REGIONAL POLICY AND CONVERGENCE OF REAL PER CAPITA INCOME AMONG SWEDISH COUNTIES

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Abstract. This study analyses how regional policy, which was introduced around 1970, has affected regional growth of real per capita incomes in Sweden in the post-war period. The study shows: (a) that real per capita incomes in Swedish counties have converged since 1945, (b) support counties have not grown faster than other counties after 1970, (c) selective regional policy supports, which constitute an important part of Swedish regional policy, do not affect the regional growth rates, and (d) government expenditures seem to affect the regional growth of real per capita incomes negatively.

1. INTRODUCTION

To increase growth of real per capita income in poorer regions, governments all over the world grant different types of support to industry in backward regions.[1] To motivate the subsidies, it is often argued that the government must intervene, because in a market economy, firms tend to invest more in central regions than in the periphery, and as a consequence, regional inequalities tend to increase over time.[2]

The purpose of this paper is to examine regional growth in Sweden and the role of regional policy there. We are interested both in whether this government policy has been motivated or not (does per capita income per capita among Swedish regions really tend to diverge over time?) and in the effects of regional policy. We focus on Sweden for two reasons. Detailed studies of the effects of Swedish regional policy subsidies indicate that these instruments have been relatively inefficient[3], and therefore a study that examines whether or not an important long-term objective of regional policy has been reached, seems to be motivated. Second, because different regional policies that have been employed in Sweden for a long time are now also becoming increasingly important in the EU, studies of the Swedish experiences can yield some information that might be useful for EU policy makers.

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[1] In 1994 the EU granted 26 Billion ECU via the structural funds (see EU, 1995a, and Jones, 1996). In addition to the structural funds, the European Commission reports that in 12 European countries in 1992 about 94 Billion ECU were transferred nationally to industry (see EU, 1995b). These supports can to a large extent be considered as regional policy aid.

[2] For example, the European Investment Bank claims, "At times of weak economic performance there would, without corrective mechanisms, be a tendency for capital investment and hence growth and employment within a unified economic area to gravitate largely towards the most prosperous regions. This is relevant to Europe, where two thirds of the regions accounting for 50% of its population still have a below-average per capita product. … That is why, in accordance with its primary remit, the EIB devotes on average more than two thirds of its financing to the development of regions facing structural or industrial redevelopment problems. Such operations interlink with grants from the Structural Funds managed by the European Commission in a mutually reinforcing way." (From the homepage of the European Investment Bank, http://www.eib.org/obj/dev.htm, 1 August, 1997).

[3] For example, Bohm & Lind (1988) find that regional policy subsidies do not affect employment in the targeted regions and firms.

Our empirical analysis focuses on both gross convergence (or σ-convergence) and explained convergence (or β-convergence) of average real per capita income across Swedish counties (see Baumol, Nelson & Wolff, 1994, Sala-i-Martin, 1996, and Section 3 below for methods). To examine what role regional policy has played in this process, we first check for other factors that might affect the process of convergence, and then test whether real per capita income in the supported counties has grown faster than real per capita income in the non-supported counties. In addition, we evaluate how selective regional policy instruments, which constitute an important part of Swedish regional policy, and the regional allocation of general public expenditures have affected the rate of convergence among counties.

The remainder of the paper is organised as follows. Section 2 gives a background of the idea of convergence of real per capita income among regions and the role of regional policy, along with a short presentation of Swedish regional policy. The data set, how to examine convergence, and how to assess the role of regional policy are discussed in Section 3. Section 4 presents the empirical results, and Section 5 summarises and concludes.

2. BACKGROUND

2.1 CONVERGENCE AND REGIONAL POLICY

In the literature on regional economics, one line of research argues that various forms of market failure give rise to persistent (and even increasing) differences in per capita income (and output) between regions (see e.g. Krugman, 1991). For example, economies of scale and location advantages associated with easy access to large markets, skilled labour and technological knowledge, in combination with migration of the most highly skilled members of the labour force from the lagging regions, might lead to growing polarisation between different regions. By granting e.g. subsidies to firms located in the backward regions or to firms which relocate to the backward regions, the government can affect regional growth rates in two ways. First, via an increase of investments and/or an increase of labour, and second, via an increase of productivity. The

latter effect might occur if the subsidies, for example, help the firms to advance their technological development and/or help them to better utilise economies of scale.

However, it is not clear whether regions tend to diverge in per capita income over time. The neo-classical prediction is that poorer countries and regions, per capita income should grow faster than richer in areas (the so called convergence hypothesis). Migration of labour with low human capital from poor to rich regions tends to increase wages in regions of departure, and vice versa in regions of destination.[4] Furthermore, increased demand for imports, the diffusion of technology, and diseconomies of location associated with over-congestion in rapidly growing centres might give rise to spread effects which peripheral regions might benefit from. That is to say, regions would then tend to converge over time.[5]

Empirically, it looks as though poorer regions grow faster than richer ones. Several studies have found that in the industrialised part of the world, GDPs per capita tend to converge, i.e. dispersion among economies decreases over time. For example, Sala-i-Martin (1996) found that in the US, the dispersion of real per capita income between states dropped during the 20th century. Similar results have been reported for European regions and for Japanese regions (see Sala-i-Martin, 1996, Armstrong, 1995, and Neven & Gouyette, 1995). Persson (1997) also found that real per capita income in Swedish counties has converged since the 1910s.

The fact that regions seem to converge, rather than diverge, suggests that forces which lead to convergence are stronger than forces that lead to divergence. But it might also suggest that different regional policies have been successful in the sense that, for example, they have hindered the migration of highly productive workers, improved the human capital of the workforce, and led to an increase of productive investments in the targeted regions. A study of the impact of the European regional development fund (ERDF) and of public investment in infrastructure and education on income levels across Spanish regions by de la Fuente and Vives (1995) gives some support for this idea. However, several other studies conclude that regional policies are inefficient. For example, Faini argues that despite massive regional policy supports,

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[4] See e.g. Barro & Sala-i-Martin (1995, Chs. 1 and 9).

Mezzagiorno in the south of Italy is still a relatively backward region of Europe.[6] Sala-i-Martin (1996) finds that government expenditures are not correlated with the overall process of regional convergence either in Europe or in the US. Fagerberg & Verspagen (1996) find that EU support for R&D in the 1980s seems to be ineffective in the sense that the policies do not explain the rate of regional growth. In a study by the EU, firms in declining regions and in control regions in six Member States were asked to rank the importance of regional policy as a factor affecting a region's competitiveness for the location of firms. The study showed that the firms (in most regions) considered the regional incentives to be relatively unimportant compared to other factors (see Armstrong et al, 1997).

There are several possible explanations for why regional policies might turn out to be ineffective. Resources might be allocated sub-optimally, because bureaucrats as well as political decision makers do not have enough information to allocate resources efficiently (see Lavoie, 1985). Hillman (1982), Burton (1983), and Magee (1997) argue that firms with economic problems are more likely to be successful in the political decision process, and as a consequence, public interventions (regulations and different types of subsidy) tend to slow down the process of structural adjustment.[7] Moreover, because the existence of directly unproductive activities, such as lobbying, are positively related to the size of the government transfers, potential recipients of subsidies will have an incentive to invest in unproductive rent-seeking activities instead of more productive activities like R&D (see e.g. Baumol, 1990, and Tollison, 1997). A related problem with subsidisation is that it might make firms less productive in the sense that given inputs become less efficiently used, i.e. technical (X-) inefficiencies occur. One possible explanation for why X-inefficiencies might occur is if the subsidies help the supported firms to avoid bankruptcy. Because the subsidies give the firms extra "breathing-space", they are not forced to re-organise their activities and

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[5] See e.g. Tsoukalis (1993) for a further discussion about divergence and convergence among regions.
[6] See discussion in de la Fuente & Vives (1995).
[7] Olson (1982, pp. 63) argues: "Special-interest groups also slow growth by reducing the rate at which resources are reallocated from one activity or industry to another in response to new technologies or conditions. One obvious way in which they do so is by lobbying for bail-outs of failing firms, thereby delaying or preventing the shift of resources to areas where they would have a greater productivity"

improve their performance to the same extent as non-supported firms, which have severe economic problems.[8]

Different types of support might also counteract each other. For example, in Sweden different types of employment support give firms in the support areas an incentive to substitute labour for capital, while the localisation support, which is above all a capital support, gives the firms an incentive to substitute capital for labour. The supports might also be too small to affect the overall development in a targeted region. Finally, direct regional policy supports might be relatively small compared with total government expenditures, and total government expenditures might affect regional growth negatively.[9]

2.2 REGIONAL POLICY IN SWEDEN

In the 1960s, a lot of people migrated from the northern parts of Sweden to the south. To mitigate this development to some extent and to make it possible for more people to live and work in the northern regions, the Social Democratic government decided to try to create new jobs more actively and to modernise industry in the northern regions.[10] To reach this objective, a regional policy program was introduced in the second half of the 1960s. Since then, an important part of regional policy has consisted of different types of support that have been granted to industry in the support areas.[11]

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[8] Schmidt (1991) shows, among other things, that the managements of firms that are more likely to be liquidated have an incentive to work harder for cost reductions in order to avoid liquidation. See also Burton (1983, p.44) for a discussion along these lines. Similarly Dahmén (1998) argues that if a firm's profits and liquidity improve "It cannot be ruled out that efforts expended on finding ways to something new can seem less urgent, and those measures which the transformation pressure calls forth are postponed", (p.70).

[9] Government expenditures might have growth enhancing effects if they help to correct market failure problems such as collective goods and externalities. However, the distortionary effects of taxation and the risk that public low-productive activities crowd out more productive private investments might affect growth negatively. Empirically, it seems as if government consumption, especially among rich countries, influences economic growth negatively, see e.g. Barro (1996) and Fölster & Henrekson (1998).

[10] This section is based primarily on SOU 1984:74, SOU 1996:69, SFS 1990:642 and NUTEK 1993:43 and 44.

[11] See NUTEK 1993:43 for a description of the support areas, and Figure A1 in the Appendix.

Basically, two types of support are granted. The general ones (e.g. lowered employer fees, employment supports, and transport support) are granted to all firms in the support areas. The other types of support are the selective ones (e.g. localisation subsidies and loans, and different types of development support) which firms must apply for.[12] In order to receive several of these supports, firms must invest in machines and buildings and promise to increase the number of employees.[13]

The support areas are divided into three types. Support areas 1 and 2 basically consist of counties in the north and north-west of Sweden, while the third category, the temporary support areas, primarily consists of some areas along the coast of Norrland in the north and some areas in the south of Sweden. In addition to this there is the so called transport-support area, which covers the northern parts of Sweden (see NUTEK 1993:43).

Table 1 reports the use of regional policy support between 1975 and 1991. Since 1975, about 23.3 billion SEK (1994 prices) have been transferred as direct grants to firms and an additional 13.5 billion as favourable loans. The table also suggests that regional policy has become increasingly important since the 1970s. Table 2 reports the allocation of supports across the support areas. Most direct grants have been granted to support area 1.

Table 1. Regional policy support to industry 1975-1991. M.SEK (1994 prices)

	Selective supports			General supports				
	Localisation loan	Localisation support	Developm. support	Empl. support	Lowered employer fees	Transport support	Total[a]	Annually[a]
1975-81	10,596	2,718	84	1,230	0	2,132	6,164	881
1982-91	2,894	6,552	1,056	2,104	4,381	3,044	17,136	1,714
Sum	13,490	9,270	1,140	3,334	4,381	5,176	23,299	1,371

[a] Localisation loans excluded.
Source: NUTEK 1993:43

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[12] See SOU 1996:69 and NUTEK 1993:43 for more detailed descriptions of the different types of support that are granted to industry in the support areas.
[13] See NUTEK 1993:43.

Table 2. Geographical dispersion of regional supports. M.SEK (1994 prices)[a]

	Support area 1	Support area 2	Temporary support area	Outside	Total	Annual
1975-81	1,709	1,664	758	2,032	6,164	881
1982-91	5,970	3,787	1,428	5,950	17,136	1,714
sum	7,680	5,451	2,186	7,982	23,299	1,371

[a] Localisation loans excluded.
Source: NUTEK 1993:43.

In addition to the regional policy supports, the allocation of central government expenditures is re-distributive between support areas and non-support areas. Table 3 reports the allocation of *all* central government expenditures between support areas and non-support areas for one fiscal year. Per capita expenditures are higher in support area 1 than in the other areas. For support areas 2 and 3, per capita expenditures are less than in the non-support areas and in support area 1.[14]

Table 3. Allocation of all government expenditures in 1985 (1994 Prices)

Area[a]	Total (M.SEK)	Per capita (SEK)
Non-support areas	382,412	66,092
Support area 1	52,575	81,924
Support area 2	93,383	60,589
Support area 3	24,332	62,527
Total	552,702	66,127

Source: SOU 1989:65, Encl. 1. Table 3 and own calculations.
[a] Support area 1 consists of the the following counties: Jämtland, Norrbotten and Västerbotten. Support area 2 consists of Älvsborg, Gävleborg, Kopparberg, Värmland and Västernorrland. Support area 3 consists of the counties of Blekinge and Kalmar (see NUTEK 1993:43 for a detailed description of the support areas).

3. DOES REGIONAL POLICY IN SWEDEN WORK?

3.1 THE EMPIRICAL FRAMEWORK

As Baumol, Nelson & Wolff (1994) discuss, the concept of convergence has been used to mean different things. The focus of this paper is on two concepts: gross convergence and explained convergence. Gross (or

unconditional) convergence means that if the coefficient of variation for some variable (e.g. real per capita income) decreases over time, then the studied regions have converged. If per capita income in all regions has increased, then convergence, in this sense, means that the poorer ones have grown faster than the initially richer ones. In effect, this concept describes how the income dispersion among regions evolves over time.

To study gross convergence of real per capita income among regions empirically, the standard deviation of the log of real per capita income among regions for various years can be used (see Sala-i-Martin, 1996). If the standard deviation is used, gross convergence is also called σ-convergence.

Because gross convergence is the result of several factors, it is not an especially good measure to use if one wants to examine the regional growth effects of specific policies. The policies examined might have led to faster gross convergence, but might also have hindered gross convergence. Therefore, a better concept for this purpose is β-convergence (or explained convergence or conditional convergence). β-convergence measures if poor regions grow faster than richer ones, keeping all other relevant variables constant. That is to say, one tries to isolate the influence that different factors might have on the process of convergence among regions. To examine β-convergence, Sala-i-Martin (1996) suggests that the following non-linear model should be estimated,[15]

$$\frac{1}{T}\log\left(\frac{y_{i,t}}{y_{i,t-T}}\right) = a - \left(\frac{1-e^{-\beta \cdot T}}{T}\right) \cdot \log(y_{i,t-T}) + \text{ "other variables" } + u_i$$

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[14] See also NUTEK (1994) for a similar description of the overall allocation of government expenditures among counties for the fiscal year of 1991-92.

[15] The model that we use and similar ones have been used in several studies to examine convergence across countries and regions and to examine factors that affect the process of convergence. An advantage of this model is that it can be related to the transitional growth process in a neoclassical model, see e.g. Barro & Sala-i-Martin (1991, 1995). However, other models are also possible. For example, given that countries and regions do not have a steady state growth path, an alternative approach is to estimate convergence as a Markov process, see Neven & Gouyette (1995).

where $y_{i,t}$ is real per capita income in region i at time t, T is the length of the interval, a is the intercept, β is the rate of convergence parameter, and u_i is the disturbance term. If regions with initially lower real per capita income, $y_{i,t-T}$, grow faster than regions with higher real per capita income, then $\beta > 0$. The non-linear expression reflects the fact that if there is convergence, poorer regions grow faster than richer ones.

The inclusion of "other variables" in the expression above recognises that variables other than the relative backwardness of regions can help to explain the process of convergence. Several studies include measures of the relative proportion of employees in agriculture and in industry to control for sectoral shocks that affect the process of growth (see e.g. Sala-i-Martin, 1996, Fagerberg & Verspagen, 1996, and Armstrong, 1995). If labour is mobile, migration of labour with low human capital from poor to rich counties, and vice versa, tends to speed up the process of convergence. To control for this effect several studies include measures of net migration (see e.g. Persson, 1997, and Barro & Sala-i-Martin, 1991).

The inclusion of other variables can also be used to examine whether different policy variables influence the process of convergence. For example, Fagerberg & Verspagen (1996) include measures of EU-sponsored R&D projects. Others include, for example, measures of public spending on education, foreign exchange distortions and measures of political stability (see Barro & Sala-i-Martin, 1995).

3.2 CONVERGENCE OF REAL PER CAPITA INCOME AMONG SWEDISH COUNTIES

To examine income convergence among Swedish regions, data on real per capita income for 24 Swedish counties for the years 1945, 1970, and 1990 are used. The development during the whole post-war period is examined because income convergence is a relatively slow process. The period examined has been split into two sub-periods, because we want to examine if active regional policy, which was introduced at the end of the 1960s and in the early 1970s, affects the process of convergence after 1970 (see below for a further discussion). Because the income data that are used do not include taxable transfers for 1945 and

1970, but include taxable transfers for the 1990 observation, the 1990 observation is biased. An important part of the taxable transfers consists of unemployment benefits. In 1990 unemployment was low in the whole country and consequently the taxable transfers did not have any major effect on the income measure. Although the choice of 1990 as the final year to a large extent solves the problem with unemployment benefits, the measure is not perfect, because pension benefits are included. If the support counties, for example, get more pensioners over time, then the measure will be biased. The national consumer price index has been employed to deflate GDP/capita.[16] See Appendix Table A1 for a detailed description of the data.

To control for sectoral shocks that affect growth in the short run, we follow Sala-i-Martin (1996) and include measures of the relative proportions of employees in agriculture and in industry for various years (AGR45, AGR70, IND45, and IND70). Another variable which might affect the process of convergence and which has been discussed in the literature is migration across regions (see Barro & Sala-i-Martin, 1995, Ch. 9). To control for effects of migration, measures of the average annual net migration rate into county i between time t-T and t are included (MIGR4570 and MIGR7090).

To test if the support counties have grown faster than they would have done if they had not been defined as support areas is a counterfactual problem. To solve this problem one would, ideally, have liked to construct an experiment where similar supported and non-supported counties were compared. Unfortunately, this type of experiment is almost impossible to set up, and instead another approach has been chosen.

First, to examine whether support areas have grown faster after regional policy became an important policy instrument around 1970, and also to test whether other types of measures that the government has used to affect regional growth rates have had an effect, a dummy variable has been included. The dummy takes on

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[16] Persson (1997), who has examined convergence among Swedish counties between 1906 and 1993, has employed both national and regional consumer price indices. His choice of price index does not affect his results.

the value one for counties which belong to a support area and zero otherwise. The counties which have

been defined as support counties are shown in Figure A1 in the Appendix.[17]

To test if the support counties have grown faster or slower than other counties after an active regional

policy program was introduced, i.e. after about 1970, one model is estimated for the period 1945 to 1970,

model 1a, and one model for the period 1970 to 1990, model 1b.[18]

$$\frac{1}{25}\log\left(\frac{\text{INC70}_i}{\text{INC45}_i}\right) = a - \left(\frac{1-e^{-\beta \cdot 25}}{25}\right) \cdot \log(\text{INC45}_i) + \delta_1 \cdot \text{AGR45}_i + \delta_2 \cdot \text{IND45}_i + \tag{1a}$$

$$+ \delta_3 \cdot \text{MIGR4570} + \gamma_1 \cdot \text{AREA}_i + u_i$$

$$\frac{1}{20}\log\left(\frac{\text{INC90}_i}{\text{INC70}_i}\right) = a - \left(\frac{1-e^{-\beta \cdot 20}}{20}\right) \cdot \log(\text{INC70}_i) + \delta_1 \cdot \text{AGR70}_i + \delta_2 \cdot \text{IND70}_i + \tag{1b}$$

$$+ \delta_3 \cdot \text{MIGR7090} + \phi_1 \cdot \text{AREA}_i + u_i$$

If the AREA stability hypothesis, $H_0 : \phi_1 = \gamma_1$, is rejected this implies that the support counties have,

ceteris paribus, followed a different growth path than the non-support counties. For instance, if $\phi_1 > \gamma_1$ this

implies that support counties have grown faster than other counties after 1970 and that it is probable that

regional policies have had a positive effect. A potential problem with the hypothesis is that it tests if there

are any changes in the absolute rate of economic growth between support and non-support counties before

and after the regional policy program was introduced. If the average rate of growth is 15 percent in the first

period and only 1 percent in the second period, then the hypothesis will not be rejected if e.g. the support

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[17] Because the support areas do not perfectly overlap the counties, some areas which do not belong to any of the support areas have been defined as support areas and vice versa, see Figure A1 in the Appendix. Counties which belong or have belonged to the temporary support areas are considered as non-support counties. Defining them as support counties would not alter the qualitative results of the present study.

[18] Because the error terms of the regressions might be related (a long lasting shock in the first period might affect growth in the following period), the regressions are estimated using the SUR technique. The SUR

counties grow 3% faster than the non-support counties both between 1945 and 1970 and between 1970 and 1990, although a 3% higher rate of economic growth is a relatively much higher growth rate in the latter period. However, as the results of the estimations will show, this is probably a minor problem.

Second, to assess whether the selective capital supports (direct subsidies and subsidised loans), which constitute an important part of regional policy, have had any effect on regional growth rates of real per capita income between 1970 and 1990 and to test how the regional allocation of total public expenditures affects regional growth rates, the following model is estimated.

$$
\frac{1}{20}\log\left(\frac{\text{INC90}_i}{\text{INC70}_i}\right) = a - \left(\frac{1-e^{-\beta \cdot 20}}{20}\right) \cdot \log(\text{INC70}_i) + \delta_1 \cdot \text{AGR70}_i + \delta_2 \cdot \text{IND70}_i + \tag{2}
$$
$$
+ \delta_3 \cdot \text{MIGR7090} + \delta_4 \cdot \text{GVTEXP85}_i + \delta_5 \cdot \text{SUPPORT}_i + u_i
$$

where SUPPORT is real total selective regional policy support between 1970 and 1990 per capita and per county (1994 prices). If regions which have been granted supports have experienced a growth effect due to these supports, then $H_0: \delta_5 = 0$ will be rejected. To test how other government expenditures affect the regional growth rates, a variable which measures the allocation of all government expenditures for one fiscal year (1985) has also been included (GVTEXP85). Information about the allocation among counties of all government expenditures is not available before 1985; therefore we have to assume that the fiscal year of 1985 is a relatively good approximation of the allocation of all government expenditures among counties in the 1970s and 1980s. Consequently, the results must be interpreted carefully.

A problem with both the above approaches is that it is indirectly assumed that if the support counties had not been defined as support counties, then they would have followed the same process of convergence as non-support counties. However, it might be the case that the support counties were defined as support areas because in the late 1960s, they experienced lower growth rates of per capita income than other areas, as well as other economic problems. If this was the case, then the tests that are used to examine the effects of

estimator is more efficient, because it takes account of the entire matrix of correlations of all of the

regional policy would falsely reject the hypothesis that regional policy has had any effect on the growth of per capita income. To examine whether this is a problem or not, we compare different characteristics of the support counties and the non-support counties in the late 1960s using t-tests.

4. RESULTS

4.1 SIGMA-CONVERGENCE

Table 4 reports average real per capita income and the standard deviation of the log of real per capita income (σ-convergence). The table suggests that since 1945 real per capita income has increased in all counties (average income has increased from 25.9 thousand SEK to 152.4 thousand SEK). Furthermore, all counties have σ-converged (standard deviation has fallen from 0.187 to 0.054). For the support counties this means that average real per capita income has come closer to the income levels in the non-support areas. In 1945, the income level in the support counties was 84% of the income level in the non-support counties, and in 1990 it was about 98%. Figure 2 also illustrates the process of convergence. Counties with low average real per capita income in 1945 and 1970 respectively have grown faster than counties with higher average real per capita income.

Table 4. Mean and dispersion among support- and non-support counties of real (1994 prices) per capita income in thousands of SEK
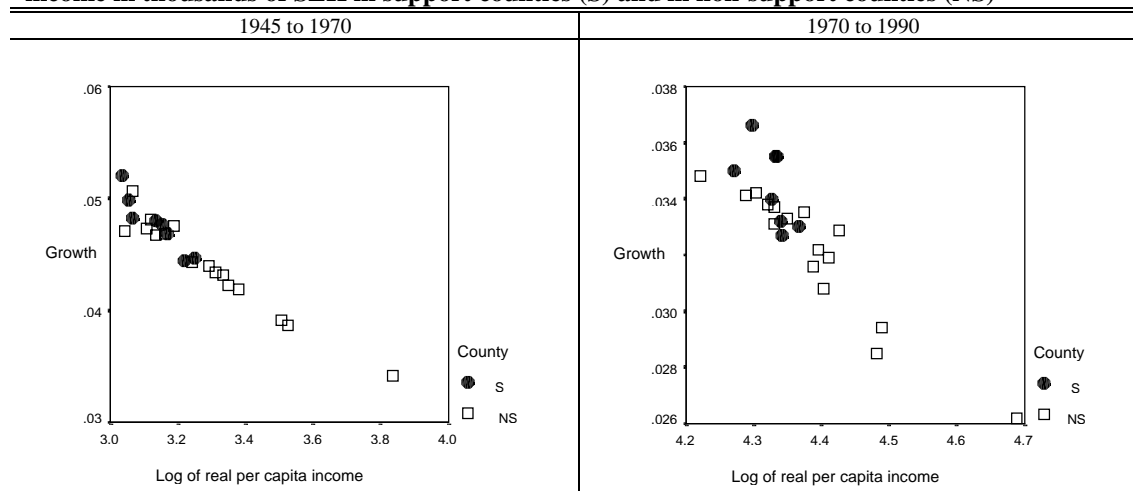
| YEAR | All regions | | Non supp. counties[b] | Support counties[b] |
	Mean	σ-convergence[a]	Mean	Mean
1945	25.9	0.187	27.3	23.0
1970	79.2	0.092	80.9	75.7
1990	152.4	0.054	153.3	150.8

[a] Standard deviation of log of real per capita income.
[b] See Table A1 and Figure A1 in the Appendix for a definition of the support and the non-support counties.

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equations, see e.g. Johnston (1984).

Figure 2. Average annual real per capita income growth rate and log real (1994 prices) per capita income in thousands of SEK in support counties (S) and in non-support counties (NS)

1945 to 1970	1970 to 1990

4.2 BETA-CONVERGENCE

If the support counties were defined as support areas because of low growth rates of per capita income in the late 1960s compared with other counties, then there is a risk that our tests of the effects of regional policy falsely reject the hypothesis that regional policy has affected the growth rates in the targeted counties. To examine whether this is a severe problem or not, Table 5 reports some t-tests of equality of means for different characteristics of the support counties and for the non-support counties.

The table suggests that the per capita income grew faster in the support counties than in the non-support counties between 1965 and 1970, and that the average per capita income, in 1970, was slightly higher in the non-support counties. Compared with the non-support counties, the proportion of employees in agriculture fell more in the support counties. Finally, the change of population between 1965 and 1970 was negative in the support counties and positive in the non-support counties, that is to say, people moved from the support counties to the non-support counties. To summarise, it seems that growth of per capita income in the support counties is not lower (in fact higher) than in non-support counties. This means that there is little risk that we falsely reject the hypothesis that regional policy has not affected the regional growth rates in the support counties.

Table 5. T-tests for equality of means

Variables[*]	Description	Non-support counties Mean	Support counties Mean	t-value
INC70	Real per capita income, 1970 (K.SEK)	80.9	75.7	1.55
INC6570	Change of real per capita income, 1965-70 (%)	3.44	3.99	-2.16[b]
AGR70	Proportion of employees in agriculture, 1970 (%)	8.96	9.95	-0.51
AGR6570	Change of Proportion of employees in agriculture, 1965-70 (%)	-3.58	-6.56	3.28[a]
IND70	Proportion of employees in the industry, 1970 (%)	33.05	28.56	1.38
IND6570	Change of proportion of employees in the industry, 1965-70 (%)	1.35	1.29	0.07
POP6570	Change of population, 1965-70 (%)	4.83	-0.64	3.29[a]

Note: [a], [b] and [c] indicate significance at 1, 5 and 10 % respectively, using a two-tailed t-test.

* The variables are described in detail in Table A1 in the Appendix.

Table 6 reports the results of the regressions. Columns 1 and 2 present the results from model 1a, columns 3 and 4 the results from model 1b, and column 5 the results from the estimation of model 2. The table suggests that both the basic model (Cols. 1 and 3) and the extended model (Cols. 2 and 4) explain the process of convergence relatively well (R^2_{adj} about 0.8-0.9). All Swedish counties have β-converged both between 1945 and 1970 and between 1970 and 1990. The speed of convergence is 3-3.5% per year in the basic model. The test of stability of the β-coefficients for the basic model suggests that there has been no changes in the process of convergence between the period 1945-1970 and 1970-1990.

Table 6. Real per capita income convergence and regional policy

Dependent variable: Average annual real per capita income growth rate.

Model	1a		1b		2
Period	1945-70		1970-90		1970-90
Col.	1	2	3	4	5
Constant	0.113[a]	0.141[a]	0.141[a]	0.187[a]	0.190[a]
	31.81	*12.28*	*14.53*	*11.44*	*8.04*
β	0.030[a]	0.047[a]	0.034[a]	0.057[a]	0.055[a]
	12.88	*4.95*	*7.76*	*5.21*	*3.85*
AGR	-	-0.0001[b]	-	-0.0003[a]	-0.0003[a]
		-2.66		*-3.77*	*-3.25*
IND	-	-0.0001[b]	-	-8.88E-05[a]	-0.0001[b]
		-2.71		*-3.65*	*-2.29*
MIGRATION	-	0.146[c]	-	0.130[b]	0.057
		1.72		*2.16*	*0.61*
AREA	-	0.001[b]	-	0.0002	-
		2.15		*0.40*	
GVTEXP85	-	-	-	-	-5.68E-05
					-1.60
SUPPORT	-	-	-	-	2.49E-08
					0.59
R^2 (R^2_{adj})	0.94 (0.93)	0.95 (0.94)	0.81 (0.80)	0.90 (0.87)	0.91 (0.88)
n	24	24	24	24	24
Test of β-stability	$\chi^2 = 1.51$	$\chi^2 = 0.77$			
Test of AREA-stability		$\chi^2 = 3.19$			

Note: t-statistics in italics. [a], [b] and [c] indicate significance at 1, 5 and 10 % respectively, using a two-tailed test.

The regressions use non-linear regression to estimate the models. For models 1a and 1b the estimation method is SUR (see Johnston, 1984, pp. 337).

The test of β-stability tests (using a Wald-test) the hypothesis that the β in model 1a equals the β in model 1b. The test of AREA stability tests (using a Wald-test) whether the support counties follow a different convergence process after 1970, i.e. the hypothesis $H_0 : \phi_1 = \gamma_1$ for model 1a and 1b.

Measures of the proportion of employees in agriculture and in industry to control for sectoral shocks, measures of net migration into county *i* to control for effects of labour mobility, and support county dummies to test if per capita income in the support counties grows faster after 1970, are included in the models in columns 2 and 4. Inclusion of the control variables in model 1a affects R^2_{adj} marginally. That is to say, convergence among counties before 1970 is, to a large extent, a function of the counties' initial per capita income. For the period after 1970, inclusion of the control variables is more important (R^2_{adj} increases from 0.80 to 0.87). Real per capita income in counties which are more dependent on agriculture and industry grows more slowly.

The results give no support for the idea, which was discussed in section 2.1 and which is often put forward in official motivations for different types of regional policy support, that regional per capita income tends to diverge over time. Instead, it seems as if regions converge, and that factors which lead to convergence of per capita income are more important than factors which lead to divergence.

Do regional policies work? Table 6 suggests that the support counties do not grow faster than other counties after 1970 (AREA is insignificant). The test of the AREA stability hypothesis, that is to say the test of the hypothesis $H_0 : \phi_1 = \gamma_1$, is not rejected at the 10 % level. The result indicates that, compared with the preceding period, support counties grow more slow after the introduction of a regional policy program.

In model 2 the role of selective regional policy supports granted to the industry and the role of government expenditures are tested. The result of the estimations suggests that counties which get more support per capita and where government expenditures are relatively more important do not converge faster than other counties (both SUPPORT and GVTEXP85 are insignificant).[19]

The fact that targeted areas have not converged faster than non-support counties and selective regional policy support does not affect regional growth rates of per capita income suggests that regional policy has been ineffective in this sense.[20] As we argued in section 2.1, there are several possible explanations for why regional policy support may not affect the regional growth rates of per capita income. One explanation is probably that the supports are relatively small compared with other sources of financing and that it is only a minor number of firms that are granted support.

Does this mean that the government should increase the regional policy supports? That is not evident, but at least, the following costs should be seriously taken into consideration. First, more supports mean higher

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[19] Sala-i-Martin (1996) refers to similar results for the United States.

[20] However, the supports might have attained other objectives. They might for example have hindered migration from the support areas. Whether or not this and other objectives of regional policy have been reached are interesting questions for future research.

taxes, which give rise to dead-weight losses and which have a negative effect on the functioning of the market economy. That is to say, if convergence is reached at the price of lower overall long-term growth of per capita income, then regions might become more equal, but average per capita income for all inhabitants (even the ones living in the targeted regions) will fall behind that of nations which experience higher growth of per capita income.[21] Second, more supports give potential recipients an incentive to invest more resources in unproductive activities such as lobbying. Third, subsidisation might also, as the results in Chapter 4 suggest, make the supported firms less productive over time.

5. SUMMARY

The purpose of this paper has been to examine if average per capita income in Swedish counties diverges or converges after 1945, and whether Swedish regional policy has affected the process of divergence/convergence of real per capita income among counties. By examining the divergence/convergence process before and after the point in time when regional policy was introduced, and by comparing targeted support areas with non-support areas, we have found that: (a) real per capita income for Swedish counties has converged since 1945, (b) targeted support counties have not grown faster than other counties after the introduction of the regional policy support program around 1970, (c) selective regional policy supports, which constitute an important part of Swedish regional policy, and government expenditures, do not affect the regional growth rates.

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[21] An indication of the importance for all regions of the overall growth of per capita incomes in a country can be illustrated by the case of Sweden. In 1970 Sweden was the third richest country in the world. Since about 1970 Sweden has developed less well; in 1991 Sweden was the twelfth richest country and in 1993 Sweden ranked as number seventeen, see Henrekson (1996). That is to say, in 1970 Swedish counties belonged to the richest regions of the world but today, although they are more equal, they do not belong to the richest ones anymore.
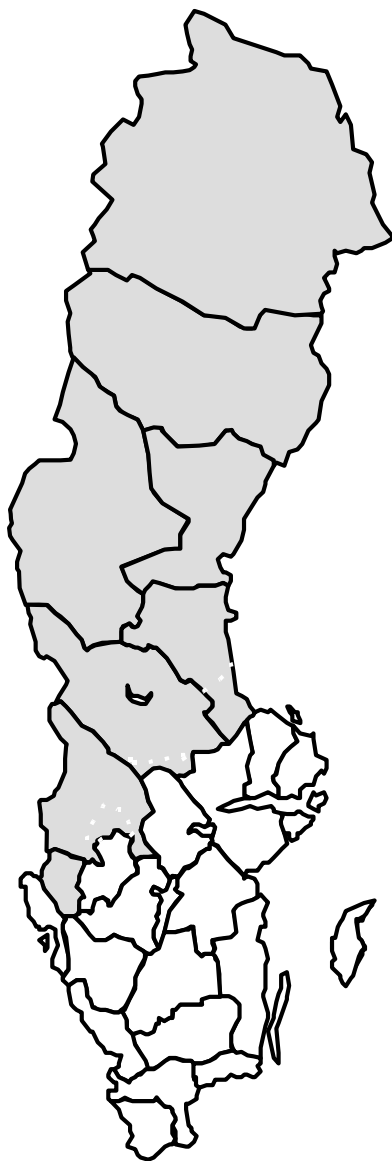
6. APPENDIX 1

Table A1. Description of variables

Variable	Description	Source
INC45	Average real (1994 prices) per capita income per county, 1945.	Tax Assessments 1946, Tab. 10, p. 79.[a]
INC70	Average real (1994 prices) per capita income per county. 1970.	Income and Wealth Statistics 1970, Tab. 18, p. 118.[a]
INC90	Average real (1994 prices) per capita income per county. 1979.	Statistical Abstract of Sweden, 1992, Tab. 229, p. 202.[a]
AGR45	Number of employees in agriculture as proportion of all employees, per county in 1945.	Tax Assessments 1946, Tab. 10.[a]
AGR70	Number of employees in agriculture as proportion of all employees, per county in 1970.	Income and Wealth Statistics 1970, Tab. 24.[a]
IND45	Number of employees in industry as proportion of all employees, per county in 1945.	Tax Assessments 1946, Tab. 10.[a]
IND70	Number of employees in industry as proportion of all employees, per county in 1970.	Income and Wealth Statistics 1970, Tab. 24.[a]
MIGR4570	Average annual net migration into county *i* between 1945 and 1970.	Vital statistics, various issues.[a]
MIGR7090	Average annual net migration into county *i* between 1970 and 1990.	Vital statistics, various issues.[a]
AREA	Dummy. 1 for the counties that largely belong to a support area (Jämtland, Norrbotten, Västerbotten, Älvsborg, Gävleborg, Kopparberg, Värmland, Västernorrland). 0 otherwise.	See NUTEK 1993:43 or Figure A1 below for a description of the support areas.
SUPPORT	Allocation among counties of selective regional policy supports between 1970 and 1990.	NUTEK
GVTEXP85	Allocation of all government expenditures among regions for the fiscal year of 1985/86.	SOU 1989:65, Encl. 1, Tab. 3.
Table 5 data		
INC6570	Change of real per capita income between 1965 and 1970 (%). (= ((INC70-INC65)/INC65)*100). INC65 is average real (1994 prices) per capita income per county in 1965.	INC70: see above. INC65: Tax Assessments and distribution of income and property, 1966. Tab. 18 Col. 10-11.[a]
AGR6570	Change of proportion of employees in agriculture between 1965 and 1970 (%). (=((AGR70-AGR65)/AGR65)*100). AGR65 is number of employees in agriculture as proportion of all employees, per county in 1965.	AGR70: see above. AGR65: Tax Assessments and distribution of income and property, 1966. Tab. 17 Col. 5, 39.[a]
IND6570	Change of proportion of employees in the industry between 1965 and 1970 (%). (=((IND70-IND65)/IND65)*100). IND65 is number of employees in the industry as proportion of all employees, per county in 1965.	IND70: see above. IND65: Tax Assessments and distribution of income and property, 1966. Tab. 17 Col. 13, 39.[a]
POP6570	Change of population, (%), 1965-1970.	Statistics Sweden.

[a] Statistics Sweden

Figure A1. Support counties and support areas

Note: Shaded counties have been defined as support areas (Jämtland, Norrbotten, Västerbotten, Älvsborg, Gävleborg, Kopparberg, Värmland, Västernorrland). Shaded areas below dotted lines in the southern part of the support area do not belong to support areas 1, 2 and/or the transport support area (see NUTEK 1993:43 for a more detailed description of the support areas).

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