028	0.0001	0.0050	0.0165	0.0019	0.0088
F Construction	0.0112	0.0002	0.0000	0.0000	0.0000	0.0000
G Trade	0.0321	0.0005	0.0204	0.0136	0.0512	0.0344
H Hotels and restaurants	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I Transport, storage, post and telecomm. services	0.0079	0.0590	0.0003	0.0034	0.0139	0.0121
J Financial and insurance services	0.0030	0.0000	0.0000	0.0005	0.0001	0.0001
K Housing and business services	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L Public administration	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
M Education	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N Health and social-work services	0.0064	0.0000	0.0000	0.0000	0.0000	0.0000
O Other services	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000
P Household work	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Use of domestic products at basic prices	**0.4610**	**0.0696**	**0.0447**	**0.1410**	**0.3677**	**0.2333**
Use of imported products	0.0295	0.0022	0.0945	0.0097	0.2629	0.3204
Product taxes	0.0055	0.0005	0.0210	0.0000	0.0771	0.0572
Intermediate consumption at purchasers' prices	**0.4960**	**0.0724**	**0.1603**	**0.1507**	**0.7077**	**0.6109**
Compensation to employees	0.1551	0.2930	0.0000	0.2769	0.0641	0.1991
Other value added components	0.3489	0.6346	0.8397	0.5724	0.2281	0.1900
Value added at basic prices	**0.5040**	**0.9276**	**0.8397**	**0.8493**	**0.2923**	**0.3891**
Output at basic prices	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**

Table 6. Input coefficients for 1928

Input of industries							
Manuf. of leather products	Manuf. of wood and wood products	Manuf. of pulp, paper and paper products	Manuf. of coke and refined petroleum products	Manuf. Of chemical products	Manuf. of rubber and plastic products		
DC	DD	DE	DF	DG	DH		Products
0.0373	0.0129	0.0111	0.0000	0.0162	0.0047	A1	Agriculture, hunting
0.0028	0.5275	0.1777	0.0000	0.0204	0.0065	A2	Forestry
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	B	Fishing
0.0000	0.0000	0.0032	0.0000	0.0003	0.0003	C	Mining
0.0001	0.0005	0.0001	0.0000	0.0261	0.0000	DA	Manuf. of food products
0.0215	0.0000	0.0014	0.0000	0.0000	0.0672	DB	Manuf. of textiles
0.1362	0.0000	0.0000	0.0000	0.0003	0.0001	DC	Manuf. of leather products
0.0033	0.0430	0.0570	0.0000	0.0046	0.0078	DD	Manuf. of wood and wood products
0.0000	0.0000	0.1221	0.0000	0.0019	0.0000	DE	Manuf. of pulp, paper and paper products
0.0000	0.0000	0.0000	0.0000	0.0002	0.0004	DF	Manuf. of coke and refined petroleum products
0.0024	0.0009	0.0021	0.0000	0.1158	0.0005	DG	Manuf. of chemical products
0.0123	0.0000	0.0000	0.0000	0.0000	0.0100	DH	Manuf. of rubber and plastic products
0.0000	0.0000	0.0062	0.0000	0.0064	0.0004	DI	Manuf. of non-metallic mineral products
0.0002	0.0027	0.0034	0.0000	0.0008	0.0010	DJ	Manuf. of basic metals and fabricated metal products
0.0015	0.0062	0.0135	0.0000	0.0062	0.0059	DK	Manuf. of machinery and equipment
0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	DL	Manuf. of electrical and optical equipment
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	DM	Manuf. of transport equipment
0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	DN	Manuf. of other products
0.0030	0.0082	0.0220	0.0000	0.0072	0.0148	E	Electricity, gas and water supply
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	F	Construction
0.0468	0.0380	0.0363	0.0000	0.0578	0.0292	G	Trade
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	H	Hotels and restaurants
0.0089	0.0799	0.0698	0.0000	0.0269	0.0302	I	Transport, storage, post and telecomm. services
0.0000	0.0001	0.0008	0.0000	0.0001	0.0000	J	Financial and insurance services
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	K	Housing and business services
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	L	Public administration
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	M	Education
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	N	Health and social-work services
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	O	Other services
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	P	Household work
0.2767	**0.7200**	**0.5267**	**0.0000**	**0.2914**	**0.1792**		**Use of domestic products at basic prices**
0.3759	0.0152	0.0455	0.0000	0.3772	0.3268		Use of imported products
0.0640	0.0020	0.0027	0.0000	0.0488	0.0281		Product taxes
0.7166	**0.7372**	**0.5749**	**0.0000**	**0.7174**	**0.5341**		**Intermediate consumption at purchasers' prices**
0.1644	0.1785	0.1381	0.0000	0.0767	0.1856		Compensation to employees
0.1190	0.0843	0.2870	1.0000	0.2060	0.2803		Other value added components
0.2834	**0.2628**	**0.4251**	**1.0000**	**0.2826**	**0.4659**		**Value added at basic prices**
1.0000	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**		**Output at basic prices**

Table 6. Input coefficients for 1928

	Input of industries					
	Manuf. of non-metallic mineral products	Manuf. of basic metals and fabricated metal products	Manuf. of machinery and equipment	Manuf. of electrical and optical equipment	Manuf. of transport equipment	Manuf. of other products
Products	**DI**	**DJ**	**DK**	**DL**	**DM**	**DN**
A1 Agriculture, hunting	0.0045	0.0047	0.0010	0.0001	0.0013	0.0064
A2 Forestry	0.0259	0.0168	0.0055	0.0000	0.0014	0.0269
B Fishing	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C Mining	0.0545	0.0009	0.0004	0.0000	0.0003	0.0000
DA Manuf. of food products	0.0003	0.0002	0.0001	0.0000	0.0001	0.0002
DB Manuf. of textiles	0.0110	0.0000	0.0000	0.0001	0.0000	0.0285
DC Manuf. of leather products	0.0000	0.0000	0.0000	0.0013	0.0000	0.0001
DD Manuf. of wood and wood products	0.0167	0.0082	0.0139	0.0001	0.0282	0.0271
DE Manuf. of pulp, paper and paper products	0.0025	0.0001	0.0001	0.0000	0.0001	0.0096
DF Manuf. of coke and refined petroleum products	0.0000	0.0004	0.0008	0.0000	0.0007	0.0000
DG Manuf. of chemical products	0.0061	0.0054	0.0035	0.0001	0.0037	0.0041
DH Manuf. of rubber and plastic products	0.0000	0.0002	0.0003	0.0001	0.0003	0.0000
DI Manuf. of non-metallic mineral products	0.0414	0.0003	0.0000	0.0001	0.0000	0.0001
DJ Manuf. of basic metals and fabricated metal products	0.0051	0.1535	0.1057	0.0645	0.0695	0.0066
DK Manuf. of machinery and equipment	0.0079	0.0173	0.0212	0.0063	0.0184	0.0025
DL Manuf. of electrical and optical equipment	0.0000	0.0002	0.0002	0.0181	0.0001	0.0000
DM Manuf. of transport equipment	0.0000	0.0000	0.0000	0.0000	0.0095	0.0000
DN Manuf. of other products	0.0000	0.0003	0.0002	0.0001	0.0001	0.0247
E Electricity, gas and water supply	0.0165	0.0181	0.0045	0.0054	0.0020	0.0032
F Construction	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
G Trade	0.0317	0.0466	0.0330	0.0234	0.0299	0.0380
H Hotels and restaurants	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I Transport, storage, post and telecomm. services	0.0284	0.0301	0.0062	0.0005	0.0085	0.0151
J Financial and insurance services	0.0004	0.0001	0.0002	0.0001	0.0002	0.0001
K Housing and business services	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L Public administration	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
M Education	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N Health and social-work services	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
O Other services	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
P Household work	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Use of domestic products at basic prices	**0.2529**	**0.3036**	**0.1969**	**0.1204**	**0.1744**	**0.1933**
Use of imported products	0.1388	0.2792	0.1845	0.1059	0.1716	0.2273
Product taxes	0.0043	0.0257	0.0166	0.0097	0.0160	0.0308
Intermediate consumption at purchasers' prices	**0.3961**	**0.6085**	**0.3980**	**0.2360**	**0.3620**	**0.4514**
Compensation to employees	0.2510	0.2298	0.4106	0.1769	0.2856	0.2150
Other value added components	0.3529	0.1617	0.1914	0.5871	0.3525	0.3336
Value added at basic prices	**0.6039**	**0.3915**	**0.6020**	**0.7640**	**0.6380**	**0.5486**
Output at basic prices	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**

Table 6. Input coefficients for 1928

Input of industries						
Electricity, gas and water supply	Construc-tion	Trade	Hotels and restaurants	Transport, storage, post and telec. services	Financial and insurance services	
E	F	G	H	I	J	Products
0.0001	0.0016	0.0049	0.0986	0.0112	0.0001	A1 Agriculture, hunting
0.0002	0.0032	0.0144	0.0000	0.0370	0.0505	A2 Forestry
0.0000	0.0000	0.0000	0.0065	0.0000	0.0000	B Fishing
0.0000	0.0106	0.0000	0.0000	0.0070	0.0039	C Mining
0.0000	0.0004	0.0000	0.1832	0.0021	0.0000	DA Manuf. of food products
0.0000	0.0206	0.0000	0.0145	0.0000	0.0000	DB Manuf. of textiles
0.0000	0.0001	0.0000	0.0001	0.0008	0.0000	DC Manuf. of leather products
0.0000	0.0690	0.0008	0.0077	0.0017	0.0001	DD Manuf. of wood and wood products
0.0000	0.0035	0.0287	0.0224	0.0037	0.0118	DE Manuf. of pulp, paper and paper products
0.0000	0.0001	0.0000	0.0000	0.0023	0.0002	DF Manuf. of coke and refined petroleum products
0.0000	0.0093	0.0000	0.0018	0.0020	0.0001	DG Manuf. of chemical products
0.0000	0.0001	0.0000	0.0000	0.0050	0.0000	DH Manuf. of rubber and plastic products
0.0001	0.0899	0.0002	0.0001	0.0003	0.0001	DI Manuf. of non-metallic mineral products
0.0000	0.0994	0.0008	0.0009	0.0028	0.0006	DJ Manuf. of basic metals and fabricated metal products
0.0000	0.0095	0.0002	0.0000	0.0090	0.0003	DK Manuf. of machinery and equipment
0.0000	0.0160	0.0008	0.0000	0.0003	0.0012	DL Manuf. of electrical and optical equipment
0.0000	0.0002	0.0000	0.0000	0.0159	0.0000	DM Manuf. of transport equipment
0.0000	0.0012	0.0013	0.0128	0.0013	0.0001	DN Manuf. of other products
0.0109	0.0063	0.0000	0.0216	0.0097	0.0226	E Electricity, gas and water supply
0.0104	0.0060	0.0000	0.0144	0.0352	0.0226	F Construction
0.0164	0.0506	0.0052	0.0512	0.0316	0.0067	G Trade
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	H Hotels and restaurants
0.0008	0.0099	0.0314	0.0003	0.0414	0.0005	I Transport, storage, post and telecomm. services
0.0000	0.0000	0.0226	0.0000	0.0188	0.0000	J Financial and insurance services
0.0000	0.0007	0.0788	0.0842	0.0083	0.0774	K Housing and business services
0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	L Public administration
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	M Education
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	N Health and social-work services
0.0000	0.0000	0.0000	0.0000	0.0025	0.0000	O Other services
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	P Household work
0.0390	**0.4082**	**0.1901**	**0.5205**	**0.2500**	**0.1988**	**Use of domestic products at basic prices**
0.1587	0.1574	0.0087	0.0892	0.1002	0.0121	Use of imported products
0.0027	0.0162	0.0009	0.0364	0.0193	0.0014	Product taxes
0.2004	**0.5818**	**0.1997**	**0.6461**	**0.3695**	**0.2124**	**Intermediate consumption at purchasers' prices**
0.1386	0.3526	0.2480	0.1595	0.3684	0.2343	Compensation to employees
0.6610	0.0656	0.5523	0.1944	0.2620	0.5532	Other value added components
0.7996	**0.4182**	**0.8003**	**0.3539**	**0.6305**	**0.7876**	**Value added at basic prices**
1.0000	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**Output at basic prices**

Table 6. Input coefficients for 1928

	Input of industries					
	Housing and business services	Public adminis-tration	Education	Health and social-work services	Other services	Household work
Products	**K**	**L**	**M**	**N**	**O**	**P**
A1 Agriculture, hunting	0.0004	0.0352	0.0142	0.0333	0.0002	0.0000
A2 Forestry	0.2247	0.0265	0.0572	0.0896	0.0295	0.0000
B Fishing	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C Mining	0.0013	0.0017	0.0050	0.0116	0.0000	0.0000
DA Manuf. of food products	0.0000	0.0295	0.0290	0.0690	0.0001	0.0000
DB Manuf. of textiles	0.0000	0.0200	0.0000	0.0323	0.0032	0.0000
DC Manuf. of leather products	0.0000	0.0018	0.0000	0.0001	0.0000	0.0000
DD Manuf. of wood and wood products	0.0001	0.0045	0.0137	0.0005	0.0010	0.0000
DE Manuf. of pulp, paper and paper products	0.0004	0.0095	0.0444	0.0003	0.0002	0.0000
DF Manuf. of coke and refined petroleum products	0.0009	0.0003	0.0002	0.0004	0.0000	0.0000
DG Manuf. of chemical products	0.0004	0.0019	0.0005	0.0099	0.0020	0.0000
DH Manuf. of rubber and plastic products	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000
DI Manuf. of non-metallic mineral products	0.0000	0.0001	0.0007	0.0008	0.0000	0.0000
DJ Manuf. of basic metals and fabricated metal products	0.0006	0.0040	0.0020	0.0026	0.0007	0.0000
DK Manuf. of machinery and equipment	0.0000	0.0153	0.0001	0.0019	0.0002	0.0000
DL Manuf. of electrical and optical equipment	0.0000	0.0009	0.0002	0.0060	0.0006	0.0000
DM Manuf. of transport equipment	0.0000	0.0095	0.0000	0.0001	0.0000	0.0000
DN Manuf. of other products	0.0002	0.0073	0.0228	0.0008	0.0016	0.0000
E Electricity, gas and water supply	0.0464	0.0121	0.0476	0.0454	0.0194	0.0000
F Construction	0.0538	0.0208	0.0663	0.0044	0.0261	0.0000
G Trade	0.0164	0.0246	0.0247	0.0356	0.0040	0.0000
H Hotels and restaurants	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I Transport, storage, post and telecomm. services	0.0021	0.0178	0.0016	0.0018	0.0015	0.0000
J Financial and insurance services	0.0070	0.0000	0.0000	0.0000	0.0000	0.0000
K Housing and business services	0.0016	0.0069	0.0564	0.0515	0.0118	0.0000
L Public administration	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
M Education	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000
N Health and social-work services	0.0000	0.0030	0.0006	0.0001	0.0000	0.0000
O Other services	0.0078	0.0000	0.0005	0.0000	0.0000	0.0000
P Household work	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Use of domestic products at basic prices	**0.3642**	**0.2536**	**0.3878**	**0.3980**	**0.1020**	**0.0000**
Use of imported products	0.0140	0.0753	0.0282	0.1032	0.0115	0.0000
Product taxes	0.0040	0.0123	0.0095	0.0201	0.0013	0.0000
Intermediate consumption at purchasers' prices	**0.3823**	**0.3412**	**0.4254**	**0.5214**	**0.1147**	**0.0000**
Compensation to employees	0.5132	0.6267	0.6070	0.3294	0.8737	0.9899
Other value added components	0.1045	0.0321	-0.0324	0.1492	0.0116	0.0101
Value added at basic prices	**0.6177**	**0.6588**	**0.5746**	**0.4786**	**0.8853**	**1.0000**
Output at basic prices	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**

Table 7. Inverse matrix for 1928

Industries		Agri-culture, hunting A1	Forestry A2	Fishing B	Mining C	Manuf. of food products DA	Manuf. of textiles DB
A1	Agriculture, hunting	1.5923	0.0160	0.0006	0.0014	0.3883	0.0434
A2	Forestry	0.0080	1.0030	0.0011	0.0031	0.0110	0.0072
B	Fishing	0.0000	0.0000	1.0000	0.0000	0.0008	0.0000
C	Mining	0.0007	0.0006	0.0028	1.1020	0.0004	0.0002
DA	Manuf. of food products	0.0158	0.0003	0.0001	0.0001	1.0663	0.0006
DB	Manuf. of textiles	0.0011	0.0001	0.0041	0.0000	0.0004	1.1639
DC	Manuf. of leather products	0.0002	0.0001	0.0000	0.0000	0.0001	0.0052
DD	Manuf. of wood and wood products	0.0036	0.0005	0.0003	0.0012	0.0022	0.0010
DE	Manuf. of pulp, paper and paper products	0.0024	0.0004	0.0007	0.0016	0.0081	0.0016
DF	Manuf. of coke and refined petroleum products	0.0001	0.0003	0.0059	0.0000	0.0001	0.0002
DG	Manuf. of chemical products	0.0093	0.0003	0.0021	0.0013	0.0037	0.0020
DH	Manuf. of rubber and plastic products	0.0001	0.0003	0.0000	0.0000	0.0001	0.0005
DI	Manuf. of non-metallic mineral products	0.0019	0.0003	0.0000	0.0012	0.0008	0.0002
DJ	Manuf. of basic metals and fabricated metal products	0.0069	0.0008	0.0008	0.0029	0.0026	0.0020
DK	Manuf. of machinery and equipment	0.0140	0.0009	0.0003	0.0092	0.0051	0.0058
DL	Manuf. of electrical and optical equipment	0.0005	0.0001	0.0000	0.0000	0.0002	0.0001
DM	Manuf. of transport equipment	0.0003	0.0010	0.0050	0.0001	0.0004	0.0003
DN	Manuf. of other products	0.0027	0.0003	0.0000	0.0000	0.0008	0.0002
E	Electricity, gas and water supply	0.0062	0.0009	0.0053	0.0187	0.0042	0.0110
F	Construction	0.0193	0.0027	0.0002	0.0005	0.0057	0.0015
G	Trade	0.0561	0.0034	0.0212	0.0164	0.0697	0.0433
H	Hotels and restaurants	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I	Transport, storage, post and telecomm. services	0.0171	0.0621	0.0014	0.0051	0.0228	0.0174
J	Financial and insurance services	0.0065	0.0013	0.0005	0.0010	0.0033	0.0016
K	Housing and business services	0.0057	0.0009	0.0017	0.0014	0.0061	0.0037
L	Public administration	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
M	Education	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	Health and social-work services	0.0102	0.0001	0.0000	0.0000	0.0025	0.0003
O	Other services	0.0033	0.0002	0.0000	0.0000	0.0009	0.0002
P	Household work	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 7. Inverse matrix for 1928

Manuf. of leather products	Manuf. of wood and wood products	Manuf. of pulp, paper and paper products	Manuf. of coke and refined petroleum products	Manuf. of chemical products	Manuf. of rubber and plastic product	
DC	DD	DE	DF	DG	DH	Industries
0.0712	0.0328	0.0281	0.0000	0.0427	0.0120	A1 Agriculture, hunting
0.0092	0.5590	0.2460	0.0000	0.0319	0.0145	A2 Forestry
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	B Fishing
0.0002	0.0011	0.0054	0.0000	0.0013	0.0007	C Mining
0.0010	0.0012	0.0008	0.0000	0.0319	0.0003	DA Manuf. of food products
0.0302	0.0002	0.0022	0.0000	0.0002	0.0790	DB Manuf. of textiles
1.1578	0.0001	0.0001	0.0000	0.0005	0.0005	DC Manuf. of leather products
0.0047	1.0461	0.0692	0.0000	0.0065	0.0087	DD Manuf. of wood and wood products
0.0021	0.0022	1.1413	0.0000	0.0052	0.0014	DE Manuf. of pulp, paper and paper products
0.0001	0.0004	0.0003	1.0000	0.0003	0.0005	DF Manuf. of coke and refined petroleum products
0.0037	0.0018	0.0034	0.0000	1.1314	0.0010	DG Manuf. of chemical products
0.0145	0.0006	0.0005	0.0000	0.0002	1.0103	DH Manuf. of rubber and plastic products
0.0002	0.0006	0.0079	0.0000	0.0079	0.0006	DI Manuf. of non-metallic mineral products
0.0012	0.0057	0.0083	0.0000	0.0028	0.0026	DJ Manuf. of basic metals and fabricated metal products
0.0029	0.0083	0.0178	0.0000	0.0082	0.0071	DK Manuf. of machinery and equipment
0.0004	0.0002	0.0002	0.0000	0.0001	0.0001	DL Manuf. of electrical and optical equipment
0.0003	0.0020	0.0017	0.0000	0.0006	0.0006	DM Manuf. of transport equipment
0.0002	0.0004	0.0003	0.0000	0.0002	0.0002	DN Manuf. of other products
0.0049	0.0106	0.0280	0.0000	0.0096	0.0166	E Electricity, gas and water supply
0.0017	0.0053	0.0048	0.0000	0.0023	0.0018	F Construction
0.0597	0.0468	0.0512	0.0000	0.0716	0.0352	G Trade
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	H Hotels and restaurants
0.0155	0.1240	0.1069	0.0000	0.0383	0.0360	I Transport, storage, post and telecomm. services
0.0019	0.0036	0.0042	0.0000	0.0026	0.0016	J Financial and insurance services
0.0050	0.0050	0.0053	0.0000	0.0062	0.0032	K Housing and business services
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	L Public administration
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	M Education
0.0005	0.0002	0.0002	0.0000	0.0003	0.0001	N Health and social-work services
0.0002	0.0004	0.0004	0.0000	0.0002	0.0001	O Other services
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	P Household work
1.3891	**1.8588**	**1.7345**	**1.0000**	**1.4031**	**1.2347**	**Total**

Table 7. Inverse matrix for 1928

Industries		Manuf. of non-metallic mineral products DI	Manuf. of basic metals and fabricated metal products DJ	Manuf. of machinery and equipment DK	Manuf. of electrical and optical equipment DL	Manuf. of transport equipment DM	Manuf. of other products DN
A1	Agriculture, hunting	0.0105	0.0114	0.0041	0.0013	0.0047	0.0144
A2	Forestry	0.0412	0.0301	0.0188	0.0033	0.0217	0.0487
B	Fishing	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C	Mining	0.0631	0.0017	0.0007	0.0002	0.0006	0.0003
DA	Manuf. of food products	0.0007	0.0007	0.0004	0.0001	0.0004	0.0005
DB	Manuf. of textiles	0.0135	0.0001	0.0001	0.0001	0.0001	0.0341
DC	Manuf. of leather products	0.0001	0.0001	0.0000	0.0016	0.0000	0.0003
DD	Manuf. of wood and wood products	0.0191	0.0110	0.0162	0.0010	0.0310	0.0302
DE	Manuf. of pulp, paper and paper products	0.0045	0.0023	0.0015	0.0010	0.0014	0.0128
DF	Manuf. of coke and refined petroleum products	0.0001	0.0006	0.0009	0.0001	0.0008	0.0001
DG	Manuf. of chemical products	0.0076	0.0076	0.0049	0.0007	0.0050	0.0051
DH	Manuf. of rubber and plastic products	0.0002	0.0005	0.0004	0.0002	0.0004	0.0002
DI	Manuf. of non-metallic mineral products	1.0435	0.0007	0.0002	0.0002	0.0002	0.0003
DJ	Manuf. of basic metals and fabricated metal products	0.0082	1.1846	0.1282	0.0787	0.0858	0.0090
DK	Manuf. of machinery and equipment	0.0099	0.0216	1.0243	0.0080	0.0210	0.0037
DL	Manuf. of electrical and optical equipment	0.0001	0.0004	0.0003	1.0185	0.0002	0.0001
DM	Manuf. of transport equipment	0.0006	0.0007	0.0003	0.0001	1.0098	0.0004
DN	Manuf. of other products	0.0001	0.0005	0.0003	0.0002	0.0002	1.0255
E	Electricity, gas and water supply	0.0197	0.0228	0.0076	0.0073	0.0045	0.0050
F	Construction	0.0019	0.0022	0.0009	0.0004	0.0009	0.0014
G	Trade	0.0387	0.0597	0.0419	0.0285	0.0376	0.0444
H	Hotels and restaurants	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I	Transport, storage, post and telecomm. services	0.0377	0.0427	0.0149	0.0044	0.0172	0.0251
J	Financial and insurance services	0.0021	0.0023	0.0015	0.0009	0.0014	0.0017
K	Housing and business services	0.0035	0.0053	0.0036	0.0024	0.0032	0.0039
L	Public administration	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
M	Education	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	Health and social-work services	0.0001	0.0001	0.0000	0.0000	0.0000	0.0001
O	Other services	0.0001	0.0002	0.0001	0.0000	0.0001	0.0001
P	Household work	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**1.3270**	**1.4098**	**1.2722**	**1.1591**	**1.2484**	**1.2674**

Table 7. **Inverse matrix for 1928**

Electricity, gas and water supply	Construc-tion	Trade	Hotels and restau-rants	Transport, storage, post and telec. services	Financial and insurance services		
E	F	G	H	I	J	Industries	
0.0005	0.0093	0.0101	0.2311	0.0215	0.0020	A1	Agriculture, hunting
0.0015	0.0533	0.0437	0.0359	0.0486	0.0730	A2	Forestry
0.0000	0.0000	0.0000	0.0067	0.0000	0.0000	B	Fishing
0.0002	0.0179	0.0008	0.0008	0.0090	0.0050	C	Mining
0.0000	0.0010	0.0002	0.1971	0.0027	0.0001	DA	Manuf. of food products
0.0003	0.0255	0.0003	0.0181	0.0015	0.0007	DB	Manuf. of textiles
0.0000	0.0002	0.0000	0.0002	0.0010	0.0000	DC	Manuf. of leather products
0.0009	0.0763	0.0035	0.0125	0.0060	0.0030	DD	Manuf. of wood and wood products
0.0006	0.0068	0.0336	0.0295	0.0062	0.0140	DE	Manuf. of pulp, paper and paper products
0.0000	0.0003	0.0002	0.0002	0.0025	0.0003	DF	Manuf. of coke and refined petroleum products
0.0002	0.0124	0.0004	0.0041	0.0031	0.0006	DG	Manuf. of chemical products
0.0000	0.0003	0.0002	0.0001	0.0053	0.0000	DH	Manuf. of rubber and plastic products
0.0012	0.0947	0.0010	0.0026	0.0040	0.0028	DI	Manuf. of non-metallic mineral products
0.0013	0.1226	0.0024	0.0052	0.0111	0.0044	DJ	Manuf. of basic metals and fabricated metal products
0.0002	0.0142	0.0013	0.0033	0.0111	0.0010	DK	Manuf. of machinery and equipment
0.0002	0.0165	0.0010	0.0005	0.0010	0.0017	DL	Manuf. of electrical and optical equipment
0.0000	0.0007	0.0006	0.0003	0.0169	0.0001	DM	Manuf. of transport equipment
0.0000	0.0014	0.0014	0.0136	0.0016	0.0002	DN	Manuf. of other products
1.0112	0.0125	0.0058	0.0288	0.0127	0.0274	E	Electricity, gas and water supply
0.0107	1.0078	0.0066	0.0230	0.0388	0.0276	F	Construction
0.0175	0.0677	1.0105	0.0763	0.0394	0.0114	G	Trade
0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	H	Hotels and restaurants
0.0019	0.0304	0.0390	0.0143	1.0501	0.0075	I	Transport, storage, post and telecomm. services
0.0004	0.0023	0.0242	0.0034	0.0208	1.0010	J	Financial and insurance services
0.0014	0.0064	0.0820	0.0909	0.0136	0.0786	K	Housing and business services
0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	L	Public administration
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	M	Education
0.0000	0.0001	0.0001	0.0015	0.0001	0.0000	N	Health and social-work services
0.0000	0.0001	0.0008	0.0012	0.0027	0.0006	O	Other services
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	P	Household work
1.0504	**1.5805**	**1.2696**	**1.8011**	**1.3314**	**1.2633**	**Total**	

Table 7. Inverse matrix for 1928

Industries		Housing and business services K	Public administration L	Education M	Health and social-work services N	Other services O	Household work P
A1	Agriculture, hunting	0.0051	0.0709	0.0381	0.0839	0.0016	0.0000
A2	Forestry	0.2305	0.0383	0.0955	0.1059	0.0348	0.0000
B	Fishing	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
C	Mining	0.0026	0.0026	0.0073	0.0133	0.0005	0.0000
DA	Manuf. of food products	0.0002	0.0325	0.0313	0.0745	0.0002	0.0000
DB	Manuf. of textiles	0.0015	0.0244	0.0027	0.0380	0.0044	0.0000
DC	Manuf. of leather products	0.0000	0.0022	0.0001	0.0003	0.0000	0.0000
DD	Manuf. of wood and wood products	0.0045	0.0082	0.0237	0.0018	0.0032	0.0000
DE	Manuf. of pulp, paper and paper products	0.0016	0.0125	0.0527	0.0025	0.0006	0.0000
DF	Manuf. of coke and refined petroleum products	0.0010	0.0004	0.0003	0.0005	0.0000	0.0000
DG	Manuf. of chemical products	0.0012	0.0032	0.0021	0.0120	0.0026	0.0000
DH	Manuf. of rubber and plastic products	0.0001	0.0003	0.0001	0.0001	0.0000	0.0000
DI	Manuf. of non-metallic mineral products	0.0053	0.0024	0.0078	0.0019	0.0026	0.0000
DJ	Manuf. of basic metals and fabricated metal products	0.0077	0.0110	0.0120	0.0055	0.0043	0.0000
DK	Manuf. of machinery and equipment	0.0011	0.0176	0.0027	0.0035	0.0007	0.0000
DL	Manuf. of electrical and optical equipment	0.0010	0.0013	0.0015	0.0063	0.0011	0.0000
DM	Manuf. of transport equipment	0.0003	0.0100	0.0003	0.0003	0.0001	0.0000
DN	Manuf. of other products	0.0003	0.0077	0.0236	0.0011	0.0017	0.0000
E	Electricity, gas and water supply	0.0484	0.0146	0.0538	0.0501	0.0206	0.0000
F	Construction	0.0560	0.0234	0.0716	0.0095	0.0274	0.0000
G	Trade	0.0222	0.0350	0.0388	0.0481	0.0071	0.0000
H	Hotels and restaurants	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I	Transport, storage, post and telecomm. services	0.0188	0.0262	0.0175	0.0135	0.0049	0.0000
J	Financial and insurance services	0.0080	0.0016	0.0018	0.0020	0.0003	0.0000
K	Housing and business services	1.0043	0.0102	0.0599	0.0557	0.0125	0.0000
L	Public administration	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
M	Education	0.0000	0.0004	1.0000	0.0000	0.0000	0.0000
N	Health and social-work services	0.0000	0.0035	0.0009	1.0006	0.0000	0.0000
O	Other services	0.0079	0.0003	0.0011	0.0006	1.0001	0.0000
P	Household work	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Total		**1.4296**	**1.3608**	**1.5473**	**1.5317**	**1.1314**	**1.0000**

Table 8. Labour input and labour-input coefficients for 1928

Products	Labour input		Labour-input coefficients	
	Hours worked	Output	Hours worked per FIM million of output	Hours worked per FIM million of output
	1,000 hours	FIM 1,000,000	Direct impact FIM	Total impact FIM
A1 Agriculture, hunting	1,455,400	10,710	135,896	251,936
A2 Forestry	338,500	3,768	89,833	163,101
B Fishing	17,400	181	96,399	96,663
C Mining	8,900	183	48,639	60,203
DA Manuf. of food products	39,138	3,945	9,921	26,877
DB Manuf. of textiles	82,456	1,685	48,925	68,922
DC Manuf. of leather products	21,541	818	26,330	31,141
DD Manuf. of wood and wood products	200,444	3,497	57,325	72,693
DE Manuf. of pulp, paper and paper products	78,541	2,818	27,872	40,298
DF Manuf. of coke and refined petroleum products				1,002
DG Manuf. of chemical products	5,622	366	15,369	22,632
DH Manuf. of rubber and plastic products	4,517	107	42,111	43,483
DI Manuf. of non-metallic mineral products	29,757	535	55,658	63,785
DJ Manuf. of basic metals and fabricated metal products	69,559	886	78,550	110,789
DK Manuf. of machinery and equipment	17,883	555	32,214	43,055
DL Manuf. of electrical and optical equipment	2,754	91	30,126	32,082
DM Manuf. of transport equipment	2,570	282	9,125	11,961
DN Manuf. of other products	8,919	285	31,340	35,014
E Electricity, gas and water supply	15,400	496	31,031	50,234
F Construction	170,500	4,522	37,702	54,055
G Trade	188,200	3,572	52,694	100,493
H Hotels and restaurants	24,500	655	37,408	37,408
I Transport, storage, post and telecomm. services	158,500	2,923	54,221	93,501
J Financial and insurance services	15,000	1,013	14,810	19,905
K Housing and business services	14,300	3,163	4,522	23,423
L Public administration	81,100	1,045	77,574	77,581
M Education	26,500	790	33,555	33,589
N Health and social-work services	20,200	694	29,086	30,954
O Other services	38,080	320	118,887	119,829
P Household work	80,920	301	269,164	269,164
Total	**3,217,100**	**50,205**	**1,596,287**	**2,085,773**

* The impact figures do not correspond correctly with inputs due to rounding errors.

Table 9. Capital input and capital-input coefficients for 1928

Products	Capital input		Capital-input coefficients	
	Capital stock	Output	Capital required per FIM million of output	Capital required per FIM million of output
	FIM 1,000,000	FIM 1,000,000	Direct impact FIM	Total impact FIM
A1 Agriculture, hunting	8,850	10,710	826,354	1,801,359
A2 Forestry	450	3,768	119,423	2,859,314
B Fishing	60	181	332,410	333,110
C Mining	170	183	929,064	1,147,917
DA Manuf. of food products	312	3,945	79,027	281,076
DB Manuf. of textiles	574	1,685	340,362	561,042
DC Manuf. of leather products	94	818	114,443	142,222
DD Manuf. of wood and wood products	1,898	3,497	542,871	797,815
DE Manuf. of pulp, paper and paper products	3,064	2,818	1,087,345	1,404,934
DF Manuf. of coke and refined petroleum products				18,819
DG Manuf. of chemical products	81	366	222,334	323,991
DH Manuf. of rubber and plastic products	47	107	435,211	458,399
DI Manuf. of non-metallic mineral products	344	535	643,597	777,264
DJ Manuf. of basic metals and fabricated metal products	576	886	650,960	997,209
DK Manuf. of machinery and equipment	73	555	131,266	285,062
DL Manuf. of electrical and optical equipment	22	91	240,019	272,544
DM Manuf. of transport equipment	10	282	36,012	104,404
DN Manuf. of other products	55	285	193,892	253,160
E Electricity, gas and water supply	5,430	496	10,941,340	11,722,533
F Construction	500	4,522	110,564	937,681
G Trade	2,570	3,572	719,579	1,634,209
H Hotels and restaurants	50	655	76,342	76,342
I Transport, storage, post and telecomm. services	7,350	2,923	2,514,371	3,208,641
J Financial and insurance services	760	1,013	750,365	904,311
K Housing and business services	20,670	3,163	6,535,926	6,927,244
L Public administration	1,580	1,045	1,511,308	1,511,541
M Education	830	790	1,050,956	1,051,616
N Health and social-work services	630	694	907,152	923,950
O Other services	800	320	2,497,617	2,564,029
P Household work	60	301	199,578	199,578
Total	**57,910**	**50,205**	**34,739,688**	**44,481,316**

* The impact figures do not correspond correctly with inputs due to rounding errors.

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