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CATCHING-UP IN EUROPE: FINLAND'S CONVERGENCE TO SWEDEN AND EU15[1]

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Tiivistelmä. Suomi onnistui 1900-luvulla kuromaan kiinni kehittyneempien maiden etumatkaa taloudellisessa hyvinvoinnissa. Johtuiko tämä siitä, että Suomi teollistui myöhemmin kuin Ruotsi ja EU15-maat? Tässä työpaperissa analysoimme Suomen kiinnikuromista tarkastelemalla talouskasvua ja työn tuottavuuden muutosta päätoimialoilla (alkutuotannossa, jalostuksessa sekä palveluissa). Selvitämme aluksi, kuinka hyvin myöhäinen teollistuminen selittää kiinnikuromista. Sen jälkeen käymme läpi rakennemuutoksen eri vaiheet. Lopuksi laskemme alkutuotannon, jalostuksen sekä palvelujen tuotannon ja työn tuottavuuden kasvun kontribuutiot talouskasvuun ja konvergenssiin. Analyysimme tuo uutta valoa konvergenssin ajoitukseen ja siihen, mitkä olivat päätoimialojen kontribuutiot. Jalostuksen suuri kasvukontribuutio ajoittui Suomessa myöhempään ajankohtaan kuin Ruotsissa. Pelkästään jalostus ei kuitenkaan selitä kiinnikuromista. Palvelujen työn tuottavuuden kontribuutio oli tärkeä Suomen konvergenssille, erityisesti vuosina 1965–1980.

Avainsanat: *kiinnikurominen, rakennemuutos, teollistuminen, talouskasvu, tuottavuus.*

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Abstract. Finland is an obvious case of economic convergence in the 20th century. Is this due to the fact that the Finnish industrialisation phase started late compared with Sweden and the EU15 average? In this article the Finnish post-WWII catch up process is traced by analysing the major - i.e., primary, secondary and tertiary - industries. First we explore whether the Finnish catch up can be explained only by late industrialisation. Then we delineate the phases of structural change, and finally, we show how primary, secondary and tertiary production and labour productivity growth have contributed to aggregate development and catch up. Our analysis brings new results on timing and locating convergence. Secondary production had its biggest impact on Finnish GDP growth later than in Sweden. However, it was not solely the advantages of secondary production growth that caused Finland's catch up. The labour productivity growth contribution from services was essential for Finland's catch up especially in 1965–80.

Keywords: *convergence, structural change, industrialization, growth, productivity.*

CONTENTS

YHTEENVETO

Suomi onnistui 1900-luvulla kuromaan kiinni Ruotsin ja EU15-maiden etumatkan taloudellisessa hyvinvoinnissa. EU15-maiden bruttokansantuote asukasta kohden saavutettiin 1960– ja 1970–luvuilla ja Ruotsin 1970– ja 1980–luvuilla sekä uudelleen 1990–luvulla. Tässä työpaperissa analysoimme Suomen kiinnikuromista (eli konvergenssia) toisen maailmansodan jälkeen tarkastelemalla talouskasvua ja työn tuottavuuden muutosta päätoimialoilla (alkutuotannossa, jalostuksessa sekä palveluissa). Usein konvergenssia käsittelevissä tutkimuksissa ajatellaan, että varhain teollistuneet maat ja niin sanotut perässätulijat kehittyvät eri tavoin. Varsinkin teollisuustoimialoilla on nähty olevan keskeinen rooli perässätulijoiden talouskasvun moottorina. Johtuuko Suomen onnistunut konvergenssi siis siitä, että teollistuminen tapahtui Suomessa myöhempään kuin Ruotsissa ja EU15-maissa? Regressioanalyysimme tulos on, että myöhäisempi teollistuminen selittää ainoastaan osittain konvergenssia. Suomessa jalostuksen vaikutus oli vahvin vuosina 1980–2003 ja Ruotsissa vuosina 1945–1979.

Käymme myös läpi rakennemuutoksen eri vaiheet Suomessa ja Ruotsissa ja laskemme alkutuotannon, jalostuksen sekä palvelujen tuotannon ja työn tuottavuuden kasvun vaikutukset talouskasvuun ja konvergenssiin. Analyysimme tuo uutta valoa konvergenssin ajoitukseen ja siihen, mitkä olivat toimialojen vaikutukset. Laskelmamme osoittavat, että palvelualojen BKT-vaikutukset ovat Suomessa vuosina 1965–1980 ja 1980–2003 olleet suuremmat kuin jalostuksen kasvuvaikutukset. Työn tuottavuuden kasvulle palvelualojen vaikutus oli Suomessa aivan keskeinen vuosina 1965–1980. Vuosina 1980–2003 Suomen jalostustoimialat ohittivat Ruotsin jalostustoimialojen vaikutuksen, ja tuolloin jalostustoimialat olivat tärkein osatekijä Suomen työn tuottavuuden kasvulle. Palvelualojen suuri merkitys Suomen konvergenssille Ruotsiin ja EU15-maihin verrattuna on uusi tutkimustulos.

1. INTRODUCTION

The economic convergence of countries has been one of the major research issues since the mid-20th century. In line with Alexander Gerschenkron's classical thesis of the advantage of relative backwardness[2] numerous studies have tried to find empirical evidence on whether productivity growth rates tend to vary inversely with productivity and production levels. The study of long run development is important because even small differences in growth rates can have enormous long term consequences for standards of living. However, the catch up of poorer countries is not automatic. In fact the differences between rich and poor countries' GDP per capita have grown during the last century.[3]

The convergence literature is linked to growth theories. For instance, the neo-classical theories[4] predict convergence in economic growth among countries that have similar saving rates and population growths. In the new growth theories[5] as well as in empirical research a country's ability to attain technological progress in production with human capital and social capability has been emphasised. For instance, according to Moses Abramovitz's seminal research countries should avoid institutional and technological obstacles to reach faster growth than in the leading countries.[6] When technological progress is achieved, it is accompanied with structural changes of the economy, meaning both changes in the shares of different industries and structural changes inside the same industry when unprofitable old technology firms are replaced with more profitable new technology firms.

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[2] Gerschenkron, Alexander, Economic Backwardness in Historical Perspective. In *The Progress of Underdeveloped Areas*, Ed. B. F. Hoselitz. University of Chicago Press 1952; Gerschenkron, Alexander, *Economic Backwardness in Historical Perspective: A Book of Essays.* Cambridge: Harvard University Press 1962.

[3] De Long, Brad, Productivity Growth, Convergence, and Welfare: Comment, *American Economic Review*, vol. 78, 1988: 5, 1138-1154; Pritchett, Lant, Divergence, Big Time, *Journal of Economic Perspective*, vol. 11, 1997: 3, 3-17.

[4] Ramsey, F. P., A Mathematical Theory of Saving, *Economic Journal*, vol. 38, 1928, 543-559; Solow, Robert, A Contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*, vol. 70, 1956: 1, 65-94; Solow, Robert, Technical Change and the Aggregate Production Function, *Review of Economics and Statistics,* vol. 39, 1957: 3, 312-320; Swan, Trevor, Economic Growth and Capital Accumulation, Economic Record, vol. 32, 1956, 334-361; Cass, David, Optimum Growth in an Aggregative Model of Capital Accumulation, *Review of Economic Studies*, vol. 32, 1965: 3, 233-240; Koopmans, Tjalling C., On the Concept of Optimal Economic Growth. *Pontificae Academiae Scientiarum Scripta Varia*, vol. 28, 1965, 225-300.

[5] Romer, Paul M., Increasing Returns and Long-Run Growth, *Journal of Political Economy*, vol. 94, 1986: 5, 1002-1037; Romer, Paul M., Growth Based on Increasing Returns Due to Specialization, *American Economic Review*, vol. 77, 1987: 2, pp. 56-62; Romer, Paul M., Endogenous Technological Change, *Journal of Political Economy*, vol. 98, 1990: 5, S71-S102; Lucas; Robert E., On the mechanics of Economic Development, *Journal of Monetary Economics*, vol. 22, 1988: 1, 3-42; Rebello, Sergio, Long-Run Policy Analysis and Long-Run Growth, *Journal of Political Economy*, vol. 99, 1991: 3, 500-521.

[6] Abramovitz, Moses, Catching Up, Forging Ahead, and Falling Behind, *Journal of Economic History*, vol. XLVI, 1986: 2, 385–406.

One of the topics related to the convergence discussion has been whether it is possible to find common patterns in economic development among countries. According to Gerschenkron the early industrialised countries and the latecomer countries develop in different ways.[7] Gerschenkron stressed the importance of manufacturing industries in the progress of latecomer countries – the more backward a country is the faster the potential growth of industrial output. The vitality of industrial production was also emphasised by Nicholas Kaldor who suggested that aggregate economic growth is related to growth in manufacturing and that manufacturing productivity increases the productivity of other industries.[8] The researchers of the classical overall pattern of economic development and structural change Colin Clark, Simon Kuznets and later on Ronald M. Hartwell, on the other hand, depict economic development as a shift from primary production to secondary production during the process of industrialisation, subsequently followed by the shift from secondary production to tertiary production as the post-industrial stage is entered.[9]

Defining absolute convergence as a poorer country's GDP per capita catching up with leading countries' GDP per capita, Finland is an obvious, positive case of economic convergence in the 20th century.[10] However, most of the convergence seems to have taken place after World War II. In Finland the industrialisation phase started late compared with Sweden and the EU15 average. The share of secondary production in GDP did not decrease until the 1970s[11] while in many Western European countries the share of manufacturing had started to decline earlier. Thus it seems that Finland was in a different phase of structural development after WWII. In addition, production shifted from primary production not only to secondary but also to tertiary production in Finland

[7] See Prados de la Escosura for a recent examination of this issue. Prados de la Escosura, Leandro, Gerschenkron Revisited. European Patterns of Development in Historical Perspective.*Universidad Carlos III de Madrid, Working Paper 05-79 (10), Economic History and Institutions Series 10,* December 2005.

[8] Kaldor, Nicholas, *Strategic Factors in Economic Development*. New York: New York State School of Industrial and Labor Relations, Cornell University 1967.

[9] This classical view has also been challenged as e.g. Broadberry argued that Germany and the United States surpassed Britain's level of aggregate labour productivity by shifting resources out of agriculture and improving the productivity of services rather than manufacturing. Clark, Colin, *The Conditions of Economic Progress*. MacMillan & Co. London 1940, 395–439; Kuznets, Simon, *Six Lectures on Economic Growth*. Frank Cass & Company, London, 1961; Hartwell, Ronald .M., The Service Revolution: The Growth of Services in Modern Economy, in *The Fontana Economic History of Europe 3: The Industrial Revolution, Ed. Carlo M. Cipolla*. Glasgow: Fontana/Collins 1973, 358-396; Broadberry, Stephen N., How did the United States and Germany Overtake Britain? A Sectoral Analysis of Comparative Productivity Levels, 1870-1990, *Journal of Economic History*, vol. 58, 1998: 2, 375-407.

[10] The growth theories have introduced yet another concept – conditional convergence – to the discussion. In conditional convergence countries converge to their own steady state GDP per capita growth rate, which is determined by their steady state capital per worker (to technology) ratio. In this paper the focus is on absolute convergence, since in the case of Finland there has also been absolute convergence to her leading neighbours, which is rather rare worldwide.

[11] Hjerppe, Riitta, *The Finnish Economy 1860–1985: Growth and Structural Change. Studies on Finland's Economic Growth XIII.* Helsinki: Bank of Finland Publications, Government Printing Office 1989; Hjerppe, Riitta & Jukka Jalava, Economic Growth and Structural Change: A Century and a Half of Catching-up, in *The Road to Prosperity: An Economic History of Finland*, Ed. Jari Ojala, Jari Eloranta & Jukka Jalava. Helsinki: Suomalaisen Kirjallisuuden Seura 2006.

at the same time in contrast with the classical view of separate industrialisation and post-industrialisation phases. Therefore, Finland has had a somewhat different path in her fast structural change after WWII compared with Sweden and the EU15.

Despite the available historical databases there is relatively little research on Finland's convergence with Sweden or/and the EU. The most notable exception is the work by Magnus Lindmark and Peter Vikström.[12] In their thorough research the authors show how the structure of Finnish economy and income levels converged to those of Swedish economy. However, when explaining the Finnish catch up Lindmark and Vikström focus on the development of the Finnish manufacturing industry. Unfortunately, with this focus the authors cannot explain exhaustively the Finnish catch up. As a second exception of convergence studies on these countries is a Nordic research group comparing Danish, Finnish and Swedish economies from the 1870s to the 1940 with convergence in mind.[13]

In this article our aim is to trace the Finnish catch up process. We will next describe some general features of Finland's economy and catch up with Sweden and the EU15. After that we will examine whether the late development of secondary and tertiary production and different path of structural change have been sources to Finland's convergence: We will first explore whether the Finnish catch up can be explained only by the late industrialisation. After that we will focus on how the structural change happened in Finland, and finally, to complete the picture, we will show how primary, secondary and tertiary production and labour productivity growth have contributed to aggregate development and catch up. This analysis will bring new results on timing and locating convergence.

[12] Lindmark, Magnus & Peter Vikström, Growth and Structural Change in Sweden and Finland: a Story of Convergence, *Scandinavian Economic History Review*, vol. 51, 2003: 1, 46-74.
[13] *Convergence? Industrialisation of Denmark, Finland and Sweden 1870–1940*, Ed. Hans Kryger Larsen. Helsinki: The Finnish Society of Sciences and Letters 2001.

2. SOME GENERAL FEATURES OF FINLAND'S ECONOMY AND CATCH UP WITH SWEDEN AND EU15

Finland in the early 2000s is an industrialized country with a standard of living ranked among the top fifteen–twenty countries in the world. Finland has been a member of the European Union since 1995 and has belonged to the European Economic and Monetary Union since 1999 with the Euro as its currency. One hundred years ago it was a poor agrarian country with a gross domestic product per capita less than a half of that of the United Kingdom or the United States, world leaders at the time. We know Finland's GDP growth from 1860 on from the Historical National Accounts of Finland, which were completed in the late 1980s.[14] We have fairly detailed annual series for the balance of total supply and demand at current and constant prices since 1860, value added and employment by industry, the structure of foreign trade by commodities and countries, etc.[15]

Though not blessed with abundant natural resources, Finland embarked on the road of industrialisation utilizing her forests, her hydropower potential and the rural labour reserve to produce goods to the Russian as well as the western market. The role of electrification and other technical innovations as enablers of productivity increase have been important.[16] Finnish GDP per person grew 12-fold from 1900 to 2000. That means a growth of 2.5 per cent per year. Swedish GDP per person increased 9-fold, that is 2.3 per cent per year, while that of the 15 European Union countries grew almost 7-fold or 1.9 per cent per year in 1900–2000. All these economies experienced incredibly fast growth compared with any other period before. Figure 2.1 shows that long term economic growth in the 20th century has been an almost continuous process with, however, severe disruptions during the World Wars and the 1930s depression.

Some acceleration of growth can be seen from 1900 to the 1970s in Figure 2.1, but all the curves flatten down to clearly slower growth rates in the 1970s, after the so-called Golden Years of Economic Growth in the post-Second World War period. In the early 1990s the Finnish economy quite unexpectedly fell into a serious depression for several years and real GDP fell by more than 10 per cent. The depression was deeper than any other peace-time depression since the middle of the 19th century. European Union countries also experienced recessions or depressions then, but not nearly as bad as that in Finland.

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[14] Hjerppe, *The Finnish Economy 1860–1985.*

[15] A Nordic database on the Norwegian School of Economics and Business' web pages contains the time series of the Finnish Historical National Accounts. See www.nhh.no/forskning/nnb/.

[16] Jalava, Jukka, Electrifying and digitalising the Finnish manufacturing industry: Historical notes on diffusion and productivity, in *Explorations in Economic Growth. A Festschrift for Riitta Hjerppe on her 60th Birthday*, Ed. Sakari Heikkinen & Jan Luiten van Zanden. Amsterdam: Aksant Academic Publishers 2004, 227-244.

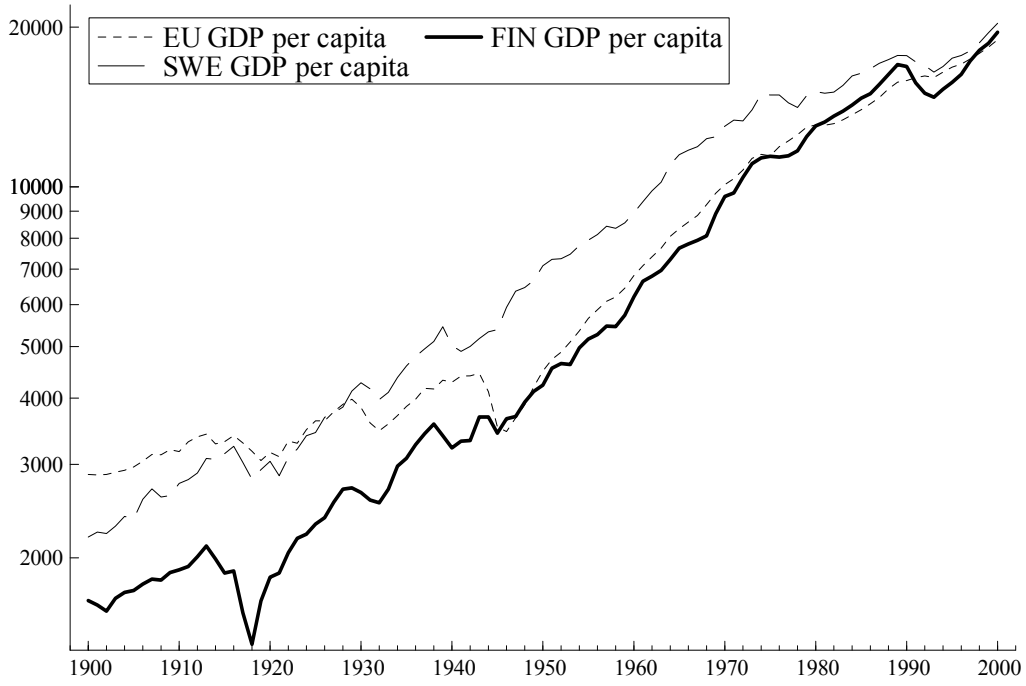

Figure 2.1. *GDP per capita in EU15, Sweden and Finland 1900–2000, logarithmic scale, 1990 Geary-Khamis dollars*

Sources: Own calculations; data from Hjerppe, Riitta, *Finland's Historical National Accounts 1860–1994: Calculation Methods and Statistical Tables*. Jyväskylä: Kopi-Jyvä Oy 1996; Statistics Finland; Carreras, Albert & Xavier Tafunell, European Union economic growth experience, 1830–2000, in *Explorations in Economic Growth. A Festschrift for Riitta Hjerppe on her 60th Birthday*, Ed. Sakari Heikkinen & Jan Luiten van Zanden. Amsterdam: Aksant Academic Publishers 2004, 63-87; Krantz, Olle, *Swedish Historical National Accounts 1800-1998: Aggregated Output Series*. Manuscript 2000; Statistics Sweden; Maddison, Angus, *The World Economy: a Millennial Perspective.* Paris: OECD, Development Centre 2001.

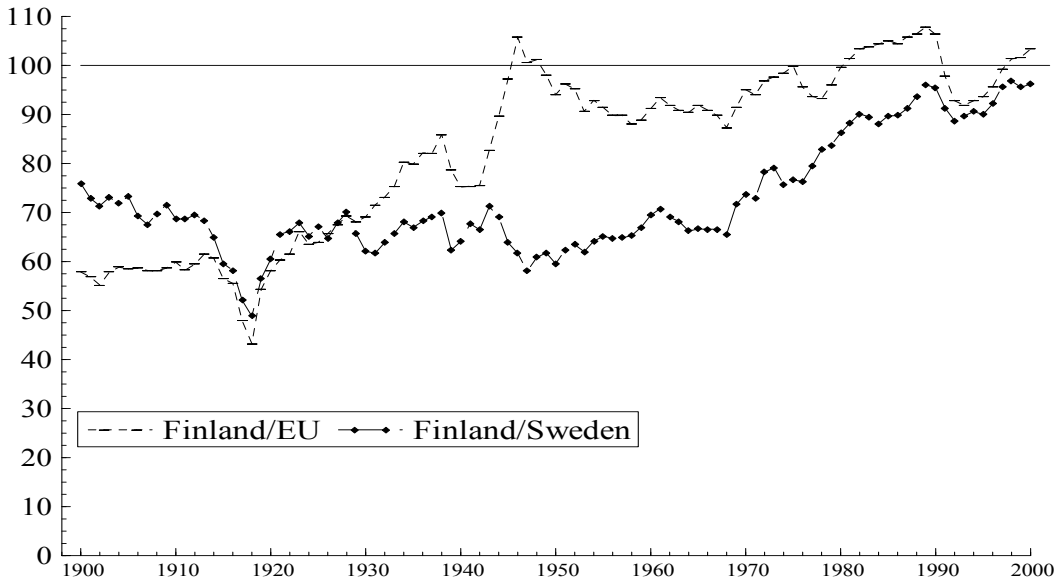

Figure 2.2. *Finland's GDP per capita compared with EU15 and Sweden, 1900–2000, per cent.*

Sources: Own calculations; data from Hjerppe, *Finland's Historical National Accounts 1860–1994;* Statistics Finland; Carreras & Tafunell, European Union economic growth experience, 1830–2000, Krantz, *Swedish Historical National Accounts 1800-1998*; Statistics Sweden.
Note that statistics from different sources (national, OECD, World Bank etc.) give somewhat different levels of GDP per capita in PPPs around the turn of the millennium. In some GDP per capita in Finland is slightly higher than that of Sweden, in most it is the other way round.

Compared with the EU15 in 1900, Finland started from a level of less than 40 per cent below West European GDP per capita (Figure 2.2). There was slow convergence, but the First World War and the Finnish Civil War dropped Finnish GDP per capita to 60 per cent below the EU15. After the war the recovery of the economy was quite fast in Finland compared with Western Europe and during the interwar period the Finnish economy did much better than the western world.[17] The GDP per capita gap narrowed to about 20 per cent and even less before the outbreak of the Second World War.

The development of the Finnish economy after the Second World War compared with the EU15 was more uneven than in the other peace time periods under consideration. First, there was a brisk catch up immediately after the war, with GDP per capita actually passing the EU15 level in 1946–48.[18] The gap widened again until the end of the 1950s.

[17] According to Krantz this was the period of the Finnish take off. Krantz, Olle, Industrialisation in Three Nordic Countries: A Long-Term Quantitative View, in *Convergence? Industrialisation of Denmark, Finland and Sweden, 1870–1940,* Ed. Hans Kryger Larsen. Helsinki: The Finnish Society of Sciences and Letters 2001, 23-65.
[18] The reconstruction of Finland, settlement of Karelian evacuees and soldiers as well as payment of war reparations to the Soviet Union forced the Finnish economy into fuller speed than the other countries

The tide turned only after the devaluations of 1957 and 1967 and easing of foreign trade regulations. The Finnish economy closed the gap to the EU15 over the 1970s despite the difficulties caused by the oil crises, exceeding the EU15 level in 1980. The early 1990s depression again changed the situation and caused a 15 percentage points collapse. This was followed by a fast recovery during the second half of the 1990s.

Compared with Sweden (Figure 2.2) the gap in GDP per capita to Sweden even widened in the early 1900s, due to Sweden's earlier industrialisation. From the early 1920s the gap prevailed on average until the 1970s, when the Finnish GDP per capita finally started to catch up. The difference was almost closed before the devastating 1990s depression set in and widened the gap again for many years, with some recovery after 1997. The reasons for this fast catch up by more than 20 percentage points from the late 1960s to the late 1980s are not at all clear and under investigation in this article.

Labour input and productivity of labour as factors of Finnish economic growth

GDP per capita can be expressed as the product of two components: labour productivity and labour input per capita. Labour productivity (GDP per hours worked) is often seen as the more important one as it can grow without bounds. For the amount of work that can be done per person there is an upper limit. Therefore economic growth can in the long run be sustained only by labour productivity change. Rephrasing the variables in natural logarithms GDP per capita can be divided as follows:

(1) log (GDP / capita) = log (GDP / hours worked) + log (hours worked / capita).

From equation 1 it can be seen that GDP per capita is higher the higher labour productivity is, the more hours have been worked on the national level (meaning a bigger employment share of population and/or more hours worked by each employee). An increase in labour input (hours worked) per capita has a level effect on GDP per capita. Labour productivity, on the other hand, has an effect on GDP through productivity growth, which acts on the compound interest principle – even a slight change in the long run productivity growth rate has significant long term implications.

Figure 2.3 shows the levels and evolution of Finnish GDP per capita and its components in index form (natural logarithmic scale) for the years 1900–2004. It is obvious that the main contribution to Finnish GDP per capita growth came from the increase in labour productivity (GDP per hours worked).

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devastated by the Second World War. The physical civil destruction was also less extensive in Finland than it was in many of the other war-faring countries.

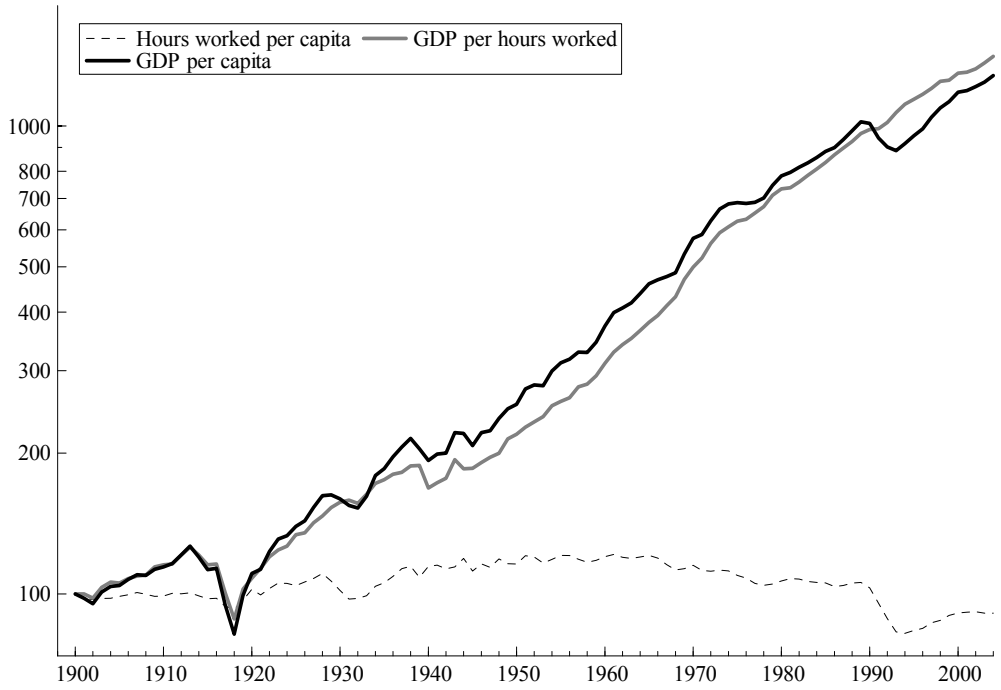


Figure 2.3. GDP per capita and its components in Finland, 1900–2004, GDP at year 2000 prices, Indices 1900=100, logarithmic scale
Source: Own calculations; data from Hjerppe, *Finland's Historical National Accounts 1860–1994;* Statistics Finland.

3. STRUCTURAL CHANGE AND PRODUCTIVITY GROWTH AS SOURCES OF FINLAND'S CONVERGENCE

In this section we study whether late industrialisation and a somewhat different path in structural change have been the sources of Finland's faster labour productivity growth, faster GDP growth and convergence. In subsection 3.1 we will first explore whether the later fast growth of secondary production explains Finland's catch up. The vitality of industrial production for economic growth was emphasised e.g. by Nicholas Kaldor.[19] Moreover, the importance of manufacturing growth has been constantly brought up in discussions of Finnish economic policy. We will use Kaldor's growth laws as a framework to test whether the development in secondary production can explain the convergence of Finland after WWII.[20] Later in subsection 3.2 we will broaden our examination and explore the impacts of primary and tertiary production on Finland's convergence to Sweden as well as the impacts of secondary production. Using the non-parametric growth accounting approach of the National Accounts framework the contributions of primary, secondary and tertiary production to GDP and labour productivity growth are studied in both countries in 1945–2003.

3.1 Can GDP and labour productivity growth be explained by secondary production?

In this subsection we will focus on secondary production in explaining economic growth in Finland and Sweden and the EU15. In accordance with Kaldor's growth laws[21] we will test the hypothesis, whether with the late fast growth phase in secondary production Finnish convergence can be explained via its effects on aggregate labour productivity and GDP growth. In other words, we make an assumption here that the fast GDP growth and the essential labour productivity growth in catch up are due to secondary production growth.

[19] Kaldor, *Strategic Factors in Economic Development.*

[20] "There can be little doubt from the empirical evidence…that the pace of long run growth and development is closely associated with the growth of industrial activities". Thirlwall, Anthony P., A General Model of Growth and Development on Kaldorian Lines, *Oxford Economic Papers,* vol. 38, 1986: 2, 199-219.

[21] It is worth noticing that originally Kaldor (1967) suggested his growth laws in a different economic environment in accordance with the UK's relatively slow growth in the post-WWII period. At that time the convergence discussion had barely begun. As mentioned before, we will use these growth laws as a framework for testing if the catch up of Finland can be explained by relatively late but fast secondary production growth. Kaldor, *Strategic Factors in Economic Development;* Kaldor, Nicholas, *Further Essays on Economic Theory.* London: Gerald Duckworth & Co. Ltd. 1978.

First the possibility to explain economic growth by Kaldor's growth laws is examined. With Ordinary Least Squares (OLS) regressions, the statistical significance and explanatory power of the laws are tested on Finnish, Swedish and EU15 data. After that we focus on the differences in explanatory power and statistical significance of each law in Finland and Sweden in 1945–2003 in order to find out whether Finland really has had different industrialisation phases compared with Sweden and to determine whether the fast secondary production evolution can explain Finland's catch up.

Kaldor (1967) stressed that a precondition for the growth of secondary and tertiary production is that primary production produces a surplus over the bare subsistence minimum. As a nation passes from economic immaturity to maturity, by which Kaldor (1978) meant a state where real incomes per head in each part of the economy are comparatively similar, the role of secondary production is crucial due to increasing returns to scale. Kaldor (1967, 1978) suggested that 1) aggregate economic growth is related to growth in manufacturing, and that 2) manufacturing productivity increases the productivity of the other sectors. These observations are often called Kaldor's growth laws.[22]

OLS regressions were carried out to cast some light on the applicability of Kaldor's laws to Finnish and Swedish historical economic change in 1945–2003 and to the EU15 in 1980–2003. The comparison of Finland and Sweden is also done in the sub-periods 1945–79 and 1980–2003.

regression (1) $\Delta Y_{GDP} = \alpha_1 + \beta_1 \Delta Y_{SEC} + \varepsilon_1$,

regression (2) $\Delta LP_{GDP} = \alpha_2 + \beta_2 \Delta Y_{SEC} + \beta_3 \Delta E_{PRIM\&TERT} + \varepsilon_2$, [23]

where

Δ = *the absolute change of the variable (here variables are expressed in natural*

[22] Not to be confused with Kaldor's stylized facts. Kaldor did actually propose several growth laws. One of them stated that manufacturing productivity growth is related to manufacturing output growth (also called Verdoorn's law). We will concentrate here on the two laws mentioned in order to assess the impacts of secondary production on GDP and aggregate level labour productivity growth on Finland's catch up. Jalava has estimated the applicability of Verdoorn's law on Finnish data as well. Jalava, Jukka, Production, Primary, Secondary, and Tertiary: Finnish Growth and Structural Change, 1860-2004, *Pellervo Economic Research Institute, Working Papers* No. 80, 2006: January; Stoneman, P., Kaldor's law and British economic growth: 1800-1970, *Applied Economics*, vol. 11, 1979: 3, 309-319; Bairam, Erkin, Verdoorn's Original Model and the Verdoorn Law Controversy: Some New Empirical Evidence Using the Australian Manufacturing Data, *Australian Economic Papers*, vol. 29, 1990, 107-112; Mamgain, Vaishali, Are the Kaldor-Verdoorn Laws Applicable in the Newly Industrializing Countries?, *Review of Development Economics*, vol. 3, 1999: 3, 295-309; Wells, Heather & Anthony P. Thirlwall, Testing Kaldor's Growth Laws across the Countries of Africa, *African Development Review*, vol. 15, 2003: 2-3, 89-105.

[23] All the variables in both regressions are differenced and logarithmised and stationary, thus the possible spuriousness problem in time series regression (connected to regression of unit root time series) is not present. Heteroskedastic and autocorrelation consistent standard errors are used in both regressions to avoid wrong statistical inference.

logarithms and Δ *approximates closely a relative change e.g. in per cents, sometimes marked with log%)*

Y = *real value added, the subscript implies the part of the economy under review,*

ΔY = *the change of real value added*

LP = *labour productivity, real value added / hours worked,*

ΔLP = *the change of labour productivity*

E = *number of hours worked,*

ΔE = *the change in number of hours worked*

α = *a constant in the regression equation*

β = *a regression coefficient for the explanatory variable, if* $\beta \neq 0$ *according to statistical tests with the data, the variable has explanatory power for the left hand side variable in the equation*

ε = *residual or error from the regression equation, the part of variation of the left hand side variable in the equation that could not be explained*

Kaldor's first proposition is assessed with regression 1,[24] where GDP growth was explained by secondary production's real value added growth in each country or area (Table 3.1). According to the results some confirmation can be given to Kaldor's first law. The model fits each country's data fairly well in each time section available and all variables' coefficients are statistically significant. The model's explanatory power (adjusted R squared) is 70 per cent for Finland and 80 per cent for Sweden in 1945–2003. However, comparing Sweden and Finland in two subsections of time (1945–79, 1980–2003), differences in the model fit can be found: The variation in secondary production value added explains only 57 per cent of Finland's GDP variation in the first period, at the same time it explains as much as 90 per cent of Sweden's GDP variation. In contrast, in the latter period the secondary production variation explains more in Finland (as much as 85 per cent). Thus, secondary production's contribution to GDP has been more important in Finland in 1980–2003. Therefore, according to these results as well, the benefits from Finland's full industrialisation came later compared with Sweden. With the latter period data, the model gets confirmation from the EU15 (91 per cent R squared) data as well.

[24] With the first regression we are primarily interested in how much we can predict (or explain) GDP growth by secondary production growth in each economic area, thus for equation 1 we look merely at the adjusted R^2 instead of ß coefficient values. However, to be sure that the simultaneous causation of secondary production growth to GDP growth does not lead us to wrong conclusions with OLS regression coefficients, the simple correlations between ΔY_{GDP} and ΔY_{SEC} are also shown in Table 3.1 and they clarify simply the same results - without parameter estimation. In addition to regression 1, we also ran regressions in which we explained ΔY_{GDP} with $\Delta Y_{PRIM,}$ ΔY_{SEC} and ΔY_{TERT}: in this case the regression coefficients (with explanatory power close to 1) give the average contribution of each production class in each period and these results, too, verified the conclusions made with regression 1. Later, in sub-section 3.2, we will use growth accounting techniques – again without parameter estimation – to achieve even annual contributions to economy-wide GDP and labour productivity growth of primary, secondary and tertiary production.

One must remember that tertiary production also contributed to GDP growth, which was not argued in Kaldor's first law and not tested with regression 1.

Table 3.1. *Results for regression 1*

	1945–2003	*1945–1979*	*1980–2003*	*1945–2003*	*1945–1979*	*1980–2003*	*1980–2003*
Country	FIN	FIN	FIN	SWE	SWE	SWE	EU15
N	58	34	24	58	34	24	24
equation	1	1	1	1	1	1	1
constant	0.008*	0.013**	0.004	0.011***	0.012***	0.010**	0.014***
	(2.63)	(2.83)	(1.11)	(6.89)	(6.79)	(3.16)	(20.15)
β_1 (ΔY_{SEC})	0.556***	0.493***	0.627***	0.506***	0.580***	0.371***	0.502***
	(6.07)	(3.84)	(17.92)	(10.80)	(19.09)	(7.67)	(12.10)
Adj. R^2	0.70	0.57	0.85	0.80	0.90	0.72	0.91
D.W.	1.21	1.42	1.20	1.24	2.35	1.27	1.63
F	134.2***	44.1***	129.9***	223.1***	304.6***	58.9***	230.1***
Correlation (ΔY_{GDP}, ΔY_{SEC})	0.84	0.76	0.92	0.89	0.95	0.85	0.96

Source: Own calculations**;** data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland; Edvinsson, Rodney, Growth, Accumulation, Crisis: With New Macroeconomic Data for Sweden 1800-2000. Stockholm: Almqvist & Wiksell International 2005; Groningen Growth and Development Centre, 60-Industry Database, October 2005, **http://www.ggdc.net**.
***= significant at the 0.1% level. **=significant at the 1% level. *=significant at the 5% level. +=significant at the 10% level. The t-statistics and F-statistics have been obtained using the Newey-West (1987) heteroskedastic and autocorrelation consistent standard errors in the software EViews 5.1. The error structure is expected to be heteroskedastic and autocorrelated up to a number of lags. The truncation lag was chosen by q = floor($4(T/100)^{2/9}$) following the suggestion of Newey and West. This means 3 lags for periods 1945-2003 and 1945-1979 and 2 lags for period 1980-2003. Newey, W. K. & K. D. West, A Simple, Positive Semi-definite, Heteroscedasticity and Autocorrelation Consistent Covariance Matrix, *Econometrica*, vol. 55, 1987: 3, 703-708.

As an assessment of Kaldor's second proposition, aggregate labour productivity growth was explained by secondary production's value added growth and non-secondary labour input growth (regression 2). According to our regression results in Table 3.2, the growth in the non-secondary labour input at first glance seems to have a clear negative relationship with labour productivity change at the economy-wide level, as Kaldor expected: the β_3-coeffiecients are negative. But with a more careful scrutiny of the results, one notices that with our data, β_3 is not statistically significant (at the 5 per cent level) in Finland in 1945-79 and the explanatory power (11 per cent) is dramatically low. Kaldor's second law does not seem to hold for Finland in 1945–79, although it gets confirmation in all the other time periods and countries. For the whole period the

explanatory power is clearly weaker for Finland than for Sweden. On the other hand, the explanatory power is the strongest for Finland in the second time period, while its biggest impact on Swedish aggregate labour productivity growth was in 1945–79. This corroborates the later continuing industrialization phase in Finland. However, non-secondary labour input growth did not decrease aggregate labour productivity in Finland in 1945–79, which implies primary and tertiary production contributions to aggregate labour productivity as well.

Table 3.2. *Results for regression 2*

	1945–2003	*1945–1979*	*1980–2003*	*1945–2003*	*1945–1979*	*1980–2003*	*1980–2003*
Country	FIN	FIN	FIN	SWE	SWE	SWE	EU15
N	58	34	24	58	34	24	24
equation	2	2	2	2	2	2	2
constant	0.022***	0.026***	0.019***	0.019***	0.021***	0.017***	0.023***
	(7.11)	(4.41)	(8.43)	(9.05)	(6.25)	(9.61)	(17.28)
$\beta_2 (\Delta Y_{SEC})$	0.232*	0.185	0.319***	0.352***	0.411***	0.186***	0.334***
	(4.22)	(1.20)	(11.51)	(6.21)	(8.32)	(4.31)	(4.67)
$\beta_3(\Delta E_{PRIM\&TERT})$	-0.464**	-0.315+	-0.778***	-0.772***	-0.580**	-0.586***	-0.880***
	(-3.04)	(-1.94)	(-10.81)	(-7.61)	(-3.57)	(-6.36)	(-6.54)
Adj. R^2	0.29	0.11	0.73	0.61	0.69	0.51	0.64
D.W.	1.27	1.24	0.94	1.14	1.63	2.38	0.90
F	12.41***	3.01+	31.86***	44.95***	37.65***	12.74***	21.19***

Source: Own calculations**;** data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland; Edvinsson, Growth, Accumulation, Crisis; Groningen Growth and Development Centre, 60-Industry Database.

***= significant at the 0.1% level. **=significant at the 1% level. *=significant at the 5% level. +=significant at the 10% level. The t-statistics and F-statistics have been obtained using the Newey-West (1987) heteroskedastic and autocorrelation consistent standard errors in the software EViews 5.1. The error structure is expected to be heteroskedastic and autocorrelated up to a number of lags. The truncation lag was chosen by q = floor($4(T/100)^{2/9}$) following the suggestion of Newey and West. This means 3 lags for periods 1945-2003 and 1945-1979 and 2 lags for period 1980-2003. Newey and West, A Simple, Positive Semi-definite, Heteroscedasticity and Autocorrelation Consistent Covariance Matrix.

To conclude, we found that Kaldor's laws can only be used partially in analysing economic growth in Finland. Secondary production had its biggest impacts on Finnish GDP growth in 1980–2003. Thus we must reject our first hypothesis, that Finnish growth and convergence to Sweden, and consequently to the EU15 as well, could be explained solely with the late fast growth phase in secondary production by its impacts on speeding up aggregate labour productivity change.

3.2 Primary, secondary and tertiary production contributions to Finland's catch up

In order to find out more about the roles of structural change and aggregate labour productivity growth as explanatory sources of Finnish convergence to Sweden in 1945–2003, we will explore the value added growth and the labour productivity growth in major industries of the economy as well. Special attention is given to service production. From now on, we will use the non-parametric growth accounting techniques of National Accounts to attain a deeper analysis of primary, secondary and tertiary production contribution within the previously used time periods.[25] To shed more light on growth and convergence in 1945–1980 we will further divide this period into two sub-periods, i.e. 1945–65 and 1965–80.

The evolution of the production structures of Sweden and Finland are shown in Table 3.3 and in Figures 3.1 and 3.2. Sweden had a more industrialised and more service oriented economic structure already in 1945, whereas Finland, although rapidly changing, was much more an agricultural society in the first years of the period. Looking at the shares in Table 3.3, one notices that while Sweden's primary production share diminished from 14 to 2 percentage points from 1945 to 2003, Finland's primary production share decreased from 42 to 3 percentage points. The fastest structural change seems to have taken place in Finland from 1945 to 1965 when the share of primary production declined from 42 to 16 percentage points and at the same time both secondary and tertiary production shares increased. However, from 1980 to 2003 the services share grew substantially again in Finland at the same time when the primary and also secondary production shares diminished. In Figures 3.1 and 3.2 it is worth noticing that the highest share of secondary production in Sweden was in the early 1960s and in Finland in the mid-1970s.

[25] With growth accounting techniques we can get not only average contribution coefficients (or explanatory powers) in each time period but obtain the annual contributions of primary, secondary and tertiary production to the economy-wide level. Using logarithmical changes in the variables under review we can calculate the average growth contributions (including the compound interest effect) for shorter time periods.

Table 3.3. *Production structure of the economy in Sweden and Finland, in 1945, 1965, 1980, 2003*

SWE	1945	1965	1980	2003
PRIM	14%	7%	4%	2%
SEC	39%	42%	32%	27%
TERT	47%	51%	64%	71%
FIN	**1945**	**1965**	**1980**	**2003**
PRIM	42%	16%	10%	3%
SEC	27%	36%	38%	32%
TERT	31%	48%	52%	65%

Source: Own calculations; data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland; Edvinsson, Growth, Accumulation, Crisis; Groningen Growth and Development Centre, 60-Industry Database**.**

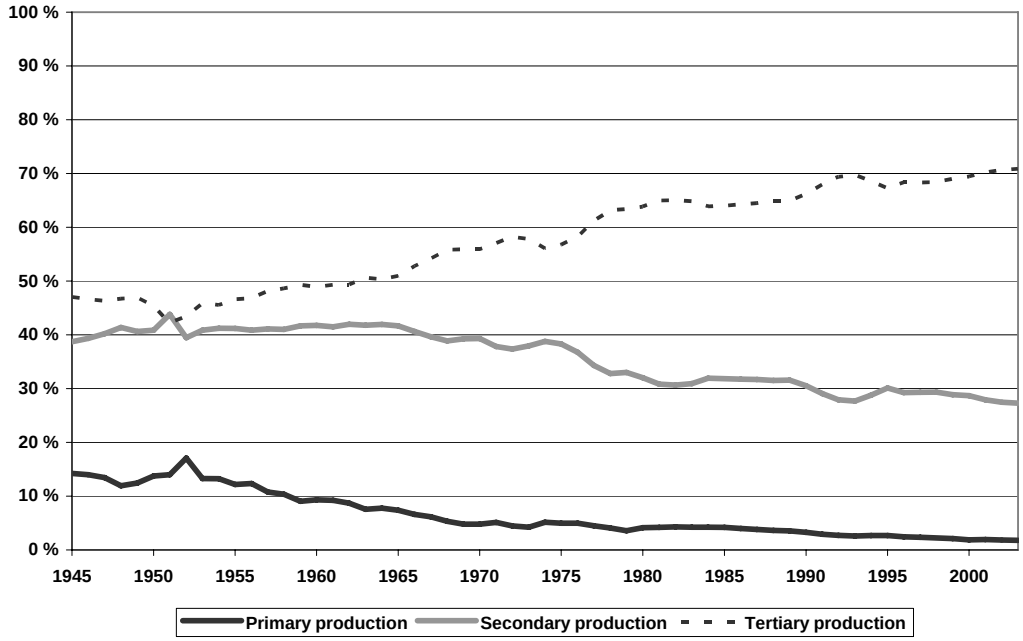


Figure 3.1. *Shares of primary production, secondary production and tertiary production in Swedish GDP, 1945–2003 per cent.*

Source: Own calculations; data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland; Edvinsson, Growth, Accumulation, Crisis; Groningen Growth and Development Centre, 60-Industry Database**.**

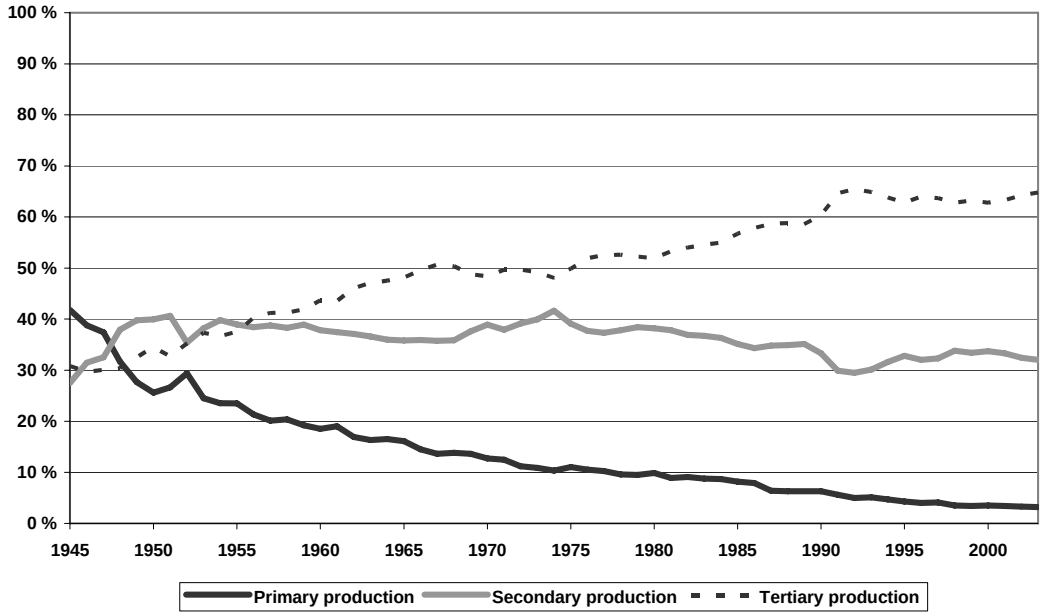


Figure 3.2. *Shares of primary production, secondary production and tertiary production in Finnish GDP, 1945–2003, per cent.*

Source: Own calculations; data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland.

Value added growth contributions

Table 3.4 shows that the value added in secondary and tertiary production grew rapidly in Finland in the first two periods. This confirms – together with previous results – that production shifted from primary production to secondary and tertiary production at the same time in Finland. This shows that Finland has gone through a good part of its industrialisation phase after WWII, but Sweden deepened its industrialisation in the first period under review as well. The growth in secondary and tertiary production in Finland (Table 3.4) has been faster than in Sweden in all of the periods. Hence, Finland came behind Sweden in structural change but went both faster and more simultaneously through the transformation from an agricultural to industrialised and post-industrialised country.

Table 3.4. *Average growth by period, log%, FIN & SWE*

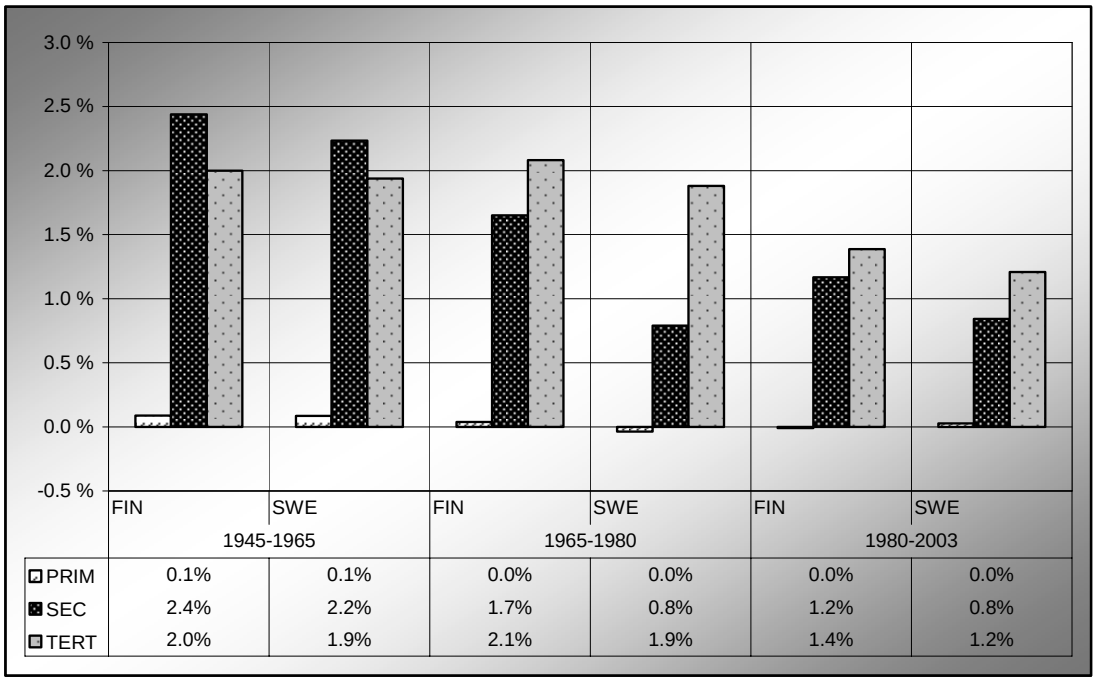
	1945-1965		1965-1980		1980-2003	
	FIN	SWE	FIN	SWE	FIN	SWE
PRIM	0.9%	0.7%	0.5%	-0.6%	-0.2%	0.7%
SEC	6.7%	5.5%	4.4%	2.0%	3.4%	2.8%
TERT	5.3%	4.1%	4.2%	3.3%	2.4%	1.8%
GDP	**4.4%**	**4.2%**	**3.7%**	**2.6%**	**2.5%**	**2.1%**

Source: Own calculations; data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland; Edvinsson, Growth, Accumulation, Crisis; Groningen Growth and Development Centre, 60-Industry Database**.**

How much then did the growth of the primary, secondary and tertiary productions contribute to GDP growth in Finland and Sweden? In Figure 3.3 the primary, secondary and tertiary production growth contributions to GDP growth are calculated by multiplying the annual current price production share with the annual volume log per cent growth in each production class in each time period.[26] Because the growth contribution rates are expressed in logarithms, they exhibit the average period growth contribution rates (including the compound interest effect) in each major industry as well.

As can also be seen from Table 3.4, the average GDP growth rate was almost similar in both countries in the first period, which confirms the fact that Finland did not catch up to a large extent with Sweden in GDP per capita in 1945–65 (see also Figure 2.2). In both countries, the growth came from both secondary and tertiary production, with the emphasis on secondary production growth in 1945–1965. Observing Table 3.4 it is clear that Finnish secondary production growth rate was higher (6.7 per cent) than the Swedish (5.5 per cent). However, because of the essentially larger secondary production share (Table 3.3) secondary production's growth contribution did not differ to a great extent in Sweden.

[26] The annual volume growth rates in primary, secondary and tertiary production were aggregated from more detailed sub-classes by using Törnqvist aggregation in accordance with Törnqvist-index methodology.



	FIN	SWE	FIN	SWE	FIN	SWE
	1945-1965		1965-1980		1980-2003	
PRIM	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
SEC	2.4%	2.2%	1.7%	0.8%	1.2%	0.8%
TERT	2.0%	1.9%	2.1%	1.9%	1.4%	1.2%

Figure 3.3 Primary, secondary and tertiary production growth contributions to GDP growth, log%, annual average by period, Finland and Sweden (average of yearly growth rates multiplied with current price annual share (current price annual share is t and t-1 years' average share))

Source: Own calculations; data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland; Edvinsson, Growth, Accumulation, Crisis; Groningen Growth and Development Centre, 60-Industry Database.

It is important to note that both Finland's secondary and tertiary production grew faster (Table 3.4) in all periods and contributed more particularly in the last two periods (Figure 3.3) than in Sweden. In the first period both countries' GDP growth pace was considerably high, but from Finland's point of view the difference in GDP per capita remained almost as big at the end of this period as at the beginning. Figure 3.3 reveals that service production's growth contributions to GDP in Finland have been even bigger than secondary production contributions in the second and third periods when Finnish growth was faster and convergence to Sweden mostly took place.

Labour productivity growth contributions

Above we noticed that it was not only the rise of secondary production but also the rise of tertiary production that caused Finland's faster GDP growth in 1965–80 and in 1980–2003. Figure 2.3 in section 2 showed the vitality of labour productivity growth in contributing to GDP per capita growth. This is why we will conclude this discussion by

evaluating primary, secondary and tertiary labour productivity growth and their contributions to aggregate labour productivity in Finland and in Sweden.

Table 3.5. *Labour productivity average growth by period, log%, FIN & SWE*

	1945-1965		1965-1980		1980-2003	
	FIN	SWE	FIN	SWE	FIN	SWE
PRIM	2.3%	4.4%	5.1%	4.9%	3.5%	3.5%
SEC	4.0%	4.8%	4.1%	4.1%	4.7%	3.7%
TERT	2.0%	2.4%	3.0%	1.9%	1.3%	1.0%
TOT economy	**3.1%**	**3.9%**	**4.2%**	**3.1%**	**2.8%**	**1.9%**

Source: Own calculations; data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland; Edvinsson, Growth, Accumulation, Crisis; Groningen Growth and Development Centre, 60-Industry Database**.**

From Table 3.5 it can be seen that labour productivity grew faster in Sweden in 1945–65 both at the aggregate level and in each major industry. This also shows why Finland did not actually catch up with Sweden in that period, although labour input grew after WWII in Finland together with labour productivity. The faster structural change and labour input growth in secondary and tertiary production during the first period helped Finland reply to Sweden's fast GDP growth and not fall behind in GDP per capita either in 1945–65.

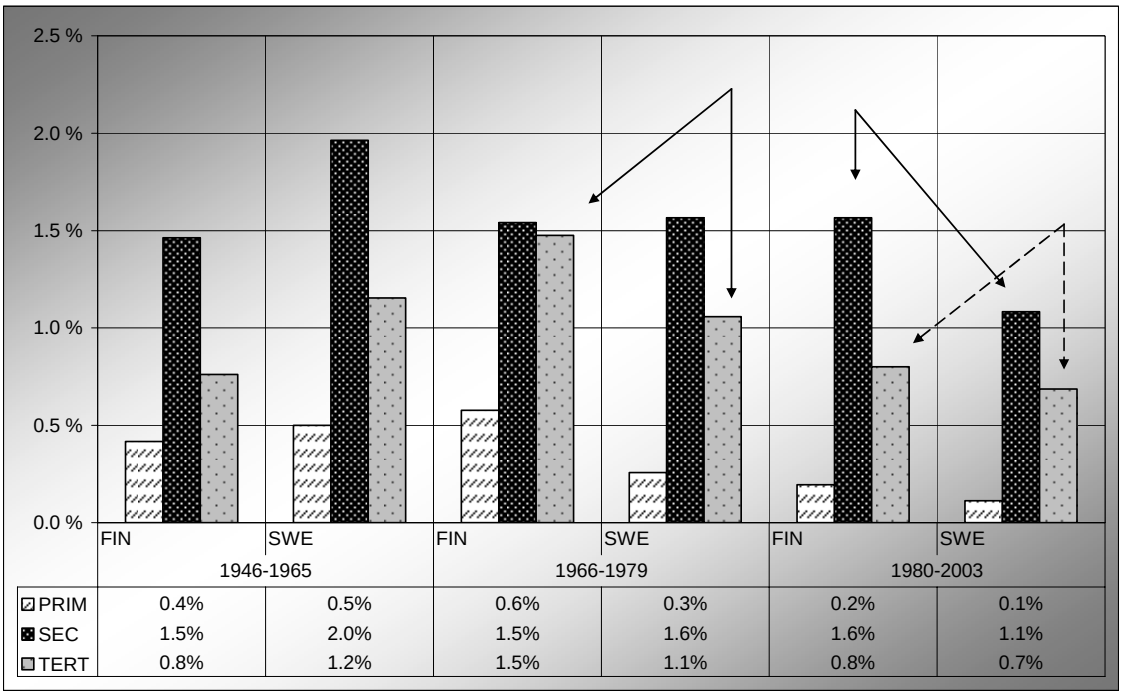
In 1965–80 Finland's labour productivity grew at the aggregate level at a higher rate than in Sweden. The speed of secondary production labour productivity growth was the same in both countries, but Finnish labour productivity in services grew more rapidly. In Sweden the productivity growth in services decelerated already in this period. This reveals the fact that the fastest labour productivity growth in services was indispensable for Finnish catch up in the period of 1965–80.

Particularly in the third period (1980–2003) aggregate level productivity and secondary production productivity[27] grew faster in Finland than in Sweden. At this point tertiary production productivity growth slowed down in Finland as well, although it was still growing faster than in Sweden. It seems that Finland by the last period had reached a similar service oriented economic structure as Sweden (see Table 3.3).

Finally, the primary, secondary and tertiary labour productivity growth contributions to aggregate labour productivity growth are presented in Figure 3.4. Comparing

[27] In 1980-2003 Finnish manufacturing productivity growth was very polarized. It was mainly due to the so-called Nokia effect. Jalava, Jukka, Catching up with the Technology Frontier: Finnish Manufacturing Productivity, 1975–2003, *Scandinavian Economic History Review*, vol. 54, 2006: 1, 47-63.

developments in the labour productivity contributions in both countries it can be detected that Finland's labour productivity growth contribution in services exceeded the Swedish one in 1965–80 and in 1980–2003. Especially in 1965–80 this was decisive for Finland's catch up as Sweden beat Finland's secondary production labour productivity contribution. In the last period, 1980–2003, Finland surpassed Sweden's labour productivity contribution in secondary production for the first time. In this period the difference to Sweden was biggest in secondary production and therefore secondary production labour productivity growth had the biggest impact on Finland's faster GDP per capita growth in 1980–2003.



	1946-1965		1966-1979		1980-2003	
	FIN	SWE	FIN	SWE	FIN	SWE
PRIM	0.4%	0.5%	0.6%	0.3%	0.2%	0.1%
SEC	1.5%	2.0%	1.5%	1.6%	1.6%	1.1%
TERT	0.8%	1.2%	1.5%	1.1%	0.8%	0.7%

Figure 3.4. Primary, secondary and tertiary labour productivity growth contributions to economy's labour productivity growth, average by period, log%, FIN & SWE (average of yearly productivity growths multiplied with current price annual share (current price annual share is t and t-1 years' average share))

Source: Own calculations; data from Hjerppe, Finland's Historical National Accounts 1860–1994; Statistics Finland; Edvinsson, Growth, Accumulation, Crisis; Groningen Growth and Development Centre, 60-Industry Database.

The bigger value added growth contributions in 1965–2003 and faster than Sweden's labour productivity growth in 1965–80 in Finnish services may also be partly a consequence of the later phase in structural change – probably there was more room for new economic production in services as well. In addition we have to notice that the share of services produced by the public sector has been bigger in Sweden. In National

Accounts public sector production is valued through the costs of production and consequently its labour productivity growth becomes zero in the calculations. This means that services' labour productivity growth in both countries has come from privately produced services, in which there must have been more growth in Finland in 1965–1980.[28]

In the end, a word of caution: when detecting only the effects on GDP per capita growth separately in both countries, it is important to notice that looking at the whole time period 1945–2003 the biggest (but not only) contributions to Finland's and Sweden's aggregate labour productivity came from secondary production. Thus, if we were explaining only the GDP per capita growth separately in each country, we might state that compared with primary and tertiary production, secondary production seems to have had the largest impacts on Finland's and Sweden's labour productivity and GDP per capita growth in 1945–2003. It probably has had its effects through innovations (e.g. overall electricity implementation in the first period and ICT implementation in the last period) on labour productivity growth in services as well. Nevertheless, taking into account Sweden's substantially strong secondary production performance and Finland's inability to overcome it in labour productivity contribution until 1980–2003, services' production contributions have contributed significantly to Finland's catch up in GDP per capita particularly in 1965–80.

[28] Surely due to a lack of historical producer price indices for service industries there are also difficulties in measuring the productivity of private services exactly.

4. CONCLUSIONS

The main task of this paper was to trace Finland's economic catch up with the EU15 and especially with Sweden. We also wanted to see whether the late industrialisation and different path of structural change were sources of Finland's faster labour productivity growth and convergence. We found that despite considerable catch up with EU15 in the interwar period, the gap in GDP per capita between Finland and the EU15 was closed mainly in the 1960s and the 1970s. Sweden's lead was only closed in the 1970s and the 1980s, and again in the 1990s. Sweden was ahead of the EU15 average in GDP per capita already in 1945 and at the beginning of the 21st century as well. Therefore when converging to Sweden, Finland has consequently caught up and overtaken the EU15 average income level.

GDP per capita has grown considerably both in Finland and Sweden in 1945–2003. A comparison of the countries shows that the difference in GDP per capita remained almost constant in 1945–65 and that Finland's catch up with Sweden mostly took place in 1965–2003. During the whole period reviewed, it seems that there was more room to expand to new economic activities in the Finnish economy. Thus, in compliance with the classical view, beginning from a low production level Finland gained from the latecomer position and from faster structural change.

Alexander Gerschenkron, Nicholas Kaldor and the classical view of structural change (Colin Clark, Simon Kuznets, Ronald Hartwell)[29] emphasised the importance of manufacturing industries to the latecomer country's catch up. Therefore, we wanted to find out whether late industrialisation and secondary production growth would explain Finland's convergence after WWII. We used Kaldor's growth laws as a framework to test this. We found that Kaldor's laws could be partially used in explaining economic growth. Secondary production had its biggest impacts on Finnish GDP growth as late as 1980–2003, whereas its major effect on Swedish GDP growth was already in 1945–79. However, labour input growth in non-secondary production did not have a statistically significant negative influence on aggregate labour productivity in Finland in 1945–79. Thus we rejected our first hypothesis that Finnish growth and convergence to Sweden, and consequently to the EU15 as well, could be explained solely with the later growth phase in secondary production via its impacts on speeding up aggregate labour productivity. Contrary to the classical view and Kaldor's growth laws, it was not solely the advantages of secondary production growth that caused Finland's catch up.

[29] Gerschenkron, Economic Backwardness in Historical Perspective. In *The Progress of Underdeveloped Areas*; Kaldor, *Strategic Factors in Economic Development*; Clark, *The Conditions of Economic Progress*; Kuznets *Six Lectures on Economic Growth*; Hartwell, The Service Revolution: The Growth of Services in Modern Economy, in *The Fontana Economic History of Europe 3: The Industrial Revolution*.

To shed more light on the roles of non-secondary parts of the economy as well, we explored value added and labour productivity growth in primary, secondary and tertiary production and their contributions to the aggregate level. Additionally, we compared Sweden and Finland in major industries in three sub-periods 1945–65, 1965–80 and 1980–2003. The analysis showed that the service production growth contributions to GDP in Finland have been even larger than secondary production contributions in the second and third periods when Finnish growth was faster and convergence to Sweden mostly took place. However, we must bear in mind that convergence is assessed in terms of GDP per capita and labour productivity growth is an important factor for GDP per capita growth. From the analysis of labour productivity contributions we saw that labour productivity growth contribution in services exceeded the Swedish one in 1965–80. Thus, labour productivity growth contribution from services was essential for Finland's GDP per capita catch up in 1965–80 since Sweden gained slightly more from secondary production labour productivity even in that period. In the last period, 1980–2003, Finland finally exceeded Sweden's labour productivity growth contributions in secondary production and the most important effect for faster Finnish GDP per capita growth came from secondary production at that time.

The importance of services, as already emphasised by Broadberry (1998) for the US and Germany with respect to the UK, in catch up is a new result for Finland and worth considering also when analysing the catching up or lagging behind of other countries. Such an exercise requires historical data on a more disaggregated level than of the total economy, which is of course more difficult to obtain, but the extra effort is well worth while.

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