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Abstract

In many countries, regional income inequality has followed an inverted U-shaped curve, growing during industrialisation and market integration and declining thereafter. By contrast, Sweden's regional inequality dropped from 1860 to 1980 and did not show this U-shaped pattern. Accordingly, today's regional income inequality in Sweden is lower than in other European countries. We note that the prime mover behind the long-run reduction in regional income differentials was structural change, whereas neo-classical and technological forces played a relatively less important role. However, this process of regional income convergence can be divided into two major periods. During the first period (1860-1940), the unrestricted action of market forces, particularly the expansion of markets and high rates of internal and international migrations, led to the compression of regional income differentials. In the subsequent period (1940-2000), the intended intervention of successive governments appears to have also been important for the evolution of regional income inequality. Regional convergence was intense from 1940 to 1980. In this period, governments aided the convergence in productivity among industries and the reallocation of the workforce from the declining to the thriving regions and economic sectors. During the next period (1980-2000), when regional incomes diverged, governments subsidised firms and people in the declining areas.

JEL codes: N94; N93; R11;R12

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Coping with Regional Inequality in Sweden:
Structural Change, Migrations and Policy, 1860-2000

A major source of concern among development economists and policymakers is the pervasiveness of regional inequality during the initial phases of modern economic growth.[1] As a country develops and becomes increasingly economically integrated and industrialised, the distribution of economic activity becomes more unequal. Modern economic activities, particularly manufacturing and high value-added services, tend to concentrate in few regions, whereas the rest of the country experiences a progressive process of de-industrialisation and specialises in agriculture and other traditional industries with lower labour productivity. Given that modern industries enjoy increasing returns and monopolistic competition gains, wages are higher in industrialising than in agricultural regions. Accordingly, in the early stages of economic growth, regional income per capita inequality increases, but beyond some point, which varies for different countries, the trend stops, and regional inequality eventually peters out. This phenomenon implies that the regional income per capita inequality describes an inverted U-shaped curve. The movements of labour from declining agrarian regions to the thriving industrial regions and the subsequent emulation of industrial structures and wages are regarded as the forces behind this reversal in regional inequality trends.[2]

Historical evidence for many Western developed countries during the last two centuries apparently gives strong support to the statements of the previous paragraph. In his pioneering article on regional income inequality, Jeffrey Williamson shows that regional income per capita inequality followed this inverted U-shaped pattern in the United States, where it peaked by the early twentieth century.[3] This

[1] There are two main reasons why policymakers are concerned about spatial inequality between a nation's regions. First, spatial inequality is a major ingredient in overall national inequality across individuals. When regional inequality increases, other things being equal, so does the overall inequality in the country. Second, regional inequality is an issue of political significance because it may have an impact on political stability and social conflict, especially when the geographical regions are aligned with political, ethnic, language, or religious divisions (Kanbur and Venables, 2005).

[2] There is an ample empirical and theoretical literature supporting this view about uneven regional development. See, among others, Caselli and Coleman (2001), Krugman (1991), and Williamson (1965).

[3] Williamson (1965). Williamson also included several other nations in his study, among them Sweden, for which he found an inverted U-shape that peaked in the 1930s using regional incomes per capita from 1920 to 1960. Our

inverted U-shaped curve is also easy to recognise in income per capita data for Italian, French, Portuguese and Spanish regions, though the chronology of the development of regional income inequality varies from one country to another.[4]

The Swedish historical experience, nevertheless, fits poorly with the previous described stylised facts in long-term regional inequality. In the long run (from 1860 to 2000), Sweden's regional inequality, measured in terms of 24-counties per capita GDP, dropped significantly and did not follow the typical inverted U-shaped pattern. A closer inspection of the available data offers a richer picture: income inequality dropped rapidly from 1860 and 1910, increased slightly from that year up to 1940 (without reaching initial levels),[5] declined again up to 1980, and finally increased (as in many other Western countries) during the recent decades. There are two other characteristics that made the evolution of country's regional inequality particularly extraordinary. First, the presence of notable rank instability in GDP per capita positions: once richer regions lost grounds significantly from one period to another, while poor regions prospered and became richer than before. This situation is closely connected to the fact that the fortune and misfortune of many Swedish regions was associated to the boom and busts of natural resources, which were commonly internationally traded.[6] Second, as a consequence of this long-run process of regional income per capita equalisation, the Swedish levels of regional inequality are comparatively low in international terms, even considering the recent upsurge in regional inequality among Swedish counties.[7]

We will show that the compression of regional inequality in Sweden was mainly caused in the long run by structural change, while neo-classical forces and technological catching-up were much less important. In other words, our evidence will give strong support to the structural interpretation for regional income differences. However, in the two periods of intense convergence (from 1860 to 1910 and from 1940 to 1980) different factors played a central role. Contrary to what happened in other European countries, the creation of the national market and the first phase of industrialisation from 1860 to 1910 were not accompanied by an upswing in regional inequality but by a substantial process of

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results are broadly consistent with Williamson's, as we find evidence of divergence tendencies in regional GDP per capita (but not in GDP per worker) in the interwar period. However, our long-term series puts this tendency into a broader perspective.

[4] See Felice (2011) for Italy; Combes et al. (2010) for France; Badia-Miró et al. (2012) for Portugal; Rosés et al. (2010) and Martínez-Galarraga et al. (2010) for Spain. See also section II.

[5] This reversal is not observable in GDP per worker data. See section III.

[6] The dominant export goods until the turn of the 20th century were oats and timber, as well as basic industrial products, such as board and bar iron. See Schön (2010: 34).

[7] See section II.

regional convergence. Our research will show that this particular feature of Sweden's development was caused by both migrations, which facilitated regional convergence in labour productivity in agriculture and services and the reduction of productivity differences across sectors. These two convergence forces counterbalanced the process of uneven industrial location, which had been capable by generating a substantial increase in regional inequality.

During the second period of rapid regional convergence, from 1940 to 1980, the role of the government was not negligible. The country developed an original regional policy that aided both the location of modern manufacturing in the most convenient locations and the reallocation of the workforce from declining to expanding regions. In other words, the objective of the successive Social Democrat governments was to generate a process of structural change. Regional policy came together with an economic policy aimed to encourage the compression of the wage distribution. The action of these two concomitant economic policies resulted in an overall increase in labour productivity by eliminating the least competitive firms from the economy.

From the 1970s onwards, regional income convergence ceased, and regional per capita incomes began to diverge significantly. Furthermore, economic policy gradually changed. The government abandoned the promotion of internal migrations and adopted a new policy of subsidising firms located in peripheral areas.

The article proceeds as follows. Section I introduces the long-term Swedish experience with regional income inequality. The next section puts Swedish experience in an international context. Section III discusses alternative explanations for the process of regional convergence in Sweden in the long run. Section IV considers the initial period from 1860 to 1940, when market forces predominated, while the following sections consider the period from 1940 to 2000, which witnessed a more active involvement of the government in regional inequality issues. The last section concludes.

I

In this section, we review the new evidence on Swedish regional inequality. As we have noted in previous paragraphs, Swedish regional history in the last 150 years is primarily a history of decreasing regional inequality. Figure 1 (below) provides the reader some basic geographic information about Swedish regions. Sweden is divided into three main historical regions (Norrland in the North, Svealand in the Centre and Götaland in the South), which roughly correspond to NUTS I in European Union terminology, and 24 counties (län), which roughly correspond to NUTS III regions. To provide our

analysis of long-run consistency, we chose to use historical counties and then to ignore the recent administrative reorganisation of Sweden.[8]

[HERE FIGURE 1]

For computing the evolution of Sweden's regional GDP from 1860 to 2000, the workhouse methodology of the historical reconstructions of regional GDPs, those suggested by Frank Geary and Tom Stark,[9] was employed by Kerstin Enflo, Martin Henning and Lennart Schön (2010). This method is interesting for the paucity of data requirements and its parsimonious relation with the basics of national accounting and general equilibrium conditions.[10] Specifically, the basic idea of this methodology is that under the conditions of perfect competition, wages are a good proxy for regional labour productivity at the industry level and labour productivity is closely connected with GDP per capita.[11] The Geary-Stark method essentially distributes already known GDP estimates on nation/industry levels regionally by using regional labour inputs and wage differentials. For the Swedish case, the method therefore allows for estimates of regional income that are consistent with existing national estimates from the Swedish Historical National Accounts to 2000.[12] This regional GDP per capita evidence is presented in the following table 1 and figure 2:

[HERE TABLE 1]

[HERE FIGURE 2]

[8] In the late 1990s, the number of Swedish counties was reduced to 21 by merging some counties in the southern and western parts of the country.

[9] Geary and Stark (2002). The method was improved by Crafts (2005) and Rosés et al. (2010).

[10] A full description of the methodology and the sources employed for the construction of Swedish regional GDP is available in Enflo et al. (2010). In this working paper, it is also shown that indirect estimates are broadly consistent with the available official estimates of regional GDP in Sweden.

[11] Wages were fixed by collective bargaining in the 1950s and the 1960s. However, this system of wage settlement has little influence on our GDP per capita calculation. The explanation for this is straightforward: if wages are fixed nationally, it took place a short-run displacement of the remuneration of factors. However, in the long-run, the sector/industry/county adjusts to equilibrium wages by creating or destroying employment (above productivity level wages destroy employment and below level wages create employment). Less productive sectors and industries abandon the region, which reduced their overall GDP but increase GDP per capita. This is precisely the kind of adjustment that happened in Sweden during the 1950s and the 1960s (see further section V for a detailed discussion and historical evidence).

[12] Krantz and Schön (2007).

Before entering in a more formal discussion of the results, figure 2 can provide the interested reader with some indication about the evolution of per capita GDPs of Swedish counties in the long run. At first glance, one striking feature of the Swedish data is the relative instability of the regional relative income per capita. The only county that stands as the richest throughout the period is the county of Stockholm, which is situated in the eastern part of Svealand. For example, in 1860, the most developed counties (together with Stockholm) were the county of Göteburg in the western part of Götaland and two counties in Norrland (Västernorrland and Gävleborg). A half-century later, in 1910, Malmöhus, the southernmost county, emerged as one of the richest regions as Norrbotten, the northernmost province and situated above the Polar Circle. Instead, in 1940, Norrbotten, like the rest of the counties of the Norrland, had dramatically lost ground, while the richest counties concentrated in the centre of the country made up a relatively rich belt between the two largest cities, Stockholm and Göteborg. In 1980, both the collapse in regional income inequality and the relative decline of Northern counties are immediately observable. Finally, in 2000, Stockholm and Göteborg re-emerged as the only two counties to maintain a consistent leading position in regional rankings, significantly above the rest of the counties in the country.

[HERE TABLE 2]

In table 2, we offer a more formal discussion of the evidence on ranking instability, which we discussed in the previous paragraph, by considering Spearman's and Pearson's rank correlation coefficients. The value for a Pearson's and Spearman's coefficient can fall between 0 (no correlation) and 1 (perfect correlation) and may have positive and negative values, which indicate an inverse relationship between variable pairs. Although the Spearman's coefficient displays significant values in the shorter-span calculations (but not in the longer-span calculations), both Pearson's and Spearman's coefficients indicated that regional inequality ranks were far from persistent in Sweden (with the exception of the latest period from 1980 to 2000). The typical value is between 0.4 and 0.6, which indicates that, on average, only half of the regions maintained their relative position between the benchmarks.

This rank instability in Sweden's regional income per capita is closely related to the same productive specialisation of the country. Sweden is a small, open economy that is largely dependent on its exports of goods. Consequently, regional fortune and misfortune are sometimes closely associated with exogenous, and habitually unexpected, changes in international demand. This situation is further strengthened by Sweden's historical specialisation in the production of natural resources, which are also

overwhelmingly exported. Therefore, the income of many regions collapses when their natural resources are exhausted and/or when international demand for their export goods declines.[13]

Was this unstable geography of per capita GDP ranks translated into long-run convergence in per capita income? Or, put another way, did this rank instability lead to regional inequality? In principle, the presence of uneven income shocks goes against per capita income convergence across locations because it alters the steady-state growth of the involved locations.[14] However, as we will show below, Sweden's regions converged over the period considered in this article because per capita GDP dispersion across locations decreases (σ-convergence) and because poorer counties tend to grow faster than the richer ones (β-convergence).[15]

[HERE FIGURE 3]

Figure 3 offers evidence about the presence of σ-convergence among the Swedish counties in the long run. We present two different measures of regional inequality: the coefficient of variation (that is, the standard deviation divided by the mean) of GDP per capita and the coefficient of variation of labour productivity (which we measure as GDP per worker). Overall, the level of regional inequality in GDP per capita shrank drastically from 1860 to 2000: the coefficient of variation fell from a value of 0.33 in 1860 to a value of approximately 0.14 in 2000. This figure could also be used to delineate the periods when σ-convergence was more or less intense. With regard to GDP per capita, it is easy to observe four large waves in regional inequality: an initial period from 1860 to 1910, in which regional inequality more than halved (the coefficient of variation declined from a value of 0.33 in 1860 to a value of approximately 0.15 in 1910); the interwar period from 1910 to 1940, in which regional inequality grew without reaching the levels prevalent in the mid-19th century (the coefficient of variation reached a level of 0.20 in 1940); the following 40 years witnessed another substantial decrease in the values of the coefficient, which arrived at a minimum in 1980 (with a value of only 0.07 in 1980); finally, during the last two decades of our series, Sweden's regional inequality has grown, arriving at a value of approximately 0.14 in 2000.[16]

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[13] Henning et al. (2011) present evidence of the importance of exports in oat, timber and iron ore for the regional specialisation and overall evolution of Sweden's economic history.

[14] See Barro and Sala-i-Martin (1992).

[15] Note that Barro and Sala-i-Martin (1992) noted that convergence only occurred in the presence of both σ-convergence and β-convergence.

[16] Note that similar results are obtained with alternative measures of regional income dispersion like the Gini index, the Theil index (population weighted) or the variation of logs. In particular, values of the Gini index were

In broad terms, evidence on labour productivity inequality confirms the statements about GDP per capita inequality in the long run but refines the chronology of regional inequality cycles. The first cycle of downward regional inequality (from 1860 to 1910) was less intense in terms of labour productivity. The following cycle of upward inequality in GDP per capita corresponds with a period of downward inequality in GDP per worker; that is, labour productivity converged from 1910 to 1940. The divergent trajectories of GDP per capita and GDP per worker during this period are likely to be related to the fact that unemployment grew over this period and was highly concentrated in several counties, primarily in rural areas and the Northern part of Sweden.[17] Finally, in the last two periods (1940-1980 and 1980-2000), the evolution of labour productivity inequality parallels that of GDP per capita.

[HERE TABLE 3]

In accordance with this process of decreasing income dispersion, we can also observe in table 3 the presence of β-convergence in the long run. The regressions of β-convergence were made using both the standard OLS-approach à la Barro and Sala-i-Martin and several dynamic panel specifications. In column 1, we present the pooled OLS specification (which includes yearly dummies and considers convergence in 10-year windows). The results are clear: convergence among Swedish regions was intense from 1860 to 2000, with a convergence rate that is significantly higher than the widely observed 2 per cent (the yearly convergence rate was approximately 3 per cent). If one has confidence in the convergence prediction of the Solow model, convergence rates above this 2 per cent figure are only possible when the neo-classical convergence forces (that is, the law of diminishing returns to capital) are accompanied by movements of capital and technology from richer to poorer regions.[18]

In columns 2 to 5, we present the dynamic panel results. Note that with this econometric approach, we relax the assumption of a unique steady state over the entire period; in other words, we test for conditional instead of unconditional convergence. Commonly, convergence rates are faster with these econometric methodologies.[19] Accordingly, we obtain faster convergence rates than with pooled-OLS. Specifically, our results move in a range from 3 per cent with GLS random effects to 9 per cent in

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as follows: 0.17 in 1860, 0.09 in 1910, 0.13 in 1940, 0.04 in 1980 and 0.09 in 2000. Detailed calculations are available upon request from the authors.

[17] Schön (2010), pp. 255-59.

[18] See Barro, Mankiw and Sala-i-Martin (1995).

[19] Islam (1995) has shown that cross-sectional analysis leads to a systematic downward bias in the convergence coefficient. Using panel data to account for these unobservable factors and to make use of the time-specific variations in our panel, we arrive at a slightly different formulation of the convergence concept. Convergence is now regarded as the process of convergence towards the region's own steady state.

GLS fixed effects, which is the favoured specification according to the Hausman test.[20] Two-step GMM produces an annual speed of convergence of 8.8 per cent. We also confirm the hypothesis of β-convergence across Sweden's counties in the long run.

[HERE FIGURE 4]

Nonetheless, as shown in figure 4, the intensity of the β-convergence process varied widely from one period to another and parallels the evolution of σ-convergence (compare evidence from figure 4 with those in the previous figure 3). During the initial period (panel a) and the Golden age period (panel c), regional income convergence was intense, featuring convergence rates of, respectively, 2.6 and 3.9 per cent per year.[21] Instead, convergence stopped during the interwar period (panel b), with a yearly convergence rate of about a half per cent, and reversed during the last 20 years of our database (panel d), with a yearly divergence rate of 2 per cent. The reasons for these differences in the behaviour of regional income convergence from one period to another will be analysed in sections III, IV and V.

II

This section compares the evolution of Sweden's regional inequality with those of other European countries. Figure 5 presents some basic information, the Gini Index, about the dispersion of regional income per capita in Britain, France, Italy, Portugal, Spain and Sweden. This comparison should be read with caution, as different databases may differ in their methodology and coverage.

[HERE FIGURE 5]

At first sight, regional inequality in Sweden was in the European norm in 1860; its level of regional inequality was practically identical to those prevalent in France and Spain (data are not available for other countries). Fifty years later (in 1910), Sweden presented the lowest inequality. More importantly, in all countries considered, regional inequality grew during the second half of the 19th century, except in Sweden. The upsurge of inequality in these European countries during that period has been attributed to the unequal distribution of industrialisation and the development of their national markets.[22] However, Sweden also experienced industrialisation and the construction of its national

[20] This is available from the authors upon request.

[21] Convergence rates have been computed with OLS regressions with robust standard errors, in which the rate of growth between *t* and *t-1* is regressed on the log of GDP per capita at *t-1*.

[22] See Felice (2011) for Italy; Combes et al. (2010) for France; and Rosés et al. (2010) and Martínez-Galarraga et al. (2010) for Spain.

market during the second half of the 19th century.[23] Since then, Sweden has maintained this leadership in regional equality, being the least unequal country in our sample.

[HERE FIGURE 6]

Figure 6 studies the relationship between regional inequality, measured with the Gini index, and GDP per capita, measured in 1990 Geary-Khamis US $. The objective is to investigate whether the Swedish experience with regional inequality is simply a consequence of its higher levels of per capita income. At first sight, Figure 6 supports that regional inequality decreases with economic development, as regional inequality was lower at higher levels of GDP per capita than at lower levels of income.[24] However, the position of Sweden parallels those observed in figure 5; that is, the low inequality levels observed in Sweden do not appear to be a consequence of the country's higher income per capita. At lower levels of development (below 1,800 US $ per capita), the levels of regional inequality prevalent in Sweden were all less extraordinary (in particular, Portugal and Italy had very similar levels of inequality). However, in cases of modern growth, Sweden ranks consistently among the less unequal countries at all levels of GDP per capita.

III

What could account for the convergence in per capita GDP across Swedish regions? In this section, we begin by analysing the demographic side of the problem, and we then explore the determinants of differences in labour productivity, which is the most important source of regional differences in per capita income in Sweden.

A region whose population has above (below) average workforce participation rates[25] or higher (lower) proportion of its population at working age enjoys, *ceteris paribus*, a higher (lower) income when measured in per capita terms. Consequently, regional income inequality should necessarily decrease if

[23] Market integration was boosted by strong improvements in the transportation system, first with the construction of canals in the 1830s (such as the Gota Canal, which linked the Swedish west coast to the Baltic Sea on the east coast) and later with the initiation of railroad construction in 1856.

[24] This was one of the arguments of Williamson's (1965) article.

[25] We measure participation rates as the ratio between employment and the working-age population (population between 15 and 65 years old). In consequence, our restrictive measure does not include, due to data restrictions, those people actively seeking a job.

workforce participation rates and the share of working age population tend to equalise across different locations.[26]

In Sweden, overall participation rates were relatively stable between 1860 and 1910 (they remained at approximately 62 per cent), grew slightly in 1940, arriving at 64 per cent, increased substantially during the following 40 years, reaching 72 per cent in 1980 and declining to 66 per cent in 2000. The path of participation rates is closely related to the expansion of women's participation rates, which mainly occurred between 1940 and 1980.[27] There was a strong correlation between this increasing participation of women in the labour market and the expansion of the public sector. The fact is that women benefited mostly from the expansion of government-financed health care and education, a process that ended in the 1980s.[28] The regional differences in participation rates in Sweden had followed a U-shape curve: the coefficient of variation was 11 per cent in 1860, declining to 7.5 per cent in 1910 and again to 4.5 per cent in 1940 but increasing to 5 per cent in 1980 and to 8 per cent in 2000.

The adjustment in the age structure across regions can be caused by both changes in the birth rates and migrations. The first channel is known in the literature as the demographic dividend or demographic gift.[29] A demographic dividend arises when a falling birth rate changes the age distribution of a population; this means that fewer investments are needed to meet the needs of the youngest age groups and that there are relatively more adults in the population of the productive labour force. In the case of different regions, within the same country, this only happened when the chronology of the demographic transition varied between regions.[30] Migration can also lead to a demographic dividend because the propensity to migrate is higher among young adults, who have higher average participation rates than the rest of the age groups.[31] In the case of Sweden, we had a double process of international and internal migrations. In the case of international migration, regions with higher rate of international migrants had, *ceteris paribus*, lower working-age population rates. In the case of home migrations, regions receiving migrants enjoyed higher working-age population rates than regions sending migrants. For example, in 1910, the county of Stockholm, the main destination of internal migrants, had a working-

[26] For a discussion on the determinants of participation rates, see, for example, Blundell and Macurdy (1999).

[27] See Stanfors (2003) for a description of Swedish women's labor force participation during the 20th century.

[28] Sommestad (1994), Ohlson (1995) and Schön (2010).

[29] See Bloom and Williamson (1998).

[30] Schultz (1985) discusses the regional differences in the demographic transition in Sweden.

[31] See, for example, Hatton and Williamson (1998). However, the massive arrival of migrants may also have led to a migration curse if the new habitants required substantial investments in human capital, housing, infrastructure and so on. See, on this issue, Taylor and Williamson (1994).

age-to-population ratio of 84 per cent, whereas in the rest of the country, this figure was 59 per cent on average.

[HERE FIGURE 7]

Figure 7 presents available evidence on internal and international migration in Sweden. After 1940, Sweden became the net recipient of foreign migrants, making comparisons with the previous period impossible. During the late 19th century, Sweden was one of the largest source countries of emigrants in relation to its population size, only surpassed by Ireland and Norway.[32] Emigration was spatially concentrated to some provinces, mostly in the southern and western parts of Sweden, where labour productivity in agriculture was the lowest compared to other Sweden's counties by the second half of the 19th century.[33] The regional pattern of net internal migration mirrors the emigration pattern well. The same provinces that lost migrants also had the largest internal outmigration rates.[34] International migrations collapsed during the interwar period, mainly as a consequence of the globalisation backlash. Simultaneously, and surprisingly, internal migration also declined dramatically.

In the years following World War II, Sweden experienced an outsized number of internal migrations. This increase in internal migration was also aided by a series of policies implemented by successive governments.[35] Although several counties in all Sweden regions were sending migrants during this period, the counties that had the highest negative migration rates were mostly situated in the Norrland region, which experienced a severe economic crisis due to the failure of its export-oriented industries. In particular, in 1970, the three countries with the largest negative net migration rates were located in Norrland (Jämtland, Norrbotten and Västerbotten). In a sharp contrast, the county that received the largest influx of migrants was Stockholm, which reached a positive influx of 2.85 per cent of its population in 1970.[36] The last thirty years of the series showed a considerable decrease in internal migrations: the rate of net internal migration practically halved from the 1960s to the 1970s (it decreased

[32] Hatton and Williamson (1998).

[33] The highest proportion of emigration is found in six counties (Halland, Värmland, Kronoberg, Älvsborg, Jönköping and Kalmar), which represented 44 per cent of all emigration between 1881 and 1910 but only 28 per cent of the total population. See, Bohlin and Eurenius (2010).

[34] On the contrary, the urbanising counties of Stockholm and Göteborg experienced large immigration rates. However, the northern parts of Sweden also attracted internal migrants. With growing exports in timber and iron ore, and prospects of mass settlement, the counties of the North gained status as Sweden's 'land of the future' and attracted migrants from all over the country. All of these counties enjoyed some of the highest labour productivity levels in agriculture by 1860.

[35] See a more detailed discussion in section IV.

[36] See the footnotes to figure 7 for the sources of this evidence.

from approximately 2.14 per thousand in the 1960s to approximately 1.26 per thousand in the 1970s). The elimination of the previous policies favouring migration and their substitution for a new regional policy is likely to be one of the underlining causes of this phenomenon.[37]

To consider more formally the contribution of demographics and the rest of the factors (mainly output per worker) to regional income inequality, we employ a decomposition of the population-weighted Theil index. Specifically, the Theil index of GDP per capita (x) inequality is decomposed into a population-weighted sum of the inequality indices due to the following: productivity per worker (LP), the participation rate (PR), and the working-age-to-total population rate (WR).[38] Algebraically:

$$T(x,p) = \sum_{i}^{n} p_i log\left(\frac{\mu}{x^i}\right) = \sum_{i}^{n} p_i \left\{log\left(\frac{LP}{LP_i}\right) + log\left(\frac{PR}{PR_i}\right) + log\left(\frac{WR}{WR_i}\right)\right\} \quad (1)$$

where p_i denotes the share of county *i* in the Sweden population, and μ is the Sweden average per capita income. This Theil decomposition is presented in the following table 4:[39]

[HERE TABLE 4]

As we can see, a large portion of the GDP per capita inequality among Swedish counties remains unexplained when one considers solely demographic factors.[40] More specifically, labour productivity explains 85 per cent of the difference in GDP per capita in 1860; practically all the difference in 1910; again 85 per cent in 1940; only 45 per cent in 1980 (when regional inequality was at historically low levels); and 72 per cent in 2000. Consequently, it appears obvious that to understand what caused the evolution of Sweden's regional inequality, we must consider what forces determined labour productivity convergence.

The issue of the regional convergence of GDP per worker (labour productivity) is the subject of an ample literature.[41] First, we present the arguments of growth theory. In the standard Neo-classical

[37] See a more detailed discussion in section IV.

[38] The mathematical development and foundations of this decomposition are available in Duro and Esteban (1998).

[39] It should be noted that this is a decomposition of the Theil index and, as a consequence, any of its components cannot be considered Theil index and accomplish with the properties of this index (for example, they can exhibit negative values).

[40] Obviously, this Theil index of GDP per capita reproduces the trends in Sweden's regional inequality of previous Figure 3; namely, regional inequality decreases by 1910, increases slightly by 1940, decreases again by 1980, and increases thereafter.

[41] Note that sometimes in the literature, GDP per capita and GDP per worker are treated as identical, when this is not necessarily the case (as we have shown above).

Solow model, convergence is caused by the law of diminishing returns to capital. Put simply, the basic argument is that initially capital-scarce regions, which are also the poorest regions, feature higher marginal capital productivity and lower labour productivity. Consequently, they tend to grow faster than capital-abundant regions and thus tend to converge with them in labour productivity.[42] This Solow model also predicts convergence across regions in an open-economy framework. Furthermore, when the movement of production factors occurs across locations, the rate of convergence is higher, as capital flows from richer to poorer regions, where its returns of capital are higher.[43] The new strand of the growth theory, the endogenous growth models, offers an alternative explanation to labour productivity convergence across locations. Departing from the idea that imitation is less costly than innovation, forerunner countries and regions may import innovations from abroad at lower costs. This led to convergence in labour productivity by reducing the technological gap among different regions.[44]

Second, trade theory also offers an explanation for the convergence of labour productivity across regions, particularly when trade increases (for example, during the formation of the national markets). The Neoclassical trade theory (the Heckscher-Ohlin model) argues that regional incomes differ due to differences in factor endowments and relative factor prices.[45] According to one of the main extensions of this model, the factor-prize-equalisation theorem, the increase in trade and factor movements leads to factor price equalisation across regions and hence a convergence in labour productivity.[46] On the other hand, the recent new developments in trade theory, the New Economic Geography, predict not convergence but divergence in labour productivity with increasing market integration. Due to the existence of product differentiation, increasing returns to scale and transport cost production tend to concentrate in a given location, where labour productivity is higher, due to the presence of location externalities.[47]

Finally, convergence across regions may be due to structural change. When resources shift from low-productivity to high-productivity sectors, overall labour productivity increases. Similarly, if poorer regions specialised in low-productivity sectors and richer regions specialised in high-productivity sectors, this structural transformation could lead to regional convergence in labour productivity. Note that this

[42] See, for example, Barro and Sala-i-Martin (1991).

[43] Barro, Mankiw and Sala-i-Martin (1995).

[44] See, for example, Krugman (1979), Barro and Sala-i-Martin (1995) or Howitt (2000).

[45] Flam and Flanders (1991); Slaughter (1997).

[46] However, the standard Heckscher-Ohlin model also enables factor-prize equalisation without income equality when market integration lead to increasing regional specialisation as a consequence of regional differences in factor endowments (Slaughter, 1997).

[47] See Baldwin et al. (2003) and Fujita et al. (1999) for an extensive analysis of this framework.

theory departs from two basic assumptions: first, some sectors are intrinsically more productive than others, and second, labour-market distortions, by limiting the free reallocation of labour across sectors, prevent the full equalisation of productivity across sectors.[48]

To test these alternative explanations of labour productivity convergence, we employ the convergence decomposition proposed by Francesco Caselli and Silvana Tenreyro (2006).[49] Basically, we separate the sources of convergence in three different components: "within-industry convergence", "labour reallocation"; and "between industry convergence".[50] We employ as a benchmark of our estimates the county of Stockholm, which remains the richest throughout the period. In other words, our result indicates the sources of catching-out of the rest of Swedish counties (*i*) towards Stockholm (*sk*). Put simply, our equation is as follows:[51]

$$\text{Convergence in labour productivity}_{i,sk} = \text{Within-industry convergence}_{i,sk} \quad (2)$$

$$+ \text{ labour reallocation}_{i,sk} + \text{between industry convergence}_{i,sk}$$

The "within-industry convergence" captures the labour productivity catch-up of each sector with the corresponding in Stockholm, weighted by the average labour share in that sector. This "within-industry convergence" corresponds roughly to the effect of both Neo-classical convergence and technological catch-up over regional convergence. In a situation of perfect competition and fully employed resources, differences in labour productivity across regions/industries can be attributed to differences in capital-labour ratios (including human capital-labour ratios) and technology differences. Consequently, regions converge when capital-labour ratios tend to equalise[52] and/or when technology flows from richer to poorer regions (that is, from more productive to less productive regions). However, the interpretation of the "within-industry convergence" becomes more complicated when the assumption of perfect competition is relaxed. The fact is that this assumption appears not to be very realistic, given that labour was hardly fully employed in all industries and periods. Therefore, an increase in the amount of working hours per worker in a given county faster than in the county of Stockholm

[48] See Caselli and Tenreyro (2006). An alternative explanation to emulation of productive structures and regional convergence, which does not imply market failure, is furnished by the New Economic Geography model of Krugman (1991).

[49] This is an extension of the method developed in Caselli and Coleman (2001).

[50] An advantage of this method over alternative methods is that it decomposes convergence in three factors while alternative methods like the Theil index only considers two (between and within convergence).

[51] See the appendix for its mathematical development of the convergence decomposition.

[52] Note that the operation of the law of diminishing returns to capital led to the equalisation of capital-labour ratios across locations.

should led to a process of catching-up in labour productivity without any increase in capital-labour ratios and total factor productivity (TFP). Furthermore, our sectors are not homogenous, as they are composed of different industries with different labour productivity levels. Therefore, the replacement of lower- with higher-labour-productivity industries within our sectors, or the movements of labour from the former to the latter, resulted in an increase in the overall "within-industry convergence".

"Labour reallocation" quantifies the part of convergence caused by labour force movements from one sector to another. In this measure, each sector is weighted by its relative productivity. The contribution is positive only when labour is reallocated to the most productive sectors and at least in the same proportion than Stockholm is actually re-allocating its workforce. Obviously, this effect is counterbalanced if Stockholm is reallocating its workers to sectors with higher labour productivity compared to its partners. This "labour reallocation" effect roughly measures the contribution of structural change to regional convergence.

Finally, we present the "between-industry convergence", which measures the contribution to the convergence in productivities across sectors. Interestingly, this may be caused by two different types of forces: a convergence in TFP (technology) levels across industries that tend to equalise relative remunerations and the reduction of market failures in labour markets (as a consequence of structural change) across sectors. [53]

[HERE TABLE 5]

Table 5 decomposes the sources of income per worker (labour productivity) convergence in Sweden from 1860 to 2000. Specifically, column 1 presents the overall rate of convergence (negative values indicate divergence) during the period; column 2 presents the "within-industry convergence", which is separated into the contribution of four sectors (agriculture, industry, services and the public sector) in columns 3 to 6 (which add up to column 2); column 7 presents the quantity of "labour-reallocation"; and column 8 presents the "between-industry convergence". In addition, we consider the sources of convergence up to four different spatial units (the country and its three large regions: Norrland, Götaland and Svealand). It is evident from this table 5 that the two major sources of labour productivity convergence in the long run for Sweden were "labour reallocation" and "between-industry convergence", while "within-industry convergence" played a relatively minor role. In other words, this

[53] As Caselli and Coleman (2001) noted, this third factor had been grossly ignored in the economic literature. However, economic historians have been very interested in a closely related problem: the presence of rural-urban wage differences and their causes. See, for example, Hatton and Williamson (1992), Rosés and Sánchez-Alonso (2004), and Sicsic (1992). Prado (2010, p. 500) documents a pronounced compression of inter-industry wage differentials in Sweden during the 20th century.

result lends strong support to the structural interpretation for regional income differences. Interestingly, this general rule applies to all the Swedish regions. However, Norrland converged significantly less with Stockholm than with the rest of the country. This lower convergence rates cannot be associated with slow labour reallocation or "between-industry convergence", which experienced rates similar to those observed in the rest of the country but with a substantial divergence in "within-industry", particularly in the industrial sectors.

[HERE FIGURE 8]

[HERE TABLE 6]

Figure 8 and Table 6 decompose convergence per worker across Swedish regions in the four main periods of Swedish regional history, which roughly correspond to the different phases of convergence/divergence presented in the previous section I (see Figures 3 and 4). At first sight, readers can observe that convergence/divergence forces varied between periods and sometimes between regions. Therefore, it appears necessary to consider in detail the historical evolution of regional income per worker inequality in Sweden. This is the task of the following two sections: in section IV, we consider this issue for the period 1860 to 1940, when government intervention was limited, and in section V, we analyse the following sixty years, from 1940 to 2000, a period in which government participation in regional economic affairs was critical for regional convergence.

IV

This section considers the causes of regional convergence in GDP per worker from 1860 to 1940, the period in which government intervention was limited, enabling us to conclude that the action of markets led to regional convergence. This period, in turn, can be sub-divided into two periods: an initial period of rapid convergence, which lasted from 1860 to 1910, and a subsequent period, from 1910 to 1940, in which regional convergence rates of GDP per worker slowed.

In the initial period from 1860 to 1910 (table 6, panel a), convergence was caused by "within-industry convergence" and "between-industry convergence", whereas "labour reallocation" played a very minor role in the process. In other words, convergence was mainly caused by technological emulation across regions and reductions in the differences in relative wages across industries. The large contribution in total convergence was in the agricultural "within-industry convergence", which explains an enormous 88 per cent of the total convergence, whereas industrial "within-industry convergence" contributed negatively to this process. The services also contributed positively to the convergence (with

approximately 34 per cent), whereas the contribution of the public sector was relatively small and negative.

What caused this process of agricultural "within-industry convergence"? Swedish agriculture experienced a noteworthy transformation since the 1880s: the intensity of production grew (in particular, the amount of land devoted to fallow declined largely); the output became less seasonal, as the production of dairy products expanded; the workforce became more stable, and the amount of temporary jobs declined; farms became more mechanised and capital-intensive; and family-based agriculture began to replace large-scale production. [54] This process of technological change was accompanied by a substantive reduction in the amount of workers in the more traditional, and less productive, agrarian occupations.

This transfer of workers from less productive to more productive jobs was more pronounced, which led to cross-county labour productivity convergence, in zones with less developed agricultural production. However, labour reallocation not only took place from agriculture to other sectors but also within agriculture. In other words, the redundant rural population moved to different occupations and places. A substantial portion of agricultural workers left the country and migrated to the New World.[55] Another group migrated to the cities, mainly Stockholm, and occupied unskilled jobs in industry and services.[56] Some left the agricultural counties and installed themselves in the expanding forestry sector, which is also part of agriculture.[57] Finally, another group of people did not migrate but changed their agricultural occupation. In this case, there was a transfer of labour within counties from less productive (such as grain production) to more productive agricultural activities (such as the production of butter and milk). [58]

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[54] Schön (2010), pp. 169-73.

[55] Hatton and Williamson (1998).

[56] A series of different straightforward regressions confirm the closest relation between labour productivity growth in agriculture and changes in workforce employment. We have regressed the log of agrarian employment on the log of agrarian labour productivity and the log of agrarian of non-agrarian employment on the log of agrarian labour productivity. These two specifications have been estimated using both random effects (GLS) and fixed effects (OLS). In all occasions, we have obtained the expected results: a negative relation between agrarian labour and agrarian productivity and a positive relation between non-agrarian labour and agrarian productivity. These relations are statistically significant at 99 per cent. For space reasons, regressions are not included here but are available, upon request, from the authors.

[57] Schön (2010), pp. 144-48.

[58] This process of labour reallocation was aided by the increasing competition in foreign grain markets, which shifted relative prices in favour of animal products, which reduced the need for labour. See Staffansson (1995).

The history of services is similar to that of agriculture. The improvement in transport, the further integration of markets, increasing demand, the process of population growth and urbanisation, and wage increases due to emigration benefited backward regions more than they did advanced regions, which had already enjoyed many of these advantages. As a consequence, technology in services tended to converge across Sweden's counties.[59]

The context of industry was quite different from those of agriculture and services because, as we have previously shown, technology diverged across Swedish counties. There are two main reasons for this phenomenon: a process of internal economies of scale in traditional industries and the concentration of the new industries in few locations. International competition, particularly from the crisis of the 1880s, put pressure on iron and steel works. The number of factories decreased, whereas their average size grew to exploit economies of scale and became competitive in foreign markets. In geographical terms, this was translated in a reduction of the number of localisations and the subsequent overall increase in industrial concentration. The new industries of the late 19th century (pulp and paper, chemical and engineering) required more skills and benefited more from Marshallian externalities than the industries of the early 19th century. Furthermore, the availability of electricity liberated the industries from the necessity of being located closed to the sources of energy and were reallocated from the countryside to urban zones, closer to their markets.[60]

What was the role of structural change in this process of regional convergence? As we mentioned earlier, structural change is captured by "labour reallocation" and "between-industry convergence". We observe that "labour reallocation" explained only 3 per cent of total convergence (table 6, panel a, column 7). This result does not imply that a reallocation of labour from agriculture to the rest of the sectors did not occur from 1860 to 1910 (see above). What really happened is that this reallocation was more intense in Stockholm than in the rest of Sweden. In this respect, the evidence is clear: from 1860 to 1910, the share of agricultural employment in overall employment more than halved in Stockholm (from approximately 36 per cent to 17 per cent), whereas it only declined by approximately 30 per cent in the rest of the country (from approximately 73 per cent to approximately 51 per cent). Instead, the "between-industry convergence" explained approximately one fourth of total convergence. In other words, the least productive sectors, mainly agriculture, converged in terms of productivity, and hence wages, with the most productive. Again, this result lends support to our presumption that productivity increases in agriculture and services were closely related to migrations.

[59] According to Schön (2010: 198), in the period from 1890 to 1910, the service sectors that expanded the most rapidly were telecommunications, banking and insurance, post, railway and foreign shipping.

[60] See, on these developments, Schön (2010: 187-190 and 214-219).

The regions of Svealand and Götaland followed the path of convergence described in previous paragraphs, while the experience of Norrland's counties was quite different, as they did not converge with Stockholm but diverged from it. A detailed inspection of the data shows that this divergence was largely due to the enormous divergence of the "within-industry convergence" in industry. The negative evolution of this indicator in Norrland is likely to be due to the rapid expansion of the sawmill industry. This labour-intensive industry was mainly located in Northern Sweden and employed unskilled and seasonal labour, which resulted in lower levels of labour productivity than in other industries.[61]

The progress of GDP per worker convergence slowed in the period from 1910 to 1940 (table 6, panel b), even GDP per capita diverged across Sweden's regions (see previous figure 3), compared with the previous period. The main reason for this finding was a negative value in the "within industry convergence", whereas "labour reallocation" and "between-effect convergence" tended to converge faster than previously. Specifically, divergence occurred only in agriculture and services, whereas industry and the public sector converged (exactly the opposite result from the previous period). This convergence in the industry technology was because human capital became increasingly widespread and infrastructure expanded at the national level, which facilitated the expansion of new industries into smaller communities outside the traditional industrial counties and cities.[62] Instead, labour productivity convergence in agriculture and services slowed because the previous mechanism of productivity convergence had been practically exhausted. Accordingly, internal and abroad migrations decreased largely compared with the previous period (see previous Figure 7).

V

In this section, we analyse the causes of regional convergence in GDP per worker from 1940 to 2000. This phase can be divided into two periods separated for the year 1980. Up to 1980, the spatial convergence in labour productivity was very intense; in fact, this was the period of fastest convergence across Swedish counties, whereas the subsequent period was characterised by an unprecedented process of regional divergence, which, however, did not cancel the convergence gains obtained during the previous forty years. We argue that government policy played a non-negligible role in both the intense process of regional convergence in labour productivity from 1940 to 1980 and the subsequent reversal of the convergence process.

[61] Schön (2010), p. 157.

[62] Schön (2010), p. 218; Berger et al. (2012) document that manufacturing activity in the metropolitan regions went into relative decline from the 1930s and onwards, whereas regions located in other parts of Sweden (mainly in the South) became the most expansive.

The post-war period saw a general faith in government intervention in general and in regional planning policies in particular throughout Western Europe. There was an expressed concern that cities were growing at the expense of more peripheral regions and that government intervention was needed to plan the development and location of industry. In consequence, regional convergence by reducing income disparities among regions emerged as one of the main preoccupations of policy makers. To decrease these regional disparities, governments implemented several measures to facilitate the reallocation of economic activities from the core to regions situated in the periphery. Consequently, typical regional policy measures comprise subsidies to employment, investment, transport and installation in poor areas. In some cases, governments even implemented taxes and regulated prices that incremented the cost of development in core or congested areas.[63]

Sweden was not immune to this expansion of government intervention in the economy. On the contrary, it was one of the first countries to adopt policies based on government activism in the economic realm as a response to the economic crisis of the 1930s.[64] In Sweden, this new policy had two major ingredients: a counter-cyclical fiscal policy[65] and a new welfare state policy as a means of creating greater security for the population. The initial welfare state policy was intensified during the late 1940s and early 1950s with a new agreement between the employers' organization and trade unions.[66] The objective of this new regulation was to compress the wage distribution by increasing the wages of the most poorly paid workers and to promote a system of equal pay for equal jobs. This policy became famously known as the Rehn-Meidner model, named after its initiators, Gösta Rehn and Rudolf Meidner, in 1951. A major consequence of this policy was that lower-productivity firms and sectors, which paid low wages, were driven out of Sweden's economy. In addition, the most competitive firms increased their profits and consequently could expand their output and production. Nevertheless, an undesirable consequence of this intervention into the labour markets was an increase in unemployment and its uneven regional distribution.

Sweden's government also developed a regional policy but, in the European context, its formulation was unusual. Despite the explicit concern of Sweden's government about regional inequalities and especially the decline of the Northern counties, economic growth became the dominant

[63] See Despicht (1970) for an account of regional policy in the UK, France, Italy, Germany and the European Communities in this period.

[64] In this new policy see Landgren (1960), Lewin (1967), Carlson (1988), Ohlsson and Olofsson (1998) and Schön (2010).

[65] To stabilise the economy, government should run deficits during economic downturns to boost demand and should save during booms to prevent overheating and inflation.

[66] See Björklund et al. (1996), Ohlsson and Olofsson (1998) and Schön (2010)(2012).

goal of regional planning. Politicians did not subscribe to the idea that the reallocation of economic activities towards declining areas was the road forward. Instead, an explicit goal of regional policy was to develop industrial locations that ensured the most efficient use of production factors, sometimes at the expense of less productive parts of the country, because it was argued that the concentration of industry was sometimes necessary for the demands of the modern society.[67] An undesirable consequence of this approach to regional policy was to amplify the negative impact of wage compression measures over unemployment in declining regions.[68] To address this severe problem, the government developed two different policies: first, it helped workers to move from one region to another by facilitating information about job vacancies and furnishing them with reallocation subsidies; and second, it trained unemployed workers in new skills that were in greater demand. The active labour market policies to promote a dynamic labour market and encourage the unemployed to move to thriving counties were in their heyday in the 1950s and 1960s. For example, in 1959, a grant was instituted to financially help the unemployed to move to expanding regions (starting assistance grant). A Swedish study reports that an equivalent of 10 per cent of all internal migrations across county borders (24,000 people) received these moving grants in 1970.[69]

Convergence-σ (see Figure 3 and table 4) and convergence-β (see figure 4) accelerated during this period.[70] The main drivers of the increase in convergence were "labour reallocation" and "between-industry convergence" (table 6, panel c), which intensified dramatically during this period.[71] It is not difficult to link the process of labour reallocation to the massive influx of workers from declining regions and industries towards growing industries and regions, which (as we mentioned above) was encouraged by economic policy. Furthermore, the policy of wage compression eliminated the less competitive firms and activities from the market and led to an equalisation of wages across industries; that is, it aided "between-industry convergence".

The social attitudes towards this policy of favouring internal migration began to change from the 1960s. Therefore, in the 1970s, this policy became notoriously unpopular with voters, especially in the

[67] See Government proposition (1964).

[68] In addition, this policy did not generate incentives for migration because that employees and trade unions established a national wage for each occupation. Accordingly, there is a large literature documenting this absence of substantial wage differentials across Sweden's counties. See, for example, Holmlund and Dahlberg (1978).

[69] Axelsson, Löfgren and Nilsson (1983).

[70] As we have already shown in the section II (see Figure 5 and 6), this process of decreasing regional inequality was not exclusive of Sweden since this pattern could be observed in several European countries in the 1950s and the 1960s. However, in comparative terms, the inequality levels of Sweden were lower.

[71] Note the paradoxical negative contribution of the public sector to the "within-industry convergence".

northern parts of the country. For example, the Swedish Labour Board (AMS), which directed some of the regional policies, was given the ironic nickname 'Alla Måste Söderut', (meaning Everybody Must go South), a play on words in which the first letters of the words form the acronym AMS. In 1972, a new government proposition declared that the earlier regional policies and industry localisation decisions had been too heavily influenced by the demands from industry and that the government should have a major role in regional planning.[72] At the same time, the higher GDP growth rates of the 1960s were replaced by the bleaker economic development of the 1970s. Some industrial regions in the Centre and South of Sweden began to encounter structural problems, whereas the formerly problematic Northern counties fared relatively better. Therefore, the established picture of Sweden's regional problem with the North came under dispute, and the government became increasingly passive in favouring internal migrations. Accordingly, the previous figure 7 shows a sharp drop in internal migration during the 1970s.

A new regional policy was implemented in the 1970s. This approach was much in line with the spirit of other European regional policies and consisted mainly of an economic support to industry in declining areas.[73] Government subsidies covered an ample spectrum of activities. Therefore, all firms located in the less developed counties enjoyed lowered Social Security fees, grants for employment and subsidies in transport costs. Furthermore, firms that made new investments and engaged unemployed people in these counties also benefited from localisation subsidies, loans, and different types of development support.[74] In addition to this regional policy, the government chose to reallocate some of its headquarters from Stockholm towards the less developed Swedish counties.[75]

As Sweden entered the European Union in 1995, the focus of the policy shifted from the regional re-distribution of income to regional competitiveness and growth. Despite the introduction of modifications in European Union's regional policy that favoured certain Swedish counties, Sweden not only is a net contributor of structural funds but also has the lowest share of its population living in areas targeted towards regional support in all of the European Union.[76] Nevertheless, European regional

[72] Government Proposition (1972).

[73] The main areas that were supported by this new policy were counties in the north and north-west of Sweden: Jämtland, Norrbotten, Västerbotten, Älvsborg, Gävleborg, Kopparberg, Värmland, and Västernorrland.

[74] See NUTEK (1993) for a summary of the amounts of regional support to industry in support areas from 1975 to 1991.

[75] See Brandth and Westerholm (2006).

[76] Specifically, a sixth objective was also added 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. In Sweden, the county of Jämtland was entirely eligible for these new Europeans funds, and the counties of Norbotten, Västernorrlands, Gävleborgs, Koppabergs and Värmlands were partially eligible. Furthermore, some regions in

policy has affected Swedish regional policy and regional budgets, mainly because much of European support requires co-financing from local agents. By 2000, the European Union contributed to 30 per cent of the total Swedish regional budget.[77]

The change in policy may have been contributed to the drastic decrease in migration rates observable in the period from 1970 to 2000 (see figure 7). This had its correlate in an increasing divergence among Sweden's regions from 1980 to 2000 (see Figure 3 and 4). The causes of the regional divergence were a process of technological differentiation (the "within-industry convergence") and the negative "labour reallocation" (that is, the reallocation of labour towards the most productive industries was more intense in the county of Stockholm than in the rest of the country) whereas, by contrast, "the "between-industry" component continued to push towards convergence (see Table 6, panel d).

This regional convergence backlash is not exclusive to Sweden because in recent decades, many European countries have exhibited similar processes (see figures 5 and 6). This evolution is mainly driven by the growth of metropolitan areas and coincides with structural change towards the service sector and knowledge-intensive industries. A substantial body of literature has forcefully argued that metropolitan areas are the natural location for knowledge-intensive service industries, which have benefited from these areas' economic and social diversity. For this reason, metropolitan areas are considered the new locomotives of economic growth.[78] For Sweden, research has shown the close connexion between economic growth and the resurgence of urban areas since the 1980s. Services and telecom industries, which are mainly located in the three major metropolitan areas of Sweden (the counties of Stockholm, Göteborg and Malmöhus), are the main culprits of this new growth upsurge and regional divergence (see table 5, section d).[79]

VI

In 1860, the various counties composing Sweden exhibited substantial differences in their per capita income, but by 1980, these differences largely vanished. How did this happen? The data suggest that the two critical mechanisms account for Sweden's counties catching-up with Stockholm were, first, a process of catch-up in productivity across sectors and, second, a vast redeployment of workers out of

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Sweden also became eligible for funds under the objective criterion 5b, 'areas experiencing structural difficulties', and between 1995 and 2000, roughly 3,000 5b-projects were engaged. See Gustavsson et al. (2004).

[77] Hanell at al. (2002).

[78] See, among others, Florida (2002) and Glaeser (1994).

[79] Lundquist et al (2008)

agriculture and towards higher-value-added sectors. The sectors receiving these labour flows were more productive because they were presumably characterised by higher human and physical capital intensity and total factor productivity. The Swedish experience in several aspects, particularly the reallocation of labour across sectors, resembles regional convergence in the US, as described by Caselli and Coleman (2001). However, in Sweden, productivity convergence between sectors is overwhelmingly more important than in the US. It may have been that the government's policy contributed to these extraordinary results.

On a closer inspection, the forces for convergence and catching-up varied between periods. In the first period of rapid convergence, 1860-1910, most of Sweden's counties' convergence with Stockholm was caused by the catch-up of labour productivity within the two least productive sectors (agriculture and services). A secondary but not trivial part of Sweden's counties convergence to Stockholm was the compression of between-industry productivity differentials. "Labour reallocation" did not play any role in the process of convergence because the relocation of labour out of agriculture towards more productive sectors was faster in Stockholm than in the rest of the country. However, we show that this "within-industry convergence" was caused by the release of labour from agriculture and services.

In the next period of intense convergence, from 1940 to 1980, structural factors played a central role. Therefore, "labour reallocation" and "between-industry convergence" were the main sources of regional income emulation. Government was also an important player in the evolution of regional fortunes and misfortunes. First, a labour market agreement policy that compressed the wage structure and damaged the least productive industries and firms was established in the 1950s. This policy resulted in a rapid increase in unemployment in certain counties. Second, to respond to the threat created by this upsurge in unemployment, policymakers implemented a series of measures that favoured migration to the thriving regions, which may have caused a sharp acceleration in the process of regional convergence.

What lesson we can learn from Sweden's historical experience in regional inequality? Structural change and labour mobility are the forces behind regional income convergence. In addition, Sweden's regional history shows that policy had a non-negligible role in this process. Obviously, this challenges a long-lasting and abundant literature that advocates the elimination of any type of regional policy.

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APPENDIX: THE DECOMPOSITION OF GDP PER WORKER CONVERGENCE

In this appendix we present the decomposition of GDP per worker convergence in Sweden. As, we mentioned earlier, we follow the methodology of Francesco Caselli and Silvana Tenreyro but adapted to the Swedish situation.[80] Particularly, we use as benchmark of our comparisons the richest spatial unit, here Stockholm, and not the mean observation as they did. Algebraically,

$$LP_t^i = \sum_{j=1}^{J} S_{jt}^i \, LP_{jt}^i \quad (1A)$$

where LP is labour productivity (value-added per worker), S is the share of employment, *i* indexes counties, *j* industries (in this case, agriculture, industry, services and the public sector) and *t* time. In other words, overall labour productivity is a weighted sum of sector's labour productivity with weights given by the share in total employment of each sector. Given that we use Stockholm as the numeraire in our convergence analysis, *i* = *SK*, convergence to Stockholm is equal to:

$$\Delta \frac{LP_t^i - LP_t^{SK}}{LP_t^{SK}} = \frac{LP_t^i - LP_t^{SK}}{LP_t^{SK}} - \frac{LP_{t-1}^i - LP_{t-1}^{SK}}{LP_{t-1}^{SK}} \quad (2A)$$

As Francesco Caselli and Silvana Tenreyro shows, this measure of convergence can be decomposed into three different sources of convergence, namely within-industry, labour reallocation and between-industry. To obtain this decomposition, we begin by adding and subtracting to equation 2A the following term:

$$\sum_{j=1}^{J} S_{jt}^i \, LP_{jt}^{SK} \quad (3A)$$

With this operation, we get the equation 4A:

$$LP_t^i = \sum_{j=1}^{J} S_{jt}^i \left(LP_{jt}^i - LP_{jt}^{SK}\right) + \sum_{j=1}^{J} S_{jt}^i \, LP_{jt}^{SK} \quad (4A)$$

Then:

$$LP_t^i - LP_t^{SK} = \sum_{j=1}^{J} S_{jt}^i \left(LP_{jt}^i - LP_{jt}^{SK}\right) + \sum_{j=1}^{J} (S_{jt}^i - S_{jt}^{SK}) LP_{jt}^{SK} \quad (5A)$$

[80] Caselli and Tenreyro (2006).

$$\frac{LP_t^i - LP_t^{SK}}{LP_t^{SK}} = \sum_{j=1}^{J} S_{jt}^i \left(\frac{LP_{jt}^i - LP_{jt}^{SK}}{LP_t^{SK}} \right) + \sum_{j=1}^{J} (S_{jt}^i - S_{jt}^{SK}) \frac{LP_{jt}^{SK}}{LP_t^{SK}} \quad (6A)$$

If we take first differences and group terms conveniently, we get the expression necessary for our convergence decomposition:

$$\Delta \frac{LP_t^i - LP_t^{SK}}{LP_t^{SK}} = \sum_{j=1}^{J} \bar{S}_{jt}^i \, \Delta \left(\frac{LP_{jt}^i - LP_{jt}^{SK}}{LP_t^{SK}} \right) + \quad (7A)$$

$$+ \sum_{j=1}^{J} \left(\overline{\frac{LP_{jt}^i}{LP_t^{SK}}} \right) \Delta S_{jt}^i - \sum_{j=1}^{J} \left(\overline{\frac{LP_{jt}^{SK}}{LP_t^{SK}}} \right) \Delta S_{jt}^{SK} +$$

$$+ \sum_{j=1}^{J} (\bar{S}_{jt}^i - \bar{S}_{jt}^{SK}) \, \Delta \left(\frac{LP_{jt}^{SK}}{LP_t^{SK}} \right)$$

Note that the first differences and the means are computed, respectively, as:

$$\Delta x_{jt} = x_{jt} - x_{jt-1}$$

$$\bar{x}_{jt}^i = \frac{x_{jt}^i + x_{jt-1}^i}{2}$$

Through the text, we call "Total convergence" the quantity on the left-hand side of equation 7A; "within-industry convergence" is the quantity in the first line of the right-hand side; "Labour reallocation" is the quantity in the second line; and "Between-industry convergence" is the quantity in the third line.

Table 1. *Regional GDP per capita in Sweden, 1860-2000 (Sweden = 1)*

	1860	**1910**	**1940**	**1980**	**2000**
Blekinge	0.83	1.01	0.89	0.99	0.91
Gävleborg	1.19	1.05	0.89	0.99	0.89
Göteborg och Bohus	1.25	1.01	1.22	1.09	1.10
Gotland	0.94	0.97	0.74	0.91	0.72
Halland	0.85	0.87	0.79	0.89	0.75
Jämtland	1.14	0.88	0.83	0.85	0.80
Jönköping	0.75	0.92	0.85	1.03	1.05
Kalmar	0.74	0.83	0.76	0.97	0.86
Kopparberg	0.73	1.03	0.89	0.97	0.90
Kristianstad	0.98	0.97	0.80	0.90	0.89
Kronoberg	0.57	0.80	0.68	1.00	1.02
Malmöhus	0.89	1.27	1.11	1.02	0.91
Norrbotten	0.82	1.15	0.82	0.95	0.87
Skaraborg	0.74	0.84	0.76	0.95	0.92
Södermanland	1.19	0.97	0.95	0.96	0.81
Stockholm	2.19	1.33	1.53	1.11	1.32
Uppsala	1.37	0.91	0.92	0.85	0.77
Värmland	0.86	0.81	0.83	0.96	0.88
Västerbotten	0.84	0.80	0.71	0.94	0.87
Västernorrland	1.14	0.95	0.84	0.96	0.90
Västmanland	1.08	0.92	0.98	1.06	0.98
Älvsborg	0.76	0.79	0.93	0.92	0.91
Örebro	0.77	0.90	1.05	0.91	0.94
Östergötland	1.22	1.03	0.94	0.99	0.92

Sources: Enflo, Henning and Schön (2010).

Table 2. *Rank order correlations across Swedish Counties, 1860-2000*

	1860-1910	**1910-40**	**1940-1980**	**1980-2000**	**1860-2000**
Spearman's coefficient	0.46***	0.52***	0.44***	0.74***	-0.08
Pearson's coefficient	0.58	0.69	0.60	0.82	0.46

Sources: See Table 1.

Notes: The rank order coefficients are computed between initial and final year of the considered interval. ***Indicates signification at 99 per cent.

Table 3. *β-convergence across Swedish Counties, 1860-2000*

	(1) OLS	(2) RE	(3) FE	(4) GMM1	(5) GMM2
B	-0.02***	0.76***	0.54***	0.62***	0.57***
Convergence rate		0.265	0.617	0.485	0.604
Implied yearly rate	0.028	0.030	0.091	0.064	0.088
R^2	0.17	0.990	0.991		
F-test	24.39		3123.22		
Hansens J				0.257	0.257
Hausman X^2		38.14			

Sources: See Table 1.

Notes: See table 1. Number of observation are 336 (N is 24 and T is 14). OLS: it is pooled ordinary least squares with robust standard errors and time dummies. We compute yearly convergence rate following Barro and Sala-i-Martín (1995). RE: it is Random effects. FE: it is fixed effects. GMM1: it is one-step estimates of the general method of moments following Arellano and Bond (1991); and GMM2: it is two-step estimates of the general method of moments following Arellano and Bover (1995) and Blundell and Bond (1998).

Table 4. *Theil Decomposition of GDP per capita, 1860-2000*

	(1) **Theil GDP per capita**	(2)	(3) **Contribution of**	(4)
		Labour Productivity	Participation rates	Working-age rates
1860	0.0500	0.0424	0.0062	0.0014
1910	0.0137	0.0136	-0.0064	0.0065
1940	0.0282	0.0237	0.0036	0.0009
1980	0.0029	0.0013	0.0011	0.0005
2000	0.0155	0.0111	0.0038	0.0006

Sources: See Table 1.

Notes: See text.

Table 5. *Decomposition of convergence in income per worker, 1860-2000*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Overall	**Within industry**					**Labor Reallo-cation**	**Between Industry**
		All sectors	Agricul.	Industry	Services	Public Sector		
Sweden	0.2580	-0.0193	0.0251	-0.0710	0.0436	-0.0170	0.1281	0.1492
Norrland	0.0901	-0.2320	-0.0114	-0.1476	-0.0559	-0.0172	0.1756	0.1466
Götaland	0.2977	0.0307	0.0345	-0.0586	0.0713	-0.0165	0.1226	0.1444
Svealand	0.2387	-0.0520	0.0177	-0.0659	0.0130	-0.0167	0.1262	0.1645

Sources: See Table 1.

Notes: Columns 3, 4, 5 and 6 add up to column 2. Column 2, 7 and 8 add up to column 1. See text and appendix for algebra

Table 6. *Decomposition of convergence in income per worker, 1860-2000*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Overall	**Within industry**					**Labor Reallo-cation**	**Between Industry**
		All sectors	Agricul.	Industry	Services	Public Sector		
a) 1860-1910								
Sweden	0.1320	0.0925	0.1168	-0.0691	0.0451	-0.0004	0.0042	0.0353
Norrland	-0.0056	-0.0448	0.0986	-0.1448	0.0012	0.0002	0.0041	0.0351
Götaland	0.1762	0.1314	0.1224	-0.0518	0.0615	-0.0006	0.0149	0.0298
Svealand	0.0813	0.0366	0.0910	-0.0766	0.0222	0.0000	-0.0049	0.0496
b) 1910-1940								
Sweden	0.0378	-0.0070	-0.0014	0.0052	-0.0122	0.0013	0.0251	0.0198
Norrland	0.0051	-0.0124	-0.0176	0.0210	-0.0174	0.0016	0.0009	0.0167
Götaland	0.0342	-0.0154	-0.0003	-0.0022	-0.0143	0.0014	0.0318	0.0177
Svealand	0.0732	0.0156	0.0061	0.0113	-0.0027	0.0009	0.0302	0.0273
c) 1940-1980								
Sweden	0.2198	0.0257	-0.0145	0.0306	0.0169	-0.0073	0.1305	0.0636
Norrland	0.2488	-0.0077	-0.0225	0.0230	0.0008	-0.0090	0.1812	0.0753
Götaland	0.2096	0.0370	-0.0120	0.0327	0.0233	-0.0070	0.1133	0.0593
Svealand	0.2222	0.0234	-0.0130	0.0311	0.0124	-0.0071	0.1344	0.0645
d) 1980-2000								
Sweden	-0.1317	-0.1022	-0.0025	-0.0291	-0.0493	-0.0213	-0.0406	0.0111
Norrland	-0.1582	-0.1167	-0.0032	-0.0320	-0.0550	-0.0265	-0.0454	0.0040
Götaland	-0.1223	-0.0998	-0.0025	-0.0310	-0.0466	-0.0197	-0.0350	0.0125
Svealand	-0.1380	-0.0970	-0.0022	-0.0199	-0.0531	-0.0217	-0.0535	0.0124

Sources: See Table 1.

Notes: See table 5.

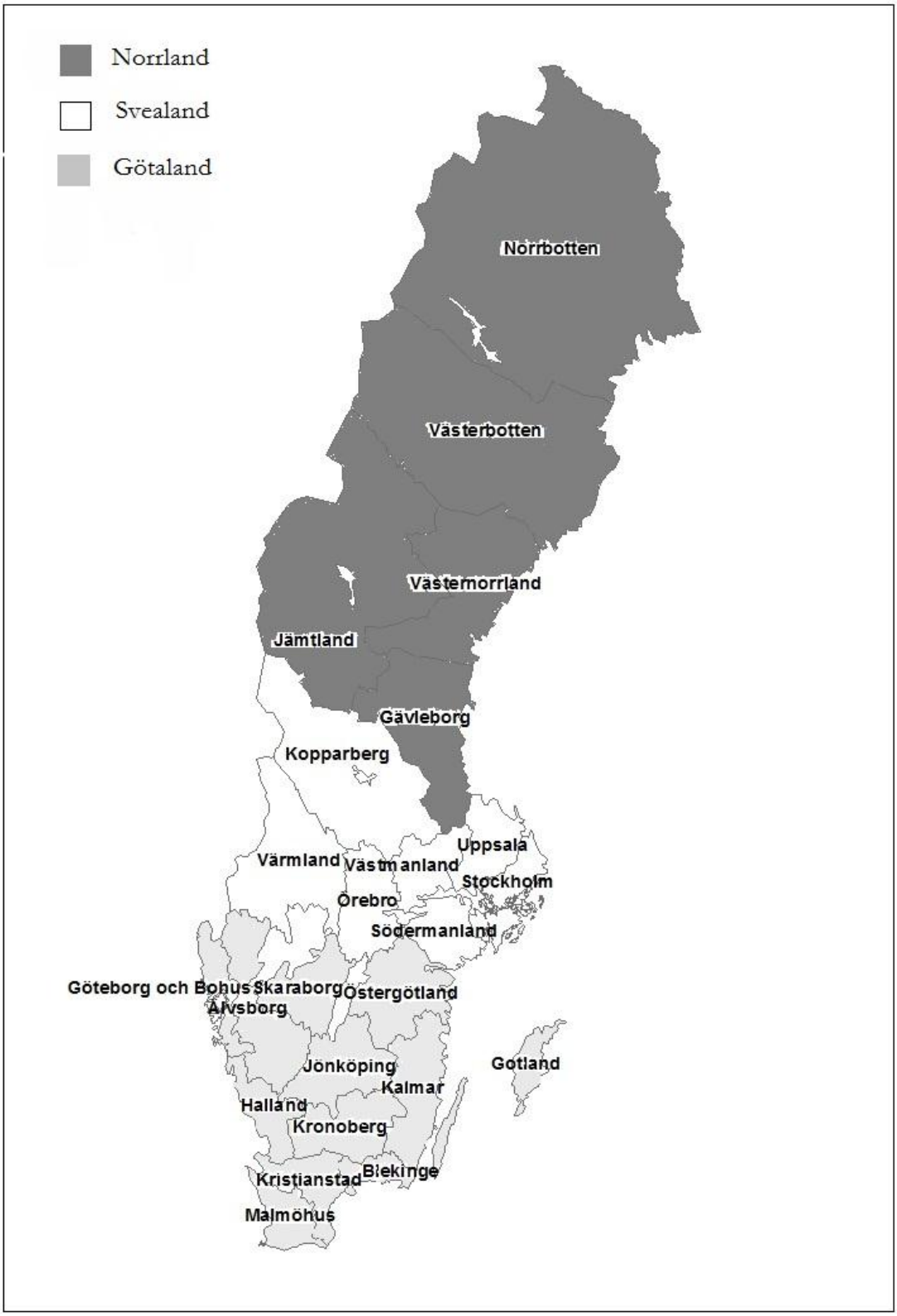

Figure 1. *Sweden's Regions and Counties*

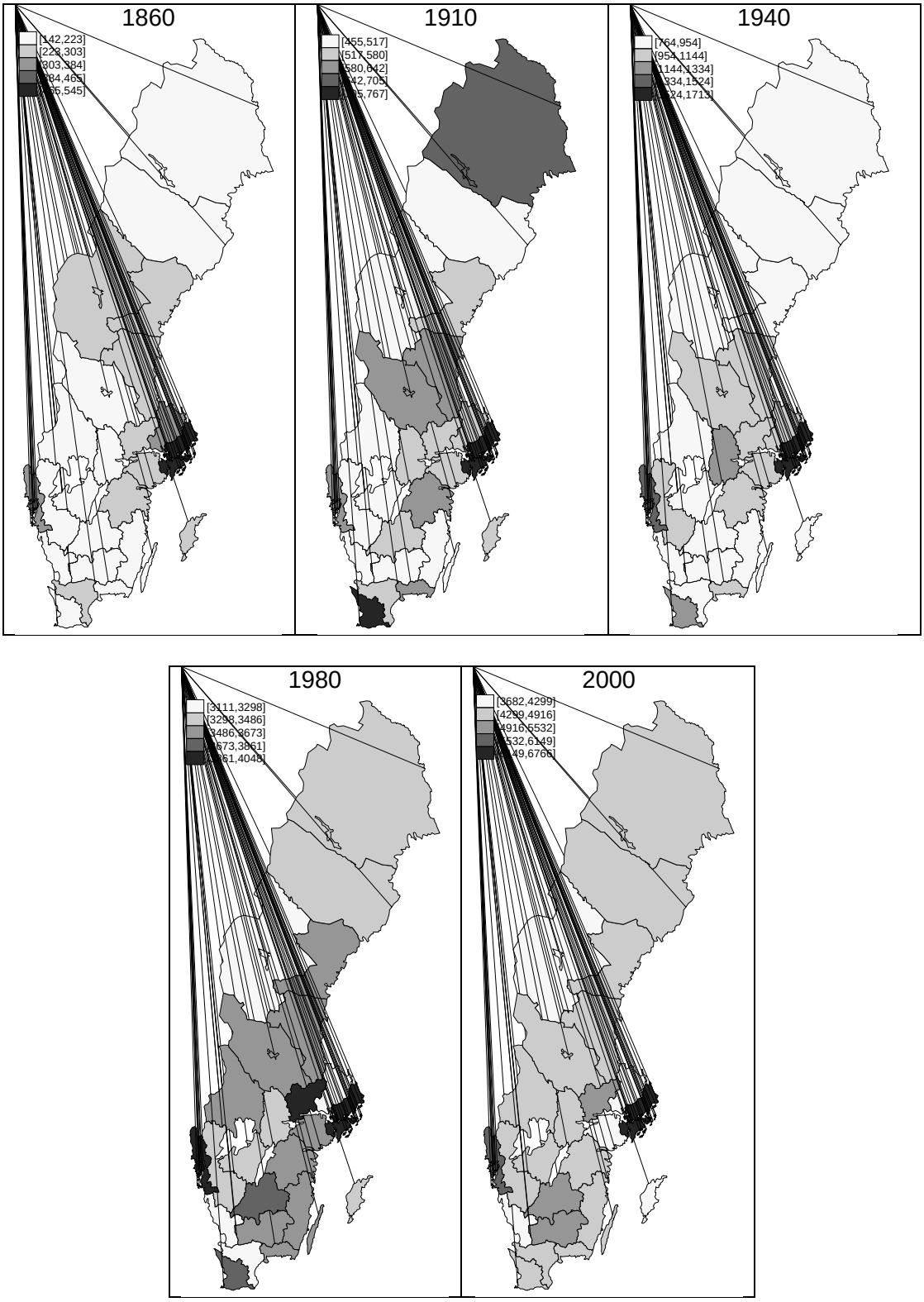

Figure 2. *Regional GDP per capita in Sweden, 1860-2000*

Sources: Enflo, Henning and Schön (2010).

Notes: fixed categories normalized on average (=100): below 70, 70 to 90 per cent, 90 to 110, 110 to 130 and above 130.

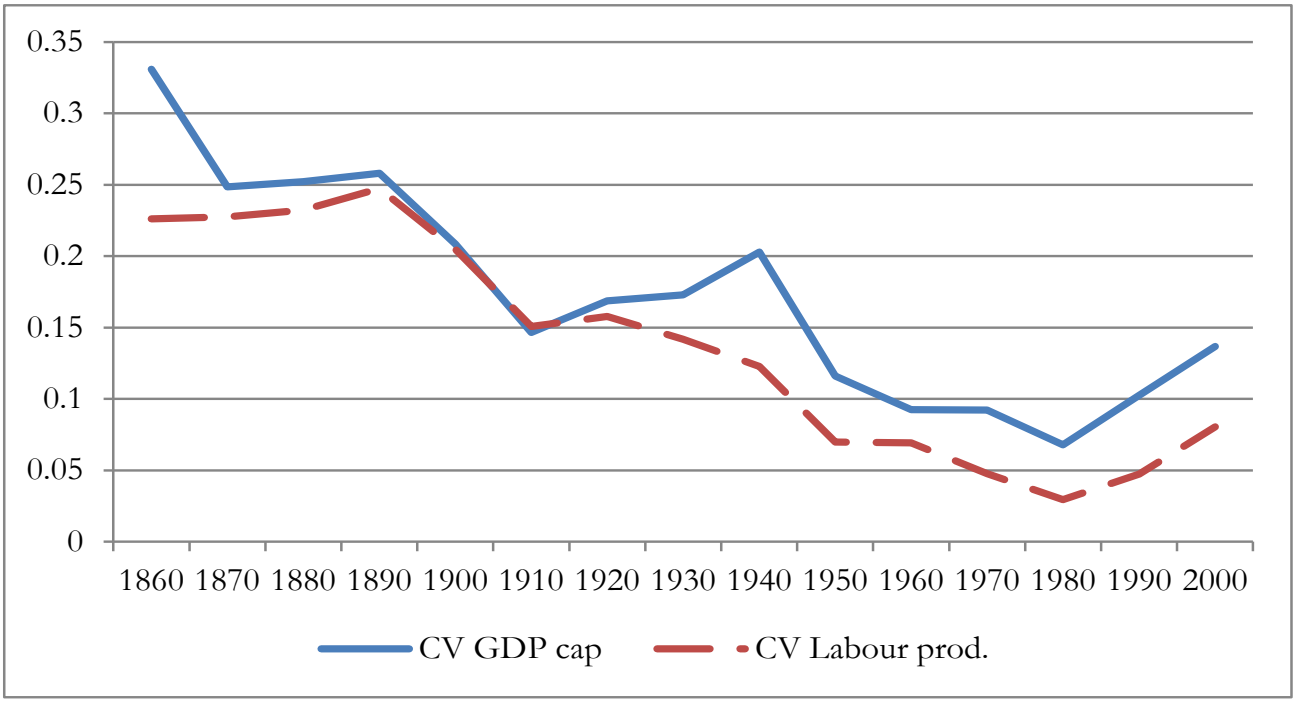

Figure 3. *σ-convergence across Swedish Counties, 1860-2000*

Sources: See Table 1.

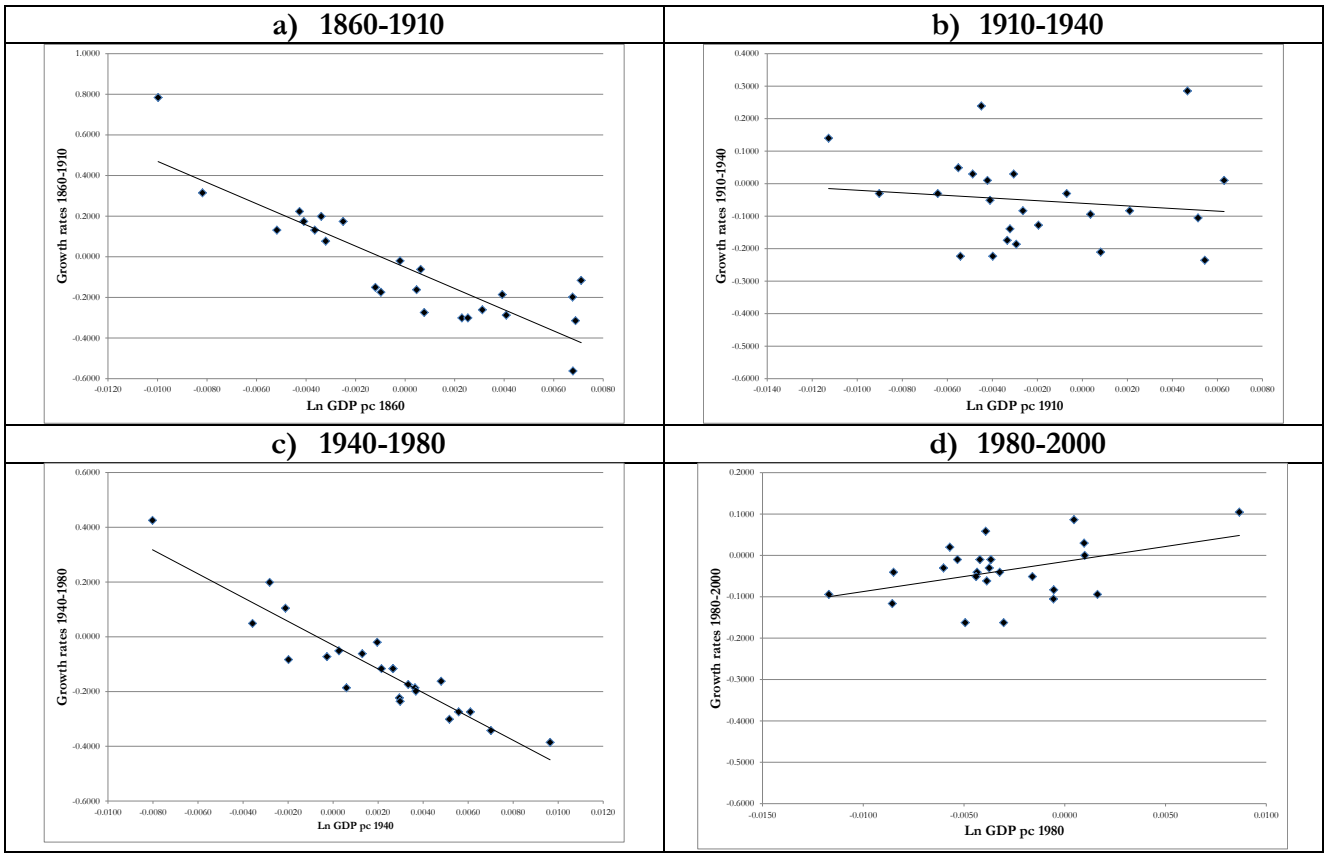

Figure 4. *β-convergence across Swedish Counties, 1860-2000*

Sources: See table 1.

Notes: see text.

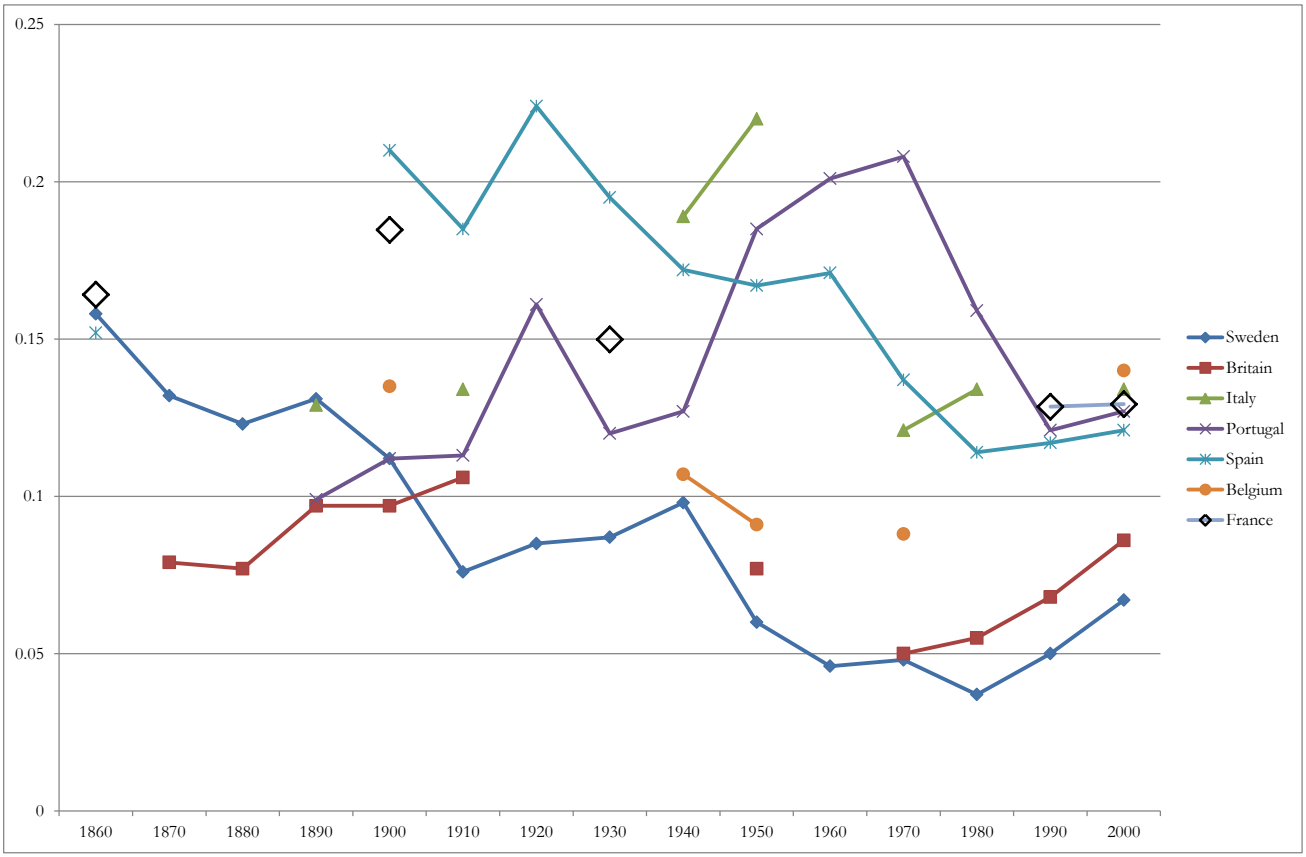

Figure 5. *Sweden's regional inequality in comparative perspective, 1860-2000*

Sources: Crafts (2005) for Britain; Buyst (2009) for Belgium (2011); Felice (2011) for Italy; Combes et al. (2010) for France; Badia-Miró et al. (2012) for Portugal; Rosés et al. (2010) and Martínez-Galarraga et al. (2010) for Spain. See table 1 for Sweden.

Notes: see text.

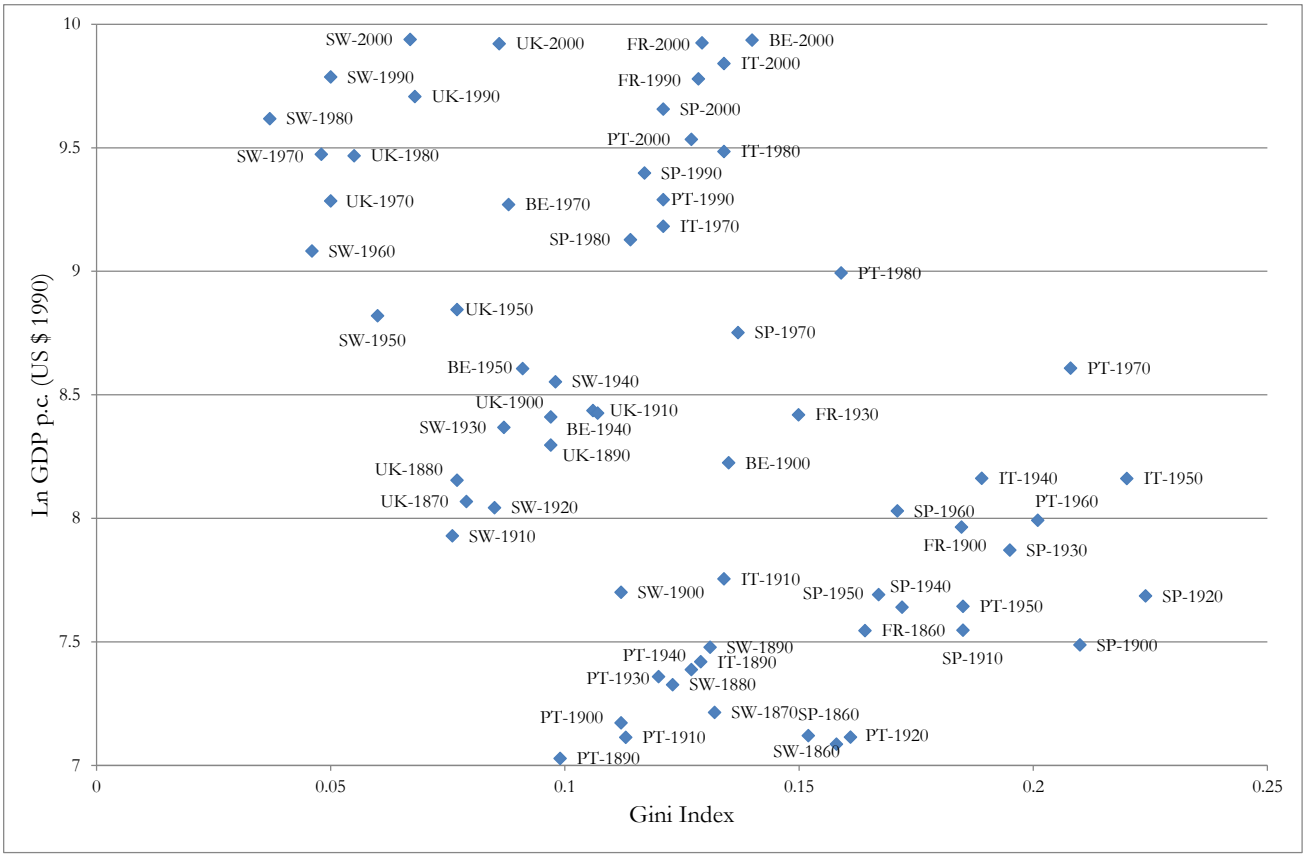

Figure 6. *Relationship between regional inequality and GDP per capita, 1860-2000*

Notes: BE is Belgium; FR is France; IT is Italy; PT is Portugal; SP is Spain; UK is Britain; SW is Sweden.

Sources: See figure 5 and GDP data from Maddison (2009).

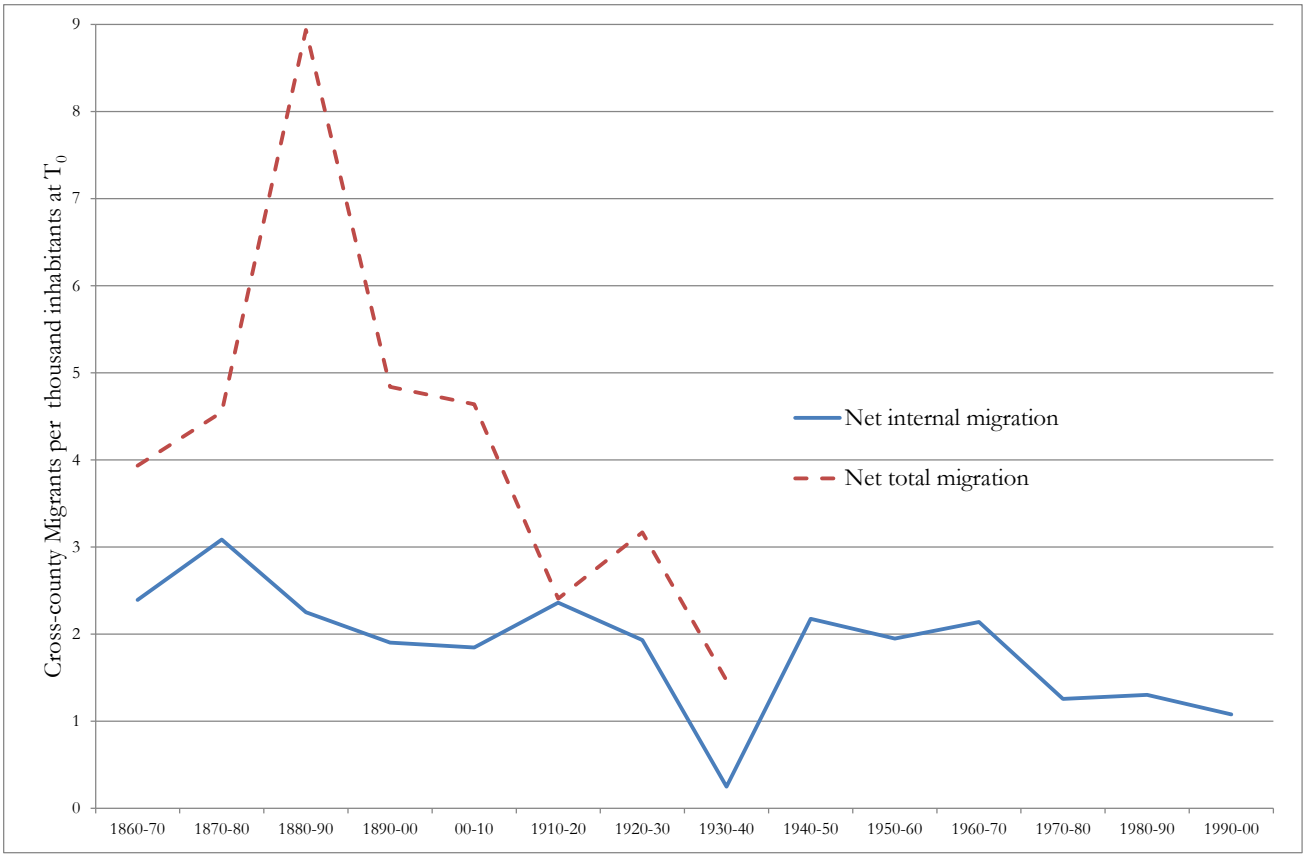

Figure 7. *The evolution of net migration in Swedish counties, 1860-2000*

Notes: Net internal migration is measured as the mean of net cross-county migrants during the considered decade divided by Sweden's inhabitants at the initial year of the decade. Net total migrations add to the previous number the total amount of net Swedish migrants abroad.

Sources: Migrant data is from Hoffsten et al. (1976), and Statistics Sweden (various years).

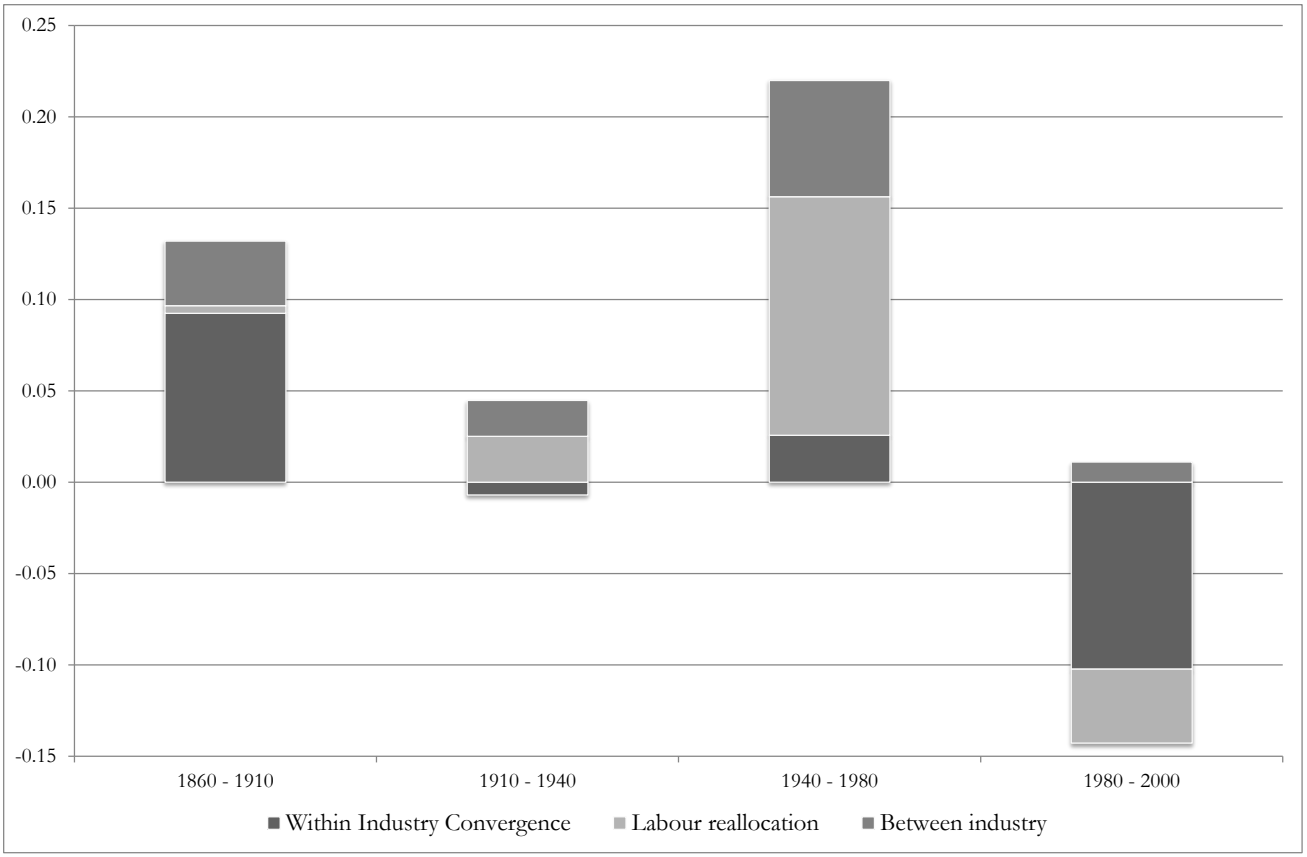

Figure 7. *The decomposition of convergence in income per worker, 1860-2000*
Sources: see table 4.

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