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# Finland's regional GDPs 1880-2010: estimates, sources and interpretations

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**Abstract:** This paper provides the first consistent long-run estimates of Finnish regional GDPs, from 1880 to 2010. Estimates are provided for 12 historical counties as well as for the 5 current-border NUTS 2-regions. The main results from the analyses of the long-run evolution of regional GDPs are the following. Firstly, it is clear that Finland's geographical position, in the intersection between Eastern and Western Europe, has led to a history of balancing between the two powers. A long-run economic decline of the historically important regions of the west is documented. Simultaneously access to Russian markets advanced the East, but trade was subject to several large shocks, notably with the Finnish independence of 1917 and the collapse of the Soviet Union in 1991. Over the long run, the paper finds that the southern part of the country has been the winner in the Finnish regional growth league. Secondly, the paper analyses regional inequality and finds that Finland's counties and regions were relatively unequal in European comparison during early industrialization. Rapid convergence in GDP per capita only took place after the Second World War, but was interrupted by the 1980s and replaced by a new tendency for divergence.

**Keywords:** Industrialization; Regional inequality; Regional income; Economic growth;

**JEL Codes:** N93, N94, R11

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# 1. Introduction

During the last two centuries, Finland has undergone a dramatic transformation: From one of Europe's poorer and more peripheral countries, to a fast-growing high-tech economy. Although Finland's 20th century economic transition rightly can be described as an 'economic miracle', it has been described to follow the "Small Successful European Economies"-pattern (Mokyr, 2006). Signifying Finland as a part of this pattern is first of all its openness to trade. However, openness to trade may be a two-edged sword. On the one hand, it allows for small economies to off-set the forces of the disadvantages of scale. On the other hand, export-dependence combined with large exposure to international business cycles and decreasing terms-of-trade, can prove to be disastrous for long-term growth, as the story of many raw-material producing developing nations have shown.[1]

Finland has however, proven successful in reaping the benefits of openness to trade by consequently moving up the value-added ladder and eventually establishing a niche as world leader in some advanced technology-products. As we will see in this paper, Finland went from being a supplier in furs and tar in the pre-industrial era, to industrializing by exporting sawn goods, pulp and paper. In the post-war period a definite transition to high-value added exports took place, with companies such as UPM (bio- and forest industries), Kone (elevators and escalators) and Nokia (mobile telephony), reaching world recognition. In order to take advantage of the opportunities provided by globalization and technological progress, having a strong institutional structure and high levels of human capital is probably crucial. Finland has a long tradition of institutional security and Finnish students rank among the top in the OECD international PISA-investigations.[2] The young Finns entering the labor market during the 1990s were among the most educated in the world (Rouvinen and Ylä-Anttila, 2003).

This paper will explore Finland's remarkable growth trajectory from a geographical perspective. There exists excellent accounts of how Finland developed from industrialization and onwards (for example Heikkinen and Hjerppe, 1986, 1987, Hjerppe 1989, Ojala et al 2006), but much less has been written about the geographical evolution of production. A related study by Kangasharju (1998) documents beta convergence in 88 Finnish small-scale sub-regions from 1934 to 1993, but by using taxable incomes as an indicator of regional income levels. Taxable incomes need not correspond to values of productions, since the geographic distance between where production was carried out and where the associated incomes where taxed might be large in the presence of capital mobility. In addition, the period covered by Kangasharju (1998) is too short to cover the entire industrialization process. There is only one previous study that has attempted to measure regional production accounts, but it is focused on the inter-war period only (Kiiskinen, 1958). Other regionally-oriented historical studies have either focused on the spatial allocation of population (Tervo, 2010) or income formation (Kiiskinen, 1961).

This paper thus provides the first regional GDP estimates from 1880 until today. The period is long enough to cover the entire Finnish industrialization process and the subsequent transition into modern economic growth. The ambition of the paper and the novel dataset is to generate

[1] This reasoning goes well in line with Bairoch's (1972) classical finding that protectionist countries actually grew faster in the 19th century. This so-called tariff-growth paradox has later been established by for example O'Rourke (2000).

[2] See http://www.oecd.org/pisa/

new hypothesis and insights into understanding long-run regional evolutions, in Finland and elsewhere.

The paper is structured as follow. Section 1 introduces the topic and provides a brief overview of Finland's economic history with specific focus on issues relevant for regional growth. Section 2 describes the method for calculating regional GDPs and in section 3 the data sources and estimation issues are presented. In section 4 the results of the new estimates are presented and discussed, while section 5 concludes the paper.

### *1.1. History*

From roughly around the 12th century until 1809, Sweden and Finland were joined as one country. Constitutional laws, judicial, religious and government authorities developed in parallel in Sweden and Finland and lay the ground for a rather egalitarian society of free-holders. Swedish-speaking settlements in the archipelago and on the coast of Finland have existed since the Middle Ages and Finland is still a bilingual nation with Finnish and Swedish as national languages.[3] Following King Gustav III's coup d'etat in 1772, Sweden-Finland adopted an absolutist, yet liberal constitution. Gustav III introduced laws of religious toleration, humanization of the criminal law, reduced export tolls and attempted to free the trade of grain. Gustav III also reduced the burden of the Finnish peasantry. The constitution of 1772 remained in place in Finland until 1919.

Geographically, Sweden-Finland was a round country, and the Gulf of Bothnia almost an interior lake. This meant that the western parts of Finland flourished due to superior market access through water-transportation. Consequently, the capital of the Finnish part (Turku) was conveniently situated on the west coast, to facilitate communication with the eastern capital (Stockholm) across the Archipelago Sea.

In 1809, Finland was annexed by Russia and became a Grand Dutchy of the Russian Empire with the Czar as Grand Duke. The Russian Czar was in favor of letting many of the institutions set up during the Swedish period remain, and Finland enjoyed a large degree of autonomy in terms of domestic policies. Most importantly, the Finnish peasantry remained free (unlike the Russian serfs) as the old Swedish law, including the relevant parts from Gustav III's Constitution of 1772, remained effective. In terms of development into democracy, Finland was a forerunner. A unicameral parliament with general suffrage was initiated as early as 1906. By consequence, Finland was one of the first countries in the world to grant women the right to vote. Finland also enjoyed relatively large autonomy in issues concerning trade and monetary policy and had her own state finances. Between 1877 and 1914 Finland was part of the classical Gold Standard

Even though the Russian annexation had relatively little impact on Finland's institutional structure, it meant more in terms of influencing its geographical structure. In order to facilitate connections with St. Petersburg, the Czar moved the capital of Finland from Turku in the western part of the country to the more central Helsinki, and market access began to change towards the east. From the 1830s regular steamship connections were established between Helsinki and St Petersburg. Even more important for market integration was the domestic

[3] At present Swedish is the main language of 5.4% of the population, down from 14% at the beginning of the 20th century.

railroad network. Surveys for a rail link between Helsinki and St Petersburg had been made in 1857, but it took until 1870 before the line was opened. It is said that the gradual expansion of the Finnish railroad network was a compromise between the interests of the Russian empire and the industrial need for transportation (Kirby, 2006, p. 109). The railroads were largely state-directed and state-owned.

Economically, Finland belonged to the poor periphery of Europe. The first consistent estimates of Finnish GDP, the Finnish Historical National Accounts (Hjerppe, 1989, 1996) start in 1860, but Maddison provides a benchmark for 1820 based on Heikkinen et al (1987). Comparing Finland to its former counter-part, Sweden in figure 1, we find that Finland was somewhat poorer than Sweden in 1820 and that the gap remained throughout industrialization.

Finland's industrial take-off is said to have taken place in the latter half of the 19th century and is often described as an export success story. During this period, exports consisted mainly of raw materials and little-processed goods (Hjerppe: 1989, p. 159). There was however a clear division of export markets between east and west. Timber products were exported to Western Europe, especially to markets in the UK, whereas a wide range of manufactured and industrial handicraft found markets in Russia, especially in the province of St Petersburg. Finnish exports to Russia were encouraged since they could be imported duty-free until the 1880s. Thereafter, Russia levied relatively lower imposition tariffs on Finland compared to other Western European countries. Table 1 shows Finland's export by main trading partner from 1880 to 2000. From the table, it is clear that Russia dominated as trading partner by 1880, but that UK increased its share until the First World War. The geographical division of exports also had consequences for Finland's internal geographical organization. Kiiskinen (1961, p. 92) argues that industrializing Finland can be divided into two parts: The South-East, Central and Northern regions became dominated by timber industries, quite oriented towards export. The Western and some of the south were rather dominated by different branches in home-market industry.

During the late 19th century and earlier 20th century, Russia started pursuing a policy of "russification" aimed at limiting the special status of the Grand Duchy of Finland. The Finns opposed this policy, and when the Bolshevik Revolution took place in Russia in 1917, Finland ceased the opportunity and declared independence. When Bolshevik Russia subsequently closed its borders, trade with the independent republic of Finland sank to almost nil (Kaukiainen 2006, p. 148). Table 1 shows that Finnish exports to Russia had ceased in 1920 and that the trading partnership did not pick up again until after World War 2.

After Finland's declared independence in 1917, a grim civil war broke out concerning leadership of the newly independent state. The forces fighting were the Social Democrats led by the People's Deputation of Finland (commonly called the Reds) and the forces of the non-socialist, conservative-led Senate (commonly called the Whites). The Reds were based in the towns and industrial centers of southern Finland, while the Whites controlled more rural central and northern Finland. The Civil War was fought from 27 January to 15 May 1918 and was eventually won by the Whites.

The interwar period involved intensifying trade-relations with the Western markets and the UK became Finland's most important trading partner, with 43 per cent of total exports in 1920, as seen from table 1. Consequently, Finland's specialization and trading pattern was concentrated towards forest products. During the 1920s and 1930s about 85 per cent of exports consisted of

raw wood and forest industry products. In fact, during some years Finland was the world's largest exporter of sawn goods and plywood (Hjerppe: 1989, p. 161).

During World War 2, Finland fought against the Soviet Union, first in the Winter War (1939-40) and thereafter in the Continuation War along-side Germany (1941-44). In 1944-45 Finland also fought the former ally Germany in the War in Lapland. Despite losing the war, Finland managed to maintain its independence and stay part of the Western bloc. Yet, the peace conditions were tough on Finland's side. In the Paris Peace Treaties of 1947, Finland lost about 10 per cent of its territorial land to the Soviet Union and was deemed heavy war reparations. The war reparations were to be paid in the form of goods and machinery to the Soviet Union. Between 1944 and 1952, a total of 141,490 railroad carriages were delivered to the Soviet Union. But the Finns showed impressing industrial capacity and by 1952, Finland had re-paid its debt, making it the only country to pay war reparations in full.[4] The significance of the war reparations to restructure Finnish industry and its trade with the Soviet Union has been widely discussed. Riitta Hjerppe (1989, p. 162) argues that it was Finland's long tradition of manufacturing metal and engineering products as well as its historical trading relation with Russia, that made it possible to deliver the heavy burden to the Soviet Union.

After the reparations had finished, the Soviet demand for Finnish industrial products remained. Thus, by the 1950s, Soviet again became an important trading partner for Finland. As can be seen from Table 1, Soviet's share in total amounted to about 15-18 per cent of Finnish exports between 1940 and 1980. This was the largest share of Soviet exports in any Western economy (Paavonen 2005, p. 153). The post-World War 2 Finnish-Soviet trade structure built on 5-year framework agreements and payments were based on bilateral clearings. Finland exported machinery and ships, and later on also textiles and other consumer goods. In return, it imported oil and some heavy industrial products from the Soviet Union (Kaukiainen: 2006, p. 151). Generally, it has been argued that the system was quite lucrative for Finland, which contrasts with the experience of the Eastern European countries (see Sutela, 2014).

As can be seen from figure 1, the post-war period involved a time of a remarkable catching-up for Finland. Only Japan and the South-East Asian countries and Ireland have experienced higher growth levels during the 20th century (Hjerppe and Jalava, 2006, p. 45). The post-war period also saw the efforts to improve Finnish social security and raise the general standards of education, by building a welfare state. The value added of the public sector outgrew the rest of the economy from the end of 1940 and onwards. The result was that its share of GDP had doubled by 1985 (Hjerppe: 1989, p. 131).

During the 1950s and 1960s, the first regional policies were implemented in Finland, with a specific target towards developing the sparsely populated northern parts. Another form of regional policy widely used by the Finnish state was the regionalization of university education. While Finland only hosted universities in Turku and Helsinki by 1950, the location of universities has thereafter come to spread over the entire country. By the end of the 1970s Universities had been founded in Tampere, Jyväskylä, Oulu, Vaasa and Rovaniemi. When Finland entered the European Union in 1995, Finnish regional policy became under the influence of EU-

[4] See House of the Estates (2012) "60 years after the war reparations, Seminar on war reparations. 7.11.2012" House of the Estates, Helsinki, http://vnk.fi/tiedostot/julkinen/pdf/2012/Sotakorvaus_EN.pdf

rules. In tandem with this process, EU also had to adjust to the regional realities of population sparse countries like Finland. Specifically, EU added a sixth objective to the existing five objectives of European regional policy. This new objective was targeted at counties with a population density of eight inhabitants per $km^2$ or less, and thus counties in North, Central and East Finland became eligible. The northern and eastern parts also became specifically targeted for Structural Funds under Objective 1 (Kinnunen: 2004).

The collapse of the Soviet Union in combination with a severe Global crisis hit Finland hard during the early 1990s. The result was a 15 per cent collapse of the economy (Hjerppe and Jalava: 2006, p. 46). Between 1990 and 1993, Finnish GDP plunged by 9.5 per cent. Similarly, unemployment surged from 3.2 to 16.6 per cent (Ottaviano and Pinelli: 2006, p. 641). During the crisis, an overvalued exchange rate (strong markka) and a tightened fiscal policy worsened the crisis.

However, this heavy structural crisis was followed by an economic boom. Between 1994 and 2000, Finnish average annual growth was about 5 % (Hjerppe and Jalava: 2006, p. 46). The upswing was mainly driven by high-tech industries, of which mobile telephone company Nokia alone is estimated to account to 1.5 percentage points of the growth rates. During this period, Finland emerged as one the world's leading information societies (e.g. Castells and Himanen, 2002). By 2003 the proportion of households owning at least one mobile phone was about 95 percent and the proportion with internet access at home was nearly 45 percent (Statistics Finland, 2005). Despite Nokia's recent hardships, Finland of today is said to have reinvented itself as a high-tech advanced economy and is ranked among the top technology nations in the world.

As seen from this short summary of Finland's economic history, openness to trade and varying degrees of market access seem to have played an important role in localization of industrial production. In addition, access to means of transportation, first via the sea-ways and later on via rail and roads, has been a key issue for regional development in this vast and sparsely populated country. The history of Finland is full of shocks to market access, being the results of wars and world-economic events. Examples are the split from Sweden in 1809, the declaration of independence in 1917, the territorial cessations after World War 2 and finally the collapse of the Soviet Union in 1991. In order to measure the effects on regional GDP per capita of the Finnish provinces, we will now turn to the construction, sources and results of these new series.

## 2. A method for calculating regional GDPs[5]

I use a method to estimate historical regional GDPs suggested by Geary and Stark (2002), the G-S method. The version of the method requires the following input data: (1) historical national GDP estimates and industry value added, preferably also including estimates of number of workers on the national industry level, (2) regional number of employees per industry, and (3) regional wages per industry. For a specific year, it is assumed that the total national GDP at factor cost is defined as the sum of regional GDPs:[6]

[5] This section draws heavily upon Enflo, Henning and Schön (2014).
[6] All equations refer to the calculations of regional GDP in a specific year.

(1)

$$Y_{nat} = \sum^{i} Y_i$$

where $Y_{nat}$ is the total national GDP at factor cost, and $Y_i$ is the GRP of region *i*. The latter is defined as:

(2)

$$Y_i = \sum^{j} y_{ij} \times L_{ij}$$

where $y_{ij}$ is the average value added per worker in region *i* and industry *j*, and $L_{ij}$ the number of employees (workers) in region *i* and industry *j.* From this follows also the definition:

(3)

$$Y_{nat} = \sum^{j} Y_j$$

where $Y_j$ is the GDP (value added) of industry *j.*

The term "industry" can be used very flexibly in the context of the G-S method.[7] It here refers to the three sectors of agriculture, manufacturing and services. One of the prime advantages with the G-S method is that it offers a solution to the predicaments that arise when there is no available data for $y_{ij}$ (value added per employee on industry/region level). This situation is likely to arise often in historical research. $y_{ij}$ is then proxied by taking information about the output per worker in each industry on national level, then assuming that regional differentials in labour productivity in each industry is reflected by the regional industry wage level relative to the national industry wage level ($w_{ij}/w_j$). Therefore, it is assumed that the final regional GDP will be given by:

(4)

$$Y_i = \sum^{j} y_j \ \beta_j \left(\frac{w_{ij}}{w_j}\right) \times L_{ij}$$

where $\beta_j$ is a scalar that will preserve regional relative differences, but ensures that regional totals add up to the known national total for each industry.

Essentially, the G-S method distributes already known GDP estimates on nation/industry levels regionally by making use of regional labor inputs and wage differentials. Previous articles have used the method to calculate regional GDPs for UK (Crafts, 2005), Spain (Martinez-Galarraga et al. 2010, Portugal (Badia-Miró et al. 2012), Sweden (Enflo et al. 2014), Belgium (Buyst, 2010)

[7] I do not make any distinction between "industry" and "sector".

and Italy (Felice, 2011) and it have been shown that the method yields fairly accurate and robust results.

# 3. Data

The data part of this paper has to be quite extensive, as many sources and estimations have been necessary to produce the regional GDPs. I will start by discussing the regional border changes needed, and then move on to present the underlying sources in terms of data for the data required by the G-S method.

## *3.1. Counties, NUTS 2- and NUTS 3-regions*

During the period I study, Finland has seen several regional border changes, both internally and externally. The main results from the paper will be based on calculations from the 12 administrative counties, in their mid- 20th century borders. The reason for working with this regional dimension if two-fold: i) The majority of the Finnish historical data was collected at the level of counties and therefore allows for maximum time-consistency in the estimations; ii) The regional borders of the administrative counties were formed during the Swedish rule. Thus the Finnish regional GDPs at historical administrative counties are rather consistent with the available long-run Swedish regional GDPs at the county level (see Enflo et al 2014). This could ensure comparisons with the Swedish data,

In the Swedish dataset, the county-level corresponds exactly with the regional classification system of the European Union, NUTS (Nomenclature Unitaire Territorial System) at NUTS-level 3. However, to make things a bit more complicated, the NUTS-system does not correspond to the Finnish historical counties at all. While there are 12 historical counties, the NUTS system divides Finland into 20 NUTS 3-regions and 5 NUTS 2-regions. Figure 2 outlines the differing regional classification systems for Finland. In the upper panel the NUTS 3 and 2-regions are presented. In the lower panel of figure 2, the historical administrative counties are presented at their 1921 and 1960 borders.

To ensure maximum international comparability of the regional GDP-series, I have decided to present the data at both county- and NUTS 2-level. In order to calculate GDPs according to both regional classifications schemes, I have used detailed population data on communal level to calculate overlapping population shares for different regional definitions.[8] The overlapping population's method yields robust estimates for the 12 counties and for the 5 NUTS 2-regions of Finland (see section 3.3.1 for a more elaborate description). Hence, this paper will provide estimates of regional GDP and employment for the 12 counties and the 5 NUTS 2 regions of Finland 1880 to 2010.

## *3.2. Changes in the borders of the historical counties*

The exact division of the counties within Finland have fluctuated over time, but the division from 1634 forms the basis. This was when Axel Oxenstierna divided Sweden-Finland into 24 Swedish and 5 Finnish counties. Over time, the number of Finnish counties grew and by the 1880s there were 8 Finnish counties. Subsequently, the number of counties changed from 8 to 12. The lower panel in figure 2 displays the borders of Finland and the Finnish counties in 1921 (8 counties) and 1960 (12 counties), and provides guidance for the rest of this discussion. The employment

[8] I am very thankful to Hannu Tervo for sharing this dataset with me. Details can be found in Tervo (2010)

data that forms the basis of our regional GDP calculations are reported consistently for 12 historical counties, but some of the wage and productivity data I use were reported at the previous borders. Therefore, a short history of the main border changes to the historical counties during the 20th century is in place.

When Finland gained independence from Russia in 1917, the question of the Åland islands (county numbered 12 in figure 2) returned to the political agenda. The Åland islands are an archipelago lying at the entrance to the Gulf of Bothnia in the Baltic Sea, just in between Sweden and Finland. The question was whether the Swedish-speaking Åland islands should form part of Sweden or the newly independent Finland. Against the popular vote, the islands were assigned to Finland. Yet, the issue became a question for the League of Nations, who affirmed the islands autonomous status in 1921. In 1918 the Åland islands split from their previous belonging to the province of Turku-Pori and has remained a separate county, and a NUTS 2 and 3-region of its own ever since.

In 1930 the northernmost part of the country was split into the counties of Lapland and Oulu (counties number 10 and 11 in the lower right panel on figure 2). In the peace treaty ending the war between the Soviet Union and Finland, Finland ceded several border territories to the Soviet Union, including about half of Viipuri county and part of Kuopio (counties number 13 and 8 in the lower left panel of figure 2). In 1945 the remains of the county of Viipuri changed name to Kymi County. Finland also ceded the strip of Lapland that had connected Finland to the Arctic Ocean around Petsamo (country 25 in the lower left panel of figure 2) and Salla in the north east to Soviet.

In 1960 Northern Karelia (county number 9 in the lower right panel) county split from Kuopio; Central Finland province (county number 7 in the lower right panel) formed from parts of Häme, Kuopio, Mikkeli, and Vaasa counties. The resulting division from 1960, displayed in the lower right panel of figure 2, is the geographical basis for the regional GDPs of the twelve historical counties provided in this paper.

### *3.3. Required data for the Geary and Stark method*

In the implementation of the Geary-Stark method on the Finnish data I use four different data sets: (1) total population data per province, (2) historical GDP and employment data on national level from the Finnish National Historical Accounts (FNHA), (3) regional employment data from a variety of sources, and (4) regional wage data from a variety of sources. In the following, a description of each dataset and its sources will be provided.

#### 3.3.1 Total population:

Population for 12 historical counties 1880-1970 is taken from the official publication *Population by Industry* from the Finnish Statistical Office (1979). Population data for 20 NUTS 3-regions was kindly provided by Hannu Tervo 1880-2004 and refers to his publication Tervo (2010). The Tervo-dataset also provides consistent estimates of population per commune in Finland since 1880 and thus allows us to calculate population differences between the twelve historical counties and the NUTS 3-regions for all the overlapping years. This information helps when forming regional GDPs per NUTS-region going from information at the county-level. For the year 2010 data for NUTS 2 and 3 were obtained from the Eurostat Regio Database. In order to obtain population data for the 12 historical counties for the missing years 1980-2010, I have

made an adjustment calculation for the years 1980-2010 based on population data from NUTS regions and communes.

In order to present regional GDPs at both county and NUTS-levels, I use spatially overlapping population figures to calculate the distribution of each county to NUTS 3-definitions, and vice versa. I then redistribute regional GDP and employment shares to the NUTS 3-regions assuming that the distribution of GDP or employment within the county is proportional to the relative population. This is of course a heroic assumption that needs to be tested. So I use data on GDPs for the overlapping years 1970-1990, when Statistics Finland produced regional GDPs for both counties and NUTS 3-regions. Assigning the GDPs that were calculated on the 12 county-level to the 20 NUTS 3 regions, produces a rather nice fit, but there are some problematic cases (in two cases the error is as large as 20 percent). Yet, the largest differences between the county and NUTS estimates (22 per cent in 1970, as seen from table A1) arise from the Åland islands. As this is a region that has had consistent border whether measured according to the NUTS- or the county system throughout the period, I do not take this as a problem of changing border definitions. Rather, it can be viewed within the margin of error of reported population and GDP figures by the official statistical publications. In addition, and as can be seen in table A1 in the appendix, the fit is very nice once the NUTS 3-regions are accumulated to NUTS 2-regions. Thus, I have confidence that this procedure provides a fairly robust way to re-calculate GDP and employment data from twelve counties to five NUTS 2-regions.

### 3.3.2 Historical National Accounts by sector:

The Finnish Historical National Accounts (Hjerppe: 1996)[9] forms the basis of the calculations. From this volume I use series of Value Added and total hours worked per sector (agriculture, industry, services).

### 3.3.3 Regional employment:

The publication *Väestön elinkeino / Population by Industry* (1979)[10] from Statistics Finland provides the basis for the regional classification. This publication provides employment by four main sectors (agriculture, industry, services and unknown) for 12 historical counties during 1880-1975. The regional division corresponds to scheme in 1960 when the country consisted of 12 counties. One problem with the classification in the employment data is that the fourth sector including 'miscellaneous workers' and 'sector unknown' is included in the data. This category amounts to about 5-10 % of the total labor force in the counties. I omit this category from our calculations, and only use the 3 main sectors. The results are not sensitive to this omission as the 'miscellaneous workers' are spread out fairly evenly regionally. All regional employment data have been adjusted to the level of the total employed in the Finnish economy according to Hjerppe's (1996) estimates.

### 3.3.4 Regional wages:

*Agricultural wages:* agricultural wages are taken from Arvo Soininen (1981, table 6 pp. 27-29) for eight historical provinces for 1878 to 1910, according to their historical borders. [11] Data refers to 'Daily wages of agricultural workers, meals included, mk/day, Males'. I have adjusted

[9] Riitta Hjerppe's book 'The Finnish Economy 1860-1985: Growth and Structural Change' includes descriptions of the data.
[10] Central Statistical Office of Finland (1979)Statistical Surveys N:o 63
[11] See the lower left panel of figure 2.

the eight historical provinces to the borders of the 1960s (twelve counties) according to the scheme in table A2 in appendix.

For 1930-1950 I use GDP and employment estimates by Auvo Kiiskinen (1958, table 17). The data refers to 18 provinces and can be used as relative productivity proxies after I have adjusted the border to the 12 counties (see the adjustment scheme in table A2 in appendix). Kiiskinen's data refer to periods 1925-29 (I adopt these for 1930); 1935-38 (I adopt these for 1940); 1950-52 (I adopt these for 1950). I use productivity estimates in agriculture and forestry for productivity coefficient in agriculture. Then I divide with total employment in agriculture/forestry (as given by table 20 in Kiiskinen, 1958). I use the resulting 'labor productivity' to arrive at a relative productivity coefficient to be used in similar manner as relative wages are used in Geary and Stark (2002).

For 1920 I use the average of the 1910 agricultural wages in Soininen (1981) and for 1930 in Kiiskinen (1958). These estimates suggest that the regions of the North and North-West saw a rapid decrease in relative wages during the period (from above average to about 70 per cent of the average). The relative wage fall is consistent with evidence in Kiiskinen (1961, p. 88) that the expansion of forestry moved further from the previous centers to central and eastern parts of Finland where investments in transportation technology and infrastructure helped bring Finland's greatest area of virgin forest into exploitation.[12]

*Industrial wages* at regional levels are lacking. However, Kiiskinen (1961, figure 2, p. 91) provides estimates of labor shares and industrial income formation for 1890-1952. Data refers to 1890-1951. These estimates are used as relative productivity coefficients for industry 1880-1920. I used the relative industrial wage coefficient from 1890 for the year 1880, assuming that relative productivity between the decades was held constant. Again, the data does not correspond to the twelve counties, so I have used the re-classification in table A3 in the appendix to arrive at consistent borders. The resulting relative productivity coefficients are presented in table A4 in the appendix.

For the years 1930-1950 Kiiskinen (1958, table 17) provide data on regional GDPs in industry, which have been used for productivity coefficients. Kiiskinen's data refer to periods 1925-29 (I adopt these for 1930); 1935-38 (I adopt these for 1940); 1950-52 (I adopt these for 1950). The regional reclassification is the same as in table A3. I use productivity estimates in Industry and Buildings for industry. Then I divide with total employment in industrial branches (industry and buildings) in Kiiskinen (1958, table 20).

*Service wages.* For the years 1880-1940 the Geary-Stark approach to service wages was utilized. For the year 1950, Kiiskinen (1958) provides an estimate of regional incomes in services. I take Kiiskinens estimate of generated incomes in services from 1950 (table 19) and divide with employment in services (table 21).

From 1960 and onwards, the Finnish statistical office provides official estimates of regional GDPs. For the period 1960-1990, these estimates correspond to the borders of the 12 historical

[12] I double-check the reliability of this method by comparing the estimates with those obtained if the summer wages for males in agriculture, provided for some regions in the Statistical Yearbook for Finland for 1920, had been used. For most counties, the results are similar, but the official wages give an unreasonably high value for Oulu. Therefore I decide to stick to the weighted approach for this particular year.

counties. For 2000 and 2010 the official regional GDP data corresponds to the 20 NUTS provinces, but is adjusted to the counties following the procedure using overlapping population shares as outlined in section 3.3.1.

# 4. Results

## *4.1 The spatial allocation of relative shares of GDP 1880-2010*

The broad picture of Finland's regional GDP-evolution can be summarized in table 2, where the shares of GDP allotted to the five NUTS 2-regions are displayed. From the table, it is clear that the regional GDP has become increasingly concentrated to capital region (Helsinki-Uusimaa), which increases its share from 29 per cent in 1880 to 39 per cent in 2010. Using this very broad spatial definition of a region, we may only observe that the relative strengthening of the capital region has taken place at the expense of the rest of the country. The other three mainland regions (Western Finland, Southern Finland and Northern and Eastern Finland) show equally strong tendencies of decline, between 6 and 8 percentage points from 1880 to 2010. The Åland Islands keep a steady one per cent share of Finland's GDP throughout the period. However, the long-run growth experience of Finland offers a richer spatial history than that. In order to properly capture it, we need to go into the level of the counties displayed in table 3. From this table, some long-run tendencies can be observed: the western decline; border changes and shifts in market access in the East and the expansion towards the northern frontier.

### 4.1.1 The Western Decline

Finland's geographical location, skirted by the gulfs of the Baltic Sea, made its Southern and Western parts relatively more accessible using sea transportation, thus promoting them with superior market access to inland areas. It is generally described that that the South-West, with the province of Turku and Pori (which hosted the Finnish capital, Turku, until 1812) has the oldest business and cultural traditions in the county. During the 17th century, Finland experienced an upswing in international trade when international ship-building boasted and the demand for tar and timber increased. In the mid-17th century Finland had ascended to a leading position among the tar exporters in Europe (Kaukiainen, 2006, p. 129). Production areas were mainly in Western Finland, with the county of Vaasa playing an influential role.

Yet, it is the western part of the country that shows the steadiest long-run decline in their shares of GDP. While the two provinces on the Western Coast (Turku and Pori and Vaasa) accounted for 32 per cent of Finland's GDP in 1880, their share in 2010 is down to 19 per cent. This decline was commented on by Professor Jutikkala as early as 1948 in a famous speach where he explained how *"Finland's economic face was turned from the Gulf of Bothnia to the Gulf of Finland"* during industrialization.[13] Thus, while the Western part of Finland dominated in tar-production and in industries directed towards consumption goods initially, the expansion of St Petersburg as a market gave places further east, such as Helsinki and Tampere, leading positions in textile and metal work industries. These developments were aided by the developments of canals and railroad networks during the mid- 19th century. These were, at least partly, set up in the interests of the Russian empire and allowed for establishing industry further away from the coasts and helped shifting the economic face of Finland further away from the west.

[13] The economic development of Finland shown by maps (Proceedings of the Finnish Academy of Science and Letters, 1948, p. 164).

### 4.1.2 Border changes and shifts in market access in the East:

Finland's annexation into the Russian Empire did not initially result in any change in its destinations for foreign trade. Actually, the trade relations with Sweden continued undistorted until the 1840s, when Sweden received the same treatment as other foreign countries in Finnish trade (Schybergson, 1973). Thus, the western markets remained important, but gradually the economic connections with North-Western Russia grew. From 1830s and onwards, cheap Russian grain was imported into Finland, making it easier to supply the populations of the growing industrial centers in the South-East. Similarly, Finnish exports of ironworks and cotton works found new markets in the area around St. Petersburg and Estonia. The relative growth of the southeast is manifest in the evolution of the Kymen County, where the expanding importance of the St. Petersburg market fuelled an increase in the relative share of Kymen's GDP from 6 to 8 per cent between 1880 and 1910.

However, access to eastern markets proved a volatile virtue for the growing Finnish counties. After the Russian Bolshevik revolution and Finland's declared independence in 1917, Russia closed its border for Finnish exports. This translated into a small fall of relative GDP shares of the Kymen County in 1920 as seen in table 3, but the region quickly picked up, thanks to the booming timber and paper industry in the interwar period.

Before the Second World War, Kymi County was actually part of the larger province Viipuri that stretched onto Lake Ladoga and incorporated much of the Karelian Isthmus in current Russia (see the lower left panel of figure 2). In 1930, Kymi County hosted Finland's second largest city, Viipuri (Vyborg). The city had expanded thanks to its location at the southern inflow of the Saimaa Channel that was inaugurated 1856 and connected the inland cities along the Saimaa lake-system with the sea. The area was an important saw-milling district, and Viipuri became a major exporting port for sawn goods (Kaukiainen, 2006, p. 134). In the territorial cessations after World War 2 and the former province of Viipuri was split into a Russian and a Finnish part and the Kymi county was created. The city of Viipuri and the main part of the area was annexed by the Soviet Union and the Saimaa Channel closed in 1940, when the new border was drawn straight through it.[14]

The regional distributional effects of the split between Finland and Soviet can be noticed in Kymi's relative share of GDP: table 3 shows that it falls from 9 per cent in 1940 to 7 per cent in 1950. The territorial cessations led to an evacuation of the Finnish population living in the annexed area.[15] About 430 000 persons (corresponding to about 11 per cent of Finland's population) were to find new homes in Finland. A majority of these people were farmers, and they were allocated farm land according to plans designed in the Finnish legislation. A recent paper by Sarvimäki (2011) documents that the settlement of the evacuated Fins constituted a large enough population shock to the rural areas where they settled to generate agglomeration externalities in terms of population growth and industrialization. Thus, an effect of the resettlement plan was the creation of a large number of small farms spread across the country, in its new borders. New farms were also created since soldiers coming from the war could get farm land from the government to start a civil life. This policy probably prolonged structural change away from agriculture as well as involving a larger percentage of the citizens being

[14] But it could reopen again in 1963 thanks to an agreement that let Finland lease the area for 50 years.

[15] The region of Karelia, including Viipuri, in the southeast were the most populous part of the ceded areas. Two other ceded areas were located in the sparsely populated northern parts of the country (Petsamo and Salla).

landowners. Yet, about half of the displaced people did not receive their income from agriculture, and as town people and industrial workers, they did not receive land but were rather encouraged to move into towns and cities to look for work.

The combined regional effects of the territorial cessation and the evacuation after World War 2 are hard to analyze. Clearly, Finland lost its second largest city, the important port of Viipuri and the markets in the east. In table 3 we see a drop in the relative importance of counties close to the lost territories between 1940 and 1950. Yet, it appears that the resettlement policy did not have any clear specific impact the rest of the counties, as the evacuated population was fairly evenly spread out. Although there is evidence of some agglomeration economies in rural areas when evacuated people moved in, the policy of giving land to former soldiers probably prolonged structural change in other areas. The net effect of these two forces might have evened out at the county level. However, given that the majority if the displaced people spoke Finnish as their mother tongue, very few of the displaced workers received land from the Swedish-speaking parts of the country (especially along the western coast). This could have further aggravated the steady decline of the western coastal counties that we observe from table 3.

The Soviet market became increasingly important for Finnish exports during the Post-War period. The Finnish war reparations to Soviet required a rapid acceleration of industrial expansion in the latter half of the 1940s, which moved the industrial center of gravity even more in favor of the south (Kiiskinen, 1961, p. 93). After the war reparations had been paid lack of competitiveness of the rapidly expanding industries lead to continued dependence on Soviet orders in the previously favored areas. Again we may observe in table 3 how the shares of regional GDP of the Kymi county increase and reach a high in 1960.

Compared to the other provinces of Eastern Finland (Northern Karelia, Kuopio, and Mikkeli) the Kymi county show the most dramatic shifts in regional shares of GDP over the long-run. Since the 1970s the Eastern part shows a small but steady decline in shares of GDP, perhaps aggravated after the 1990s by the collapse of the trading arrangements with the Soviet Union.

#### 4.1.3 The central and northern parts – expanding towards the frontier

Between 1880 and 1930, cultivation and settlement spread considerably into the north and central parts of the country. Yet, the previous literature points towards a great uniformity of regional shares in agricultural output. Although the northern frontier rapidly expanded, it seems the regions of the south and west have offset their relative smaller changes of expansion by intensification and mechanization (Kiiskinen 1961, p. 87). The expansion levels off in the 1930s. Taking the example of the Northern county of Oulu in table 3, it can be found that the share of regional GDP stays at a high share of 8-9 per cent between 1880 and 1920, but declines thereafter.

As previously mentioned, forestry and forest industry were the dominant factors of income growth in the areas of the south during the late 19th century, especially in the rather urban mid-South and South-east. But thanks to advancements in transportation technologies, investment in roads and transport equipment, expansion of the forest sector moved further from the urban centers. This made it possible to put the great virgin forests central and northern Finland into the sphere of profitable exploitation. As a result, the share of income from forestry fell in Southern and Western Finland's and subsequently increased in the Central and the North. With increasing technological sophistication of the forestry and forest industry, Central and Northern

Finland have become heavily specialized in raw-material intensive and capital-intensive industries.

In the table 3 we clearly see how the regions of middle Finland (Central Finland and and Häme) and the very north (Lapland) experience an increase in the regional shares of GDP from the 1920-30s and until the 1980s. These areas clearly benefited from the improved modes of transportation into the inner and northern parts of the country. The state played an active role in industrial policy, for example by setting up of state-owned manufacturing firms and energy companies such as Rautaruukki and Kemijoki, which turned the southern part of Lapland county into an area characterized by big industry.

Another form of regional policy is placement of universities. Notably, the University of Oulu is argued to have had had an invaluable effect on the growth of the north-western region (Economic Council, 2001). The role of industry-university linkages in the city of Oulu has been much discussed. For example, Waagø et al. (2001) argue that an electronics and telecommunication industry grew out of the long term planning and close cooperation of regional actors. During its peak of success NOKIA chose to locate its R&D and other departments with about 12,000 employees in Oulu. After Nokia's remarkable fall on the market, the region is still host to a large population of highly skilled programmers and engineers and is becoming a leading information and communications technology cluster in Northern Europe.

Lately, policies have aimed towards developing tourism in the area. In Lapland county today, tourism provides more employment opportunities than any other industry that makes indirect or direct use of natural resources (Saarinen, 2003). With the introduction of special efforts into tourism of the north, such as the Santa Claus Village near Rovaniemi or special purpose-built spaces (from glass igloos to luxury suites) to watch he Northern Lights, the area is rapidly transforming it economic base.

Despite regional policies and a drive towards developing tourism, table 3 displays that the GDP shares of the provinces in central and northern Finland have stayed rather constant. During the mid of the century with the expanding forestry frontier and subsequent industrial policy, the share increased somewhat, but since 2000 it has decreased again. The only exception is the Häme province that over the long-run has increased its share in relative regional GDP.[16]

### *4.2 Regional inequality and convergence trends in GDP per capita*

Figure 3 displays the long-run fall in regional inequality between 12 counties. The graph shows that the population-weighted coefficient of variation, initially used by Williamson (1965) to calculate regional inequality, fluctuates between 0.35 and 0.45 between 1880 and 1930. These regional inequality figures during early industrialization are quite large in international comparison. For Spain, famous for its regional divide, Martinez-Galarraga et al. (2010) document that regional inequality between NUTS 2-provinces peaked at 0.40 around 1920. Thus, Finland's early growth trajectory was signified by large regional inequalities, also in international comparison. The regional divide can be said to center around a relatively rich, industrialized and urbanized South and a less developed Northern part of the country.

[16] Häme province hosts old cultural traditions and is home to Finland's third largest city, Tampere. The city has old industrial roots and produces textiles, shoes and metal wares for the Finnish home market.

Scrutinizing the period a bit more, suggests a broad pattern of convergence between 1880 and 1910 and divergence between 1910 and 1930. After 1930, Finland experienced a remarkably fast drop in inequality rates, down to very low levels (0.15) in 1980. The convergence period 1930-1980 was however interrupted after 1980, when regional inequality rose again. The shape of the Finnish long-run pattern of regional inequality with alternating period of convergence (1880-1910 and 1930-1980) and divergence (1910-1930 and post 1980) is robust also to not correcting for population, and also whether we consider the twelve counties or the twenty NUTS 3-regions. One exception is that the upswing in regional inequality documented after 1980 becomes more pronounced when analyzing CV:s based on data measured at the NUTS 3-level. The reason is that NUTS 3 separates the area around the Helsinki region (coded with FI181) more than the county level does, since Helsinki is part of the larger Uusimaa county.

In Figure 4 Finland's long run evolution is compared to Sweden. The figure shows that Finland started from a more unequal position than Sweden in 1880 and that regional inequality remained high throughout early industrialization, while it dropped significantly in Sweden. The convergence process in Finland clearly took off later compared to the Swedish counterpart. However, once convergence started, the result was impressing. In four decades, from 1940 to 1980, Finland moved from very high levels of regional inequality down to almost as low levels as Sweden in 1980. Previously, Enflo and Rosés (2014) have shown that Sweden had remarkably low levels of regional inequality in 1980, compared to a sample of European countries. In figure 4, it is clear that Finland remained somewhat more unequal in 1980, but that its regional distribution of GDP per capita must be considered among the lower in Europe nevertheless. After 1980, the trend of increasing divergence is almost parallel in Sweden and Finland. This suggests that similar factors of convergence in the post-war period were interrupted in 1980.

### *4.3 Explanation of convergence patterns in relative GDPs per capita*

The broad convergence pattern, described in figure 3, can be further scrutinized in tables 4 and 5 and supplemented by the maps in figure 5. For simplicity, the following discussion is organized within the identified convergence / divergence periods 1880-1910, 1910-1940, 1940-1980 and post 1980.

#### 4.3.1. The industrialization break-through 1880-1910

As seen from table 5, the high initial levels of regional inequality that we observe between the twelve counties are mainly a result of the capital region's extraordinary high relative GDPs per capita (2.2 times the Finnish average in 1880). The upper left panel in figure 5 confirms the picture that the Uusimaa County remained in the top income class, followed by the counties in the south-western part of the country. Over the period, the inequality has gradually reduced, as seen in the middle map of figure 5, partly due to a relative falling behind of Uusimaa and partly to industrialization spreading to the northern and eastern part of the country. Earlier research has pointed towards the relative decline in industrial formation of the southern coast between 1890 and 1910 as a driving force of convergence (Kiiskinen 1961, p. 92). Overall, a relative decline in regional inequality is observed during the industrial break-up, partly due to slow industrialization of the south and partly due to the spreading of agriculture, forestry and forest industry to the peripheral areas of Finland.

#### 4.3.2. Independence and interwar period 1910-1940

After Finnish independence, Uusimaa region industrialized faster than the rest of the country, and relative GDP per capita levels of this region is again driving rising inequality until 1930.

Despite the closure of the Russian border to trade after the Finnish declaration of independence 1917, we do not observe any long-run decline of the eastern counties relative GDP per capita during the inter-war period. On the contrary, Kymi, Kuopio and Northern Karelia counties appear in relatively better positions in 1940 than in 1910. Mikkeli reaches an all-time low in 1940. According to Kiiskinen (1961, p. 68), the regional economy of the mid-south became especially penalized by the 1918 war of independence, as the most violent battles were fought in this region. From table 5 we note a small relative decline in GDP per capita of the Häme County, where the fierce battle of Tampere was fought in 1918, but a relative increase of the Uusimaa region between 1910 and 1920.

In general the interwar period displayed an increasing tendency for divergence, with the capital region forging ahead, the north-western parts of the country falling behind and some weak tendencies for relative improvement in the central parts of Finland, were forest land became exploited thanks to improved transportation investment.

### 4.3.3. Post-war period 1940-1980

The post-war period was signified by rapid convergence. Within 40 years, Finland went from a high-inequality country to one with among the lowest levels of regional inequality in Europe. Regional differences in industrial productivity rapidly leveled out. This was particularly the case in Central Finland, one of the most backward regions in 1880, where relative GDP per capita have drawn closer to the average between 1930 and 1950. In Uusimaa, the opposite was true, relative regional GDP per capita levels dropped from 2.12 to 1.57 times the average, as seen from table 5.

The Åland Islands show an interesting journey. After the League of Nations assigned the island to Finland in 1921, the islands became politically neutral, entirely demilitarized and exclusively Swedish-speaking by law. Going from second richest county in 1880, the islands gradually lost their economic muscles, and experienced their all-time low in 1930. Thereafter, table 5 bears witness how the relative regional GDP per capita of the islands have been considerably volatile, from a very low in 1970, to a very high thereafter.[17] In the post-war period, the islands became highly successful in shipping, and in 1959 modern large passenger ferries began to operate the route between the islands and Stockholm in Sweden and Turku in Finland. The traffic was made profitable by tax-free sales on goods that were highly taxed in Sweden, such as alcohol, perfume and tobacco. Several shipping companies were founded on the Åland Islands, and it is probable that a large part of the islands GDP can be attributed to value added from sales in the shipping industry. As Finland joined the EU in 1995, the islanders feared that the incomes from tax-free would become history. However, EU granted the islands a special status and an exception to the tax-free rules of the internal market.

In 1980, the relative GDP per capita levels of Finland have converged rapidly, but scrutinizing the map in figure 5, the relatively richest counties are still found in the south (Uusimaa and Häme) and south-east (Kymi), signifying that eastern markets probably played a non-negligible role for Finland in 1980. The relative decline of the western region, notably, Turku and Pori,

[17] It should be noted that these fluctuating figures after 1970 are not a result of any of the calculations that I made in the paper: the data is taken from the official publications of Statistics Finland, and the Islands actually never change borders, so their county and NUTS-classification has remained intact. Rather, the fluctuations are likely a result of the specific economic conditions on the Islands.

which was the third richest county in 1880, is notable in relative GDP per capita levels also and visible in table 5.

#### 4.3.4. Post 1980

Post 1980 regional divergence has been the trend in Finland. The Finnish weakening of regional convergence also appears to be part of a phenomenon documented on an EU-wide basis (Tondl 1999, Enflo, 2010). In the case of Finland's regional divergence, the economic crisis of the early 1990s, has been put forward as a main watershed in long-run regional equality patterns (Tervo, 2005). Although the crisis hit all Finland fairly evenly, with most regions losing about one-fifth of its employment, the post-crisis recovery was highly uneven. The increased labor-force mobility[18] and the rise of new non-natural resource dependent industries[19] have halted the process of regional convergence. Between 1993 and 1996, two-thirds of the newly created jobs were localized in one of the three major cities, Helsinki, Tampere or Turku (Tervo, 2005). Post 1990, a new specialization in high-tech, footloose industries interrupted the previous process of long-term convergence and Finnish agglomeration economies happened in areas with better market and supplier access (Ottoviano and Pinelli, 2006). Thus, as can be seen in table 5 and in the maps in figure 5, the post-1980s have brought about an increasing concentration of production to the southern part of Finland (Uusimaa county). This county has again forged ahead in terms of relative regional GDP per capita, thus fostering the most recent divergence tendency.

## 5. Discussion and concluding remarks

This paper shows the regional long-run evolution of Finland's GDP per capita. It is shown that Finland's regions were relatively unequal in terms of GDP per capita and in European comparison during early industrialization. Gradually, industrialization was spread to include larger parts of the country, especially thanks to improvements in transportation technologies that made an expanding timber industry possible. Rapid convergence in GDP per capita only took place after the Second World War, but was interrupted by the 1980s and replaced by a new tendency for divergence. When looking at shares of GDP, Finland's spatial evolution can be described as a gradual concentration of GDP in the southern parts of the country. In addition, the historically important western parts have declined whereas the role of the eastern markets has led to some fluctuations in the share of eastern counties in GDP.

In this concluding section, I will attempt to speculate about causes for the Finnish long-term regional convergence pattern and draw up avenues for future research. In order to do so, I find it useful to make comparisons with Sweden. Firstly, I will consider the relative role of migration for convergence. The early Swedish convergence period 1860-1910 have been explained by large figures of internal and external migration, where people left the poorest areas and went to the more promising ones (Enflo and Rosés, 2014). Especially, the rapidly industrializing and expanding forestry sector in the northern parts of the country were attractive poles for internal migrants. Enflo, Lundh and Prado (2014) further corroborate the equalizing forces internal and external migration had on agricultural wages in this period. Thus, one obvious candidate for the Finnish lack of strong convergence during the early industrialization phase may be little internal

[18] 1.5 million people changed their municipality of residence 1995 and 2000, while the corresponding figure in 1985 to 1990 was only 1.2 million (Nivalainen 2003)

[19] The significance of high-tech industry rose dramatically, with high-tech products increasing from 12.4 percent of total exports in 1994 to 20.4 in 1999

and external migration. Previous literature supports this idea, for example Pitkänen (1994) argues that internal migration was fairly modest during the late 19th century. As late as the 1920s, about 90 per cent of the Finnish population lived in their home county and 70 per cent even remained in their home municipality. In addition, emigration figures were low: While more than one million Swedes left for the New World between 1829 and 1929, the corresponding figure from Finland was 350 000. The regional distribution of Finnish emigrants show that people left areas with relatively low regional GDP per capita, and good access to water transportation. Hence, emigration was concentrated around the Bothnian Gulf, with half of the emigrants coming from the relatively poor county of Vaasa (Arkivens Portti 2014).[20] While we do observe in table 5 that Vaasa county climbed in the relative rankings of regional GDP between the late 19th century and 1910, it is probably the case that the migration numbers were too small to bring the strong converging forces of wages and regional GDP that previous research has found for Sweden.

Secondly, the role of regional policies must be understood. Enflo and Rosés (2014) attribute Sweden's rapid convergence between 1940 and 1980 to migration and structural change, but also by the unique policy of compressed wages and grants to encourage internal migration. Thus, Swedish regional policy during the 1950s and 1960s were mainly directed towards encouraging structural change and migration by suppressing wage inequalities and offering moving grants. The Finnish regional policy, salient from the mid- 1960s and onwards, appears on the contrary to have aimed towards de-centralizing industry and spreading it across development areas (Tervo 2010). It is interesting to note that although regional policy objectives were relatively different in Sweden and Finland, the outcome of strong regional convergence after World War 2 until 1980 is very similar. One must then ask, if there are other forces behind this strong evolution?

Again, the issue of migration lies close at hand. After the establishment of the Common Nordic Labour Market in 1954, Finland saw a substantial outflow of Finns to Sweden, especially in the 1960s and 1970s. Since 1954, as many as two-thirds of the inter-Nordic migrants have been Finnish emigrants to, and Finnish returnees from, Sweden (Fischer and Straubhaar, 1996). The 1950s and 1960s have thus been labeled the era of Great Migrations and involved rapid depopulation of rural areas (Tervo, 2005). Some of the underlying reasons for the strong migration wave were the relative income gap between Sweden and Finland and the fast agricultural decline associated with Finland's rapid industrialization. During the 1980s, Finland had largely caught up with Sweden in GDP per capita terms (see figure 1) and the migration flows slowed down. While emigration lead to increasing spatial concentration of economic production and welfare, the effects on regional GDP per capita are likely to have been convergence. Thus, it is possible that this emigration wave, in combination with industrialization and structural change had a similar, but delayed, converging impact on Finland's relative GDP per capita as we observed for Sweden already in the late 19th century.

Thirdly, the role of transportation and infrastructure in sparsely populated countries like Finland and Sweden is often discussed. Theoretical models like Krugman (1991) predict that increasing investments into infrastructure may lead to a further concentration of economic activities. In the case of Finland, improved transportation initially had de-concentrating effect as inland towns began to form with the growth of forest industries. As in Sweden, cities connected

[20] http://wiki.narc.fi/portti/index.php?w=sv

to rail boomed and new cities sprouted at railroad junctions during the late 19th century. Berger and Enflo (2013) show that railroads increased local urbanization and industrialization and had persistent effects on the economic landscape in Sweden. Future research should clarify the role of the Finnish railroads in shaping local economic conditions and fostering pre-conditions for de-centralized growth and regional convergence. It was not until the 1950s and 1960s that scholar's document how the infrastructure policy of Finland deliberately was created to lay the foundations for the development of the sparsely populated parts of Finland. Tervo (2005) argue that the policies, for example a major road-building program that improved the operational preconditions for the manufacturing and service industries, eventually increased competitiveness of more remote regions.

This paper concludes by pointing towards the recent trend breaks in regional convergence after the 1980s. Both Sweden and Finland have experienced rapidly diverging tendencies. It appears that the novel high-tech industrial specialization pattern of both countries is fostering agglomerations and industrial concentrations to urban areas. Perhaps these strong diverging forces are even more disruptive in sparsely populated and peripheral countries, such as Sweden and Finland. A future concern for policy makers will be how to combine rapid growth in high-tech industries with regional equality and how societal services will be sustained in sparsely populated areas.

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# Appendix

Table A1. Checking differences of Regional GDPs calculated on bases county-level GDPs adjusted for population shares to the officially reported regional GDPs at NUTS 2-level

| | | 1970 | 1980 | 1990 |
|---|---|---|---|---|
| FI13 | East | 1.01 | 0.98 | 0.96 |
| FI18 | South | 1.00 | 1.01 | 1.00 |
| FI19 | West | 0.99 | 0.97 | 1.00 |
| FI1A | North | 1.00 | 1.01 | 1.03 |
| FI2 | Åland | 0.78 | 1.01 | 1.01 |

Table A2. Scheme to allocated wage data from Soininen's (1981) eight to the twelve counties.

| Twelve counties | Soininen (1981) |
|---|---|
| Uusimaa | Uusimaa |
| Turku and Pori | Turku and Pori |
| Åland | Turku and Pori |
| Häme | Häme |
| Kymi | Viipuri |
| Mikkeli | Mikkeli |
| Northern Karelia | Kuopio |
| Kuopio | Kuopio |
| Central Finland | Kuopio |
| Vaasa | Vaasa |
| Oulu | Oulu |
| Lapland | Oulu |

Table A3. Regional classification from Kiiskinen's (1958) 18 regions to the twelve counties.

| Twelve counties | Kiiskinen |
|---|---|
| Uusimaa | Helsinki |
| Turku and Pori | Average of Turku and Pori |
| Åland | Average of Turku and Pori |
| Häme | Average of Tavastehus and Lahtis |
| Kymi | Average of Kotka and Villmarstrand |
| Mikkeli | St Michels |
| Northern Karelia | Average Joensuu and Kajana |
| Kuopio | Kuopio |
| Central Finland | Jyväskylä |
| Vaasa | Average of Vasa, Seinajoki and Karleby |
| Oulu | Uleåborg |
| Lapland | Nordbotten |

Table A4. Relative industrial productivity coefficients, derived from Kiiskinen (1961)

| Twelve counties | Kiiskinen | 1890 | 1900 | 1910 | 1920 |
|---|---|---|---|---|---|
| Uusimaa | South-Coast | 1.29 | 1.46 | 1.19 | 1.18 |
| Turku and Pori | South-West | 1.09 | 0.99 | 0.92 | 1.04 |
| Åland | South-West | 1.09 | 0.99 | 0.92 | 1.04 |
| Häme | Middle-South | 1.20 | 1.05 | 1.08 | 0.92 |
| Kymi | South-East | 1.09 | 1.22 | 1.25 | 1.12 |
| Mikkeli | South-East | 1.09 | 1.22 | 1.25 | 1.12 |
| Northern Karelia | South-East | 1.09 | 1.22 | 1.25 | 1.12 |
| Kuopio | Central Finland | 0.54 | 0.60 | 0.55 | 0.81 |
| Central Finland | Central Finland | 0.54 | 0.60 | 0.55 | 0.81 |
| Vaasa | West-Coast | 0.83 | 0.84 | 1.18 | 1.10 |
| Oulu | Northern Finland | 0.97 | 0.83 | 0.84 | 0.82 |
| Lapland | Northern Finland | 0.97 | 0.83 | 0.84 | 0.82 |

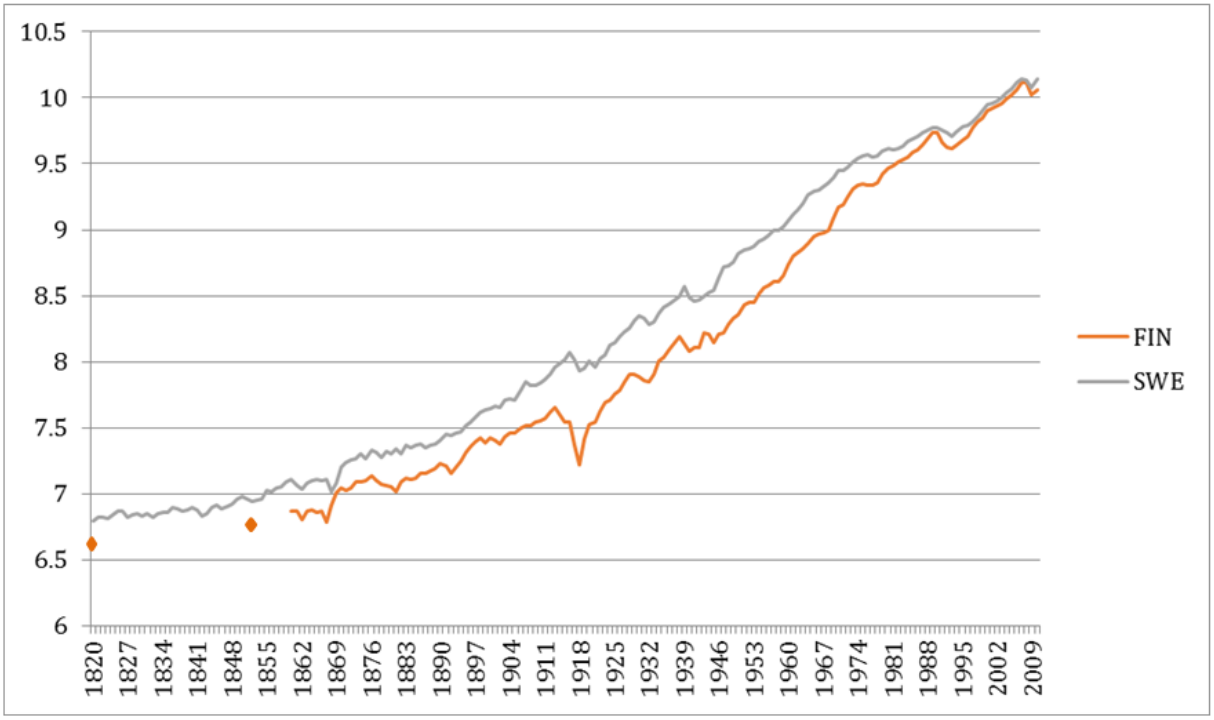
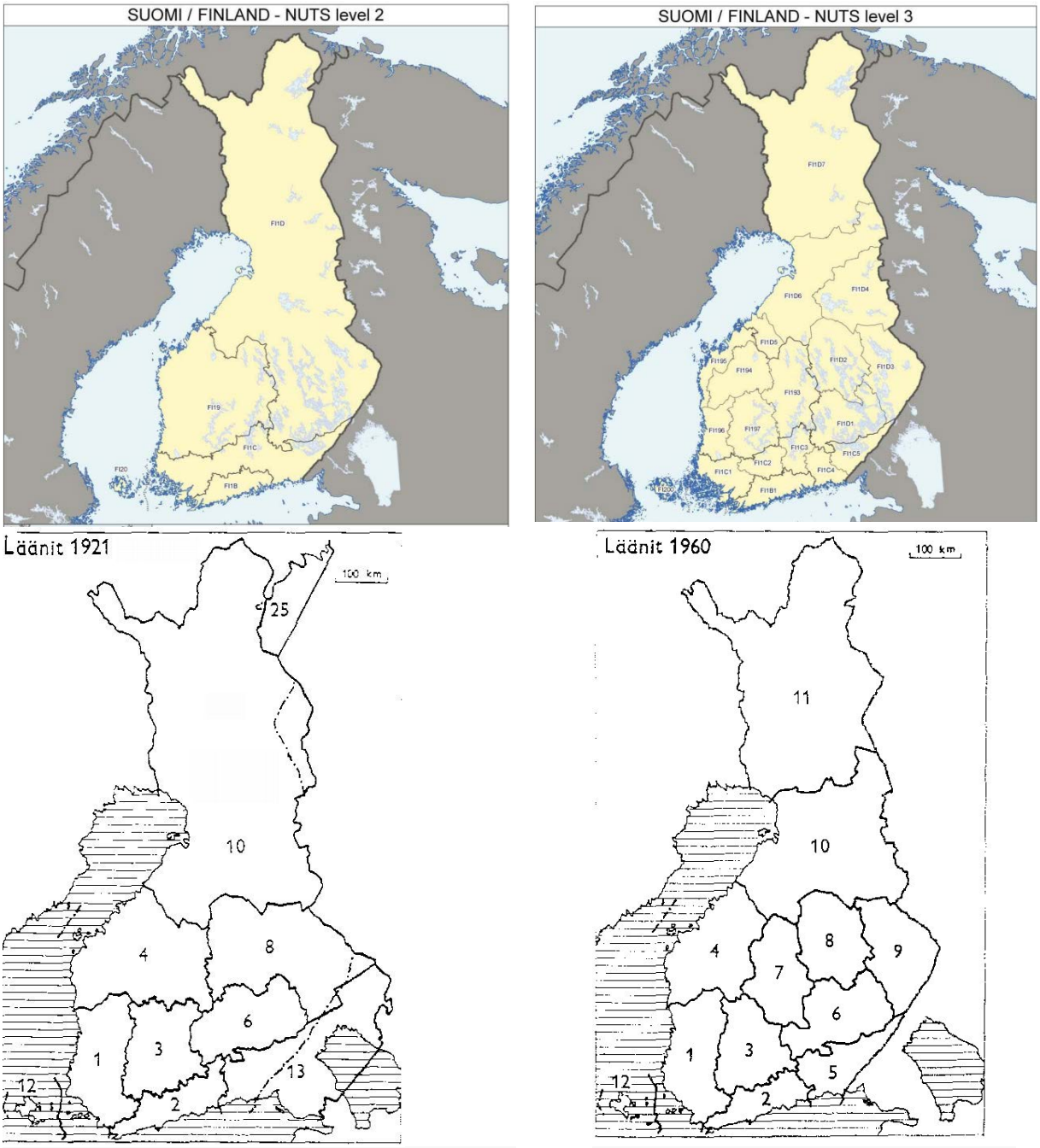



*Figure 1.* Relative GDP per capita, Finland and Sweden. Point estimate in 1820 and 1848. Source: Maddison's *Statistics on World Population, GDP and Per Capita GDP, 1-2008 AD.*




1: Turku and Pori, 2: Uusimaa, 3: Häme, 4: Vaasa, 6: Mikkeli, 8: Kuopio, 10: Oulu, 12: Åland, 13: Viipuri, 25: Petsamo

1: Turku and Pori, 2: Uusimaa, 3: Häme, 4: Vaasa, 5: Kymi, 6: Mikkeli, 7: Central Finland, 8: Kuopio, 9: Northern Karelia, 10: Oulu, 11: Lapland, 12: Åland

*Figure 2*. Upper panel: Finland NUTS 2 regional division (left) and NUTS 3 (right) according to the revisions of Eurostat 2011. Lower panel: The division of Finland's historical provinces in 1921 (left) and in 1960 (right)

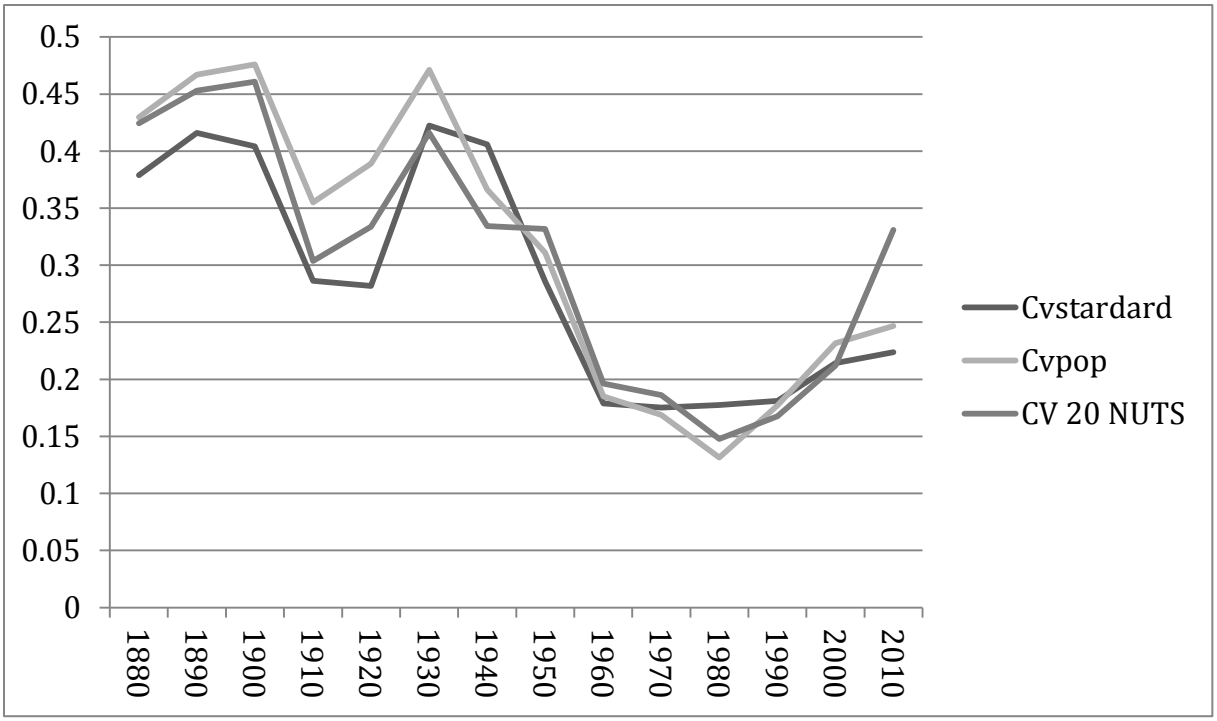



*Figure 3.* Coefficient of variation, 12 counties, based on averages and population weigted averages and standard calculation. CV for the 20 NUTS 2 regions are also included for comparison.

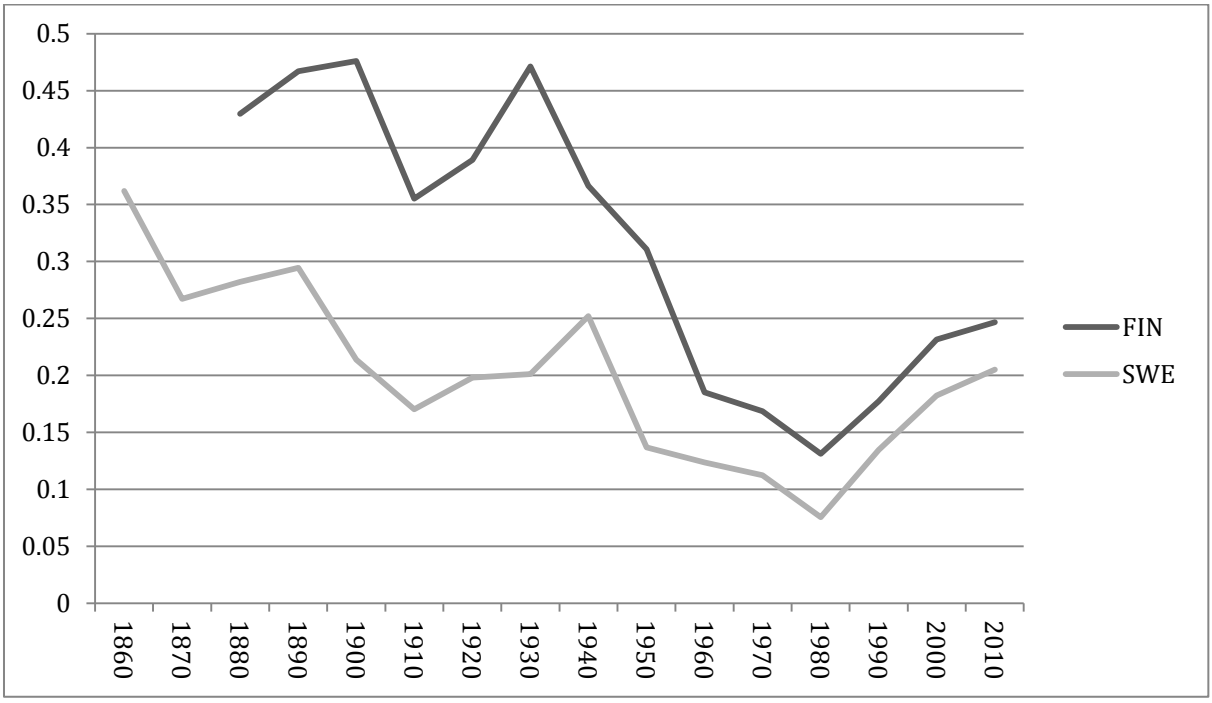



*Figure 4.* Comparison of population weighted coefficients of variation between Sweden (24 counties) and Finland (12 counties).

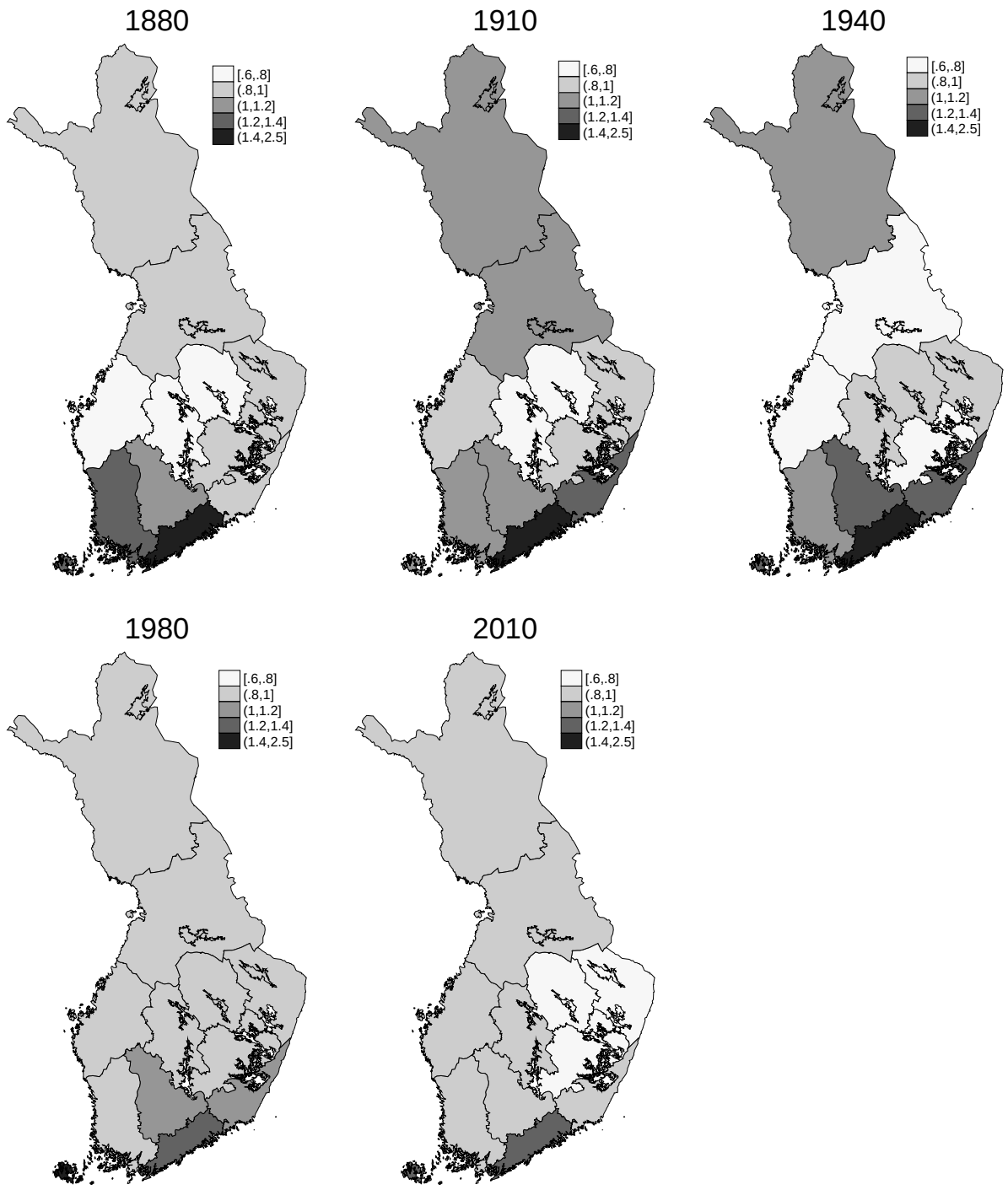



*Figure 5.* The spatial distribution of relative regional GDP per capita, Finland GDP per capita =1, categories <0.8, 0.8-1, 1-1.2, 1.2-1.4 and 1.4< . Sources: table 5.

**Table 1. Share of total export to main trading partners**

| | UK | GER | RUS | SWE | Total |
|---|---|---|---|---|---|
| 1880 | 0.15 | 0.06 | 0.41 | 0.08 | 0.70 |
| 1900 | 0.30 | 0.09 | 0.29 | 0.04 | 0.72 |
| 1920 | 0.43 | 0.05 | 0.00 | 0.08 | 0.56 |
| 1930 | 0.39 | 0.12 | 0.04 | 0.03 | 0.58 |
| 1948 | 0.29 | 0.01 | 0.15 | 0.06 | 0.51 |
| 1960 | 0.24 | 0.11 | 0.14 | 0.05 | 0.55 |
| 1980 | 0.11 | 0.11 | 0.18 | 0.17 | 0.56 |
| 2000 | 0.09 | 0.12 | 0.04 | 0.09 | 0.34 |

Notes: Calculated from Mitchell (2007). Germany in 1980 refers to West Germany.
In 2000 USA had replaced Russia as the fourth largest export market with a share of 0.073.

**Table 2. Shares of regional GDP, five NUTS 2-regions**

| NUTS code | Official name | 1880 | 1890 | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FI19 | Western Finland (Länsi-Suomi) | 0.29 | 0.28 | 0.26 | 0.28 | 0.27 | 0.26 | 0.27 | 0.27 | 0.27 | 0.25 | 0.25 | 0.23 | 0.22 | 0.23 |
| FI1B | Helsinki-Uusimaa | 0.18 | 0.19 | 0.22 | 0.20 | 0.23 | 0.26 | 0.25 | 0.25 | 0.24 | 0.27 | 0.28 | 0.32 | 0.37 | 0.39 |
| FI1C | Southern Finland (Etelä-Suomi) | 0.26 | 0.26 | 0.26 | 0.26 | 0.24 | 0.24 | 0.25 | 0.25 | 0.24 | 0.24 | 0.23 | 0.22 | 0.20 | 0.18 |
| FI1D | East and North Finland (Itä ja Pohjois Suomi) | 0.26 | 0.26 | 0.25 | 0.26 | 0.25 | 0.23 | 0.22 | 0.22 | 0.25 | 0.23 | 0.23 | 0.22 | 0.20 | 0.20 |
| FI20 | Åland | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 |

Notes: The regional GDPs were calculated using the Geary-Stark method, outlined in section 2 of this paper. For data sources, see section 3.

**Table 3. Shares of regional GDP, twelve counties (läänit)**

| County name | 1880 | 1890 | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uusimaa | 0.20 | 0.21 | 0.24 | 0.22 | 0.24 | 0.27 | 0.26 | 0.26 | 0.24 | 0.28 | 0.28 | 0.32 | 0.37 | 0.39 |
| Turku and Pori | 0.21 | 0.20 | 0.18 | 0.18 | 0.17 | 0.16 | 0.17 | 0.16 | 0.15 | 0.15 | 0.14 | 0.14 | 0.13 | 0.12 |
| Åland | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 |
| Häme | 0.12 | 0.12 | 0.11 | 0.12 | 0.11 | 0.14 | 0.14 | 0.15 | 0.14 | 0.14 | 0.14 | 0.13 | 0.13 | 0.13 |
| Kymi | 0.06 | 0.06 | 0.07 | 0.08 | 0.07 | 0.08 | 0.09 | 0.07 | 0.09 | 0.08 | 0.07 | 0.07 | 0.06 | 0.05 |
| Mikkeli | 0.06 | 0.05 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0.05 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 |
| Northern Karelia | 0.04 | 0.04 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 |
| Kupoio | 0.05 | 0.05 | 0.05 | 0.04 | 0.05 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 |
| Central Finland | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 |
| Vaasa | 0.11 | 0.11 | 0.10 | 0.11 | 0.10 | 0.08 | 0.08 | 0.07 | 0.08 | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 |
| Oulu | 0.08 | 0.09 | 0.08 | 0.09 | 0.08 | 0.06 | 0.05 | 0.05 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Lapland | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 |

Notes: see table 2

**Table 4. Relative GDP per capita, Finland=1, five NUTS 2 regions**

| Nuts code | Official name | 1880 | 1890 | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FI19 | Western Finland (Länsi-Suomi) | 0.86 | 0.84 | 0.76 | 0.89 | 0.90 | 0.91 | 0.93 | 0.84 | 0.86 | 0.84 | 0.86 | 0.80 | 0.78 | 0.81 |
| FI1B | Helsinki-Uusimaa | 2.63 | 2.64 | 2.56 | 2.04 | 2.10 | 2.19 | 1.73 | 1.57 | 1.27 | 1.23 | 1.16 | 1.25 | 1.32 | 1.22 |
| FI1C | Southern Finland (Etelä-Suomi) | 1.05 | 1.05 | 1.03 | 1.01 | 0.98 | 1.01 | 1.04 | 0.89 | 0.90 | 0.87 | 0.83 | 0.82 | 0.77 | 0.76 |
| FI1D | East and North Finland (Itä ja Pohjois Soumi) | 0.77 | 0.77 | 0.77 | 0.84 | 0.82 | 0.76 | 0.72 | 0.65 | 0.73 | 0.75 | 0.78 | 0.74 | 0.70 | 0.73 |
| FI20 | Åland | 1.23 | 1.21 | 1.03 | 0.98 | 0.91 | 0.87 | 1.12 | 0.82 | 0.76 | 0.60 | 0.99 | 1.17 | 1.12 | 1.08 |

Notes: see table 2

**Table 5. Relative GDP per capita, Finland=1, 12 counties (läänit)**

| County name | 1880 | 1890 | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uusimaa | 2.20 | 2.27 | 2.30 | 1.89 | 2.01 | 2.12 | 1.72 | 1.57 | 1.30 | 1.27 | 1.21 | 1.29 | 1.36 | 1.38 |
| Turku and Pori | 1.34 | 1.31 | 1.12 | 1.14 | 1.14 | 1.11 | 1.20 | 1.03 | 1.04 | 1.02 | 0.97 | 0.95 | 0.92 | 0.85 |
| Åland | 1.38 | 1.37 | 1.18 | 1.11 | 1.03 | 0.98 | 1.24 | 0.92 | 0.85 | 0.67 | 1.41 | 1.30 | 1.24 | 1.23 |
| Häme | 1.19 | 1.17 | 1.07 | 1.07 | 1.06 | 1.33 | 1.28 | 1.18 | 1.08 | 1.02 | 1.01 | 0.96 | 0.92 | 0.97 |
| Kymi | 1.00 | 1.06 | 1.20 | 1.23 | 1.08 | 1.13 | 1.31 | 0.96 | 1.12 | 1.06 | 1.00 | 0.97 | 0.95 | 0.81 |
| Mikkeli | 0.84 | 0.73 | 0.83 | 0.86 | 0.86 | 0.79 | 0.71 | 0.90 | 0.80 | 0.82 | 0.83 | 0.80 | 0.73 | 0.75 |
| Northern Karelia | 0.88 | 0.81 | 1.02 | 0.86 | 0.95 | 0.83 | 0.93 | 0.77 | 0.79 | 0.79 | 0.82 | 0.77 | 0.72 | 0.70 |
| Kupoio | 0.78 | 0.71 | 0.68 | 0.70 | 0.77 | 0.97 | 0.81 | 0.76 | 0.81 | 0.83 | 0.85 | 0.87 | 0.77 | 0.80 |
| Central Finland | 0.78 | 0.65 | 0.70 | 0.76 | 0.99 | 1.03 | 0.98 | 0.96 | 0.87 | 0.87 | 0.90 | 0.95 | 0.89 | 0.84 |
| Vaasa | 0.78 | 0.78 | 0.71 | 0.99 | 0.94 | 0.73 | 0.76 | 0.66 | 0.83 | 0.83 | 0.95 | 0.84 | 0.80 | 0.88 |
| Oulu | 0.97 | 1.13 | 0.97 | 1.19 | 1.02 | 0.74 | 0.66 | 0.55 | 0.76 | 0.83 | 0.86 | 0.84 | 0.80 | 0.81 |
| Lapland | 0.86 | 0.92 | 1.05 | 1.11 | 1.11 | 1.15 | 1.07 | 0.83 | 0.93 | 0.91 | 0.92 | 0.89 | 0.87 | 0.82 |

Notes: see table 2