On the Determinants of Average Income Growth and Net Migration at the Municipal Level in Sweden[*]

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Abstract

The purpose of this paper is to study what factors determined the average income growth and net migration at the municipal level in Sweden during the 1980s. To do this, we allow for a broad set of possible determinants of the local growth pattern such as economic "opportunity" variables, local policy and national policy decisions (including local public investments), the political stability within the local council, and the local socio-economic structure. Our results suggest a negative correlation between the initial level of average income and the subsequent average income growth, which can be interpreted in terms of conditional convergence. We also find local government policy variables to be important determinants of net migration and average income growth.

1. INTRODUCTION

The local public sector in Sweden, which is the main provider of childcare, primary education, secondary education, care for the elderly, and social care, has expanded quite dramatically during the last three decades. For example, from 1970 through 1995 local public expenditures have doubled in real per capita terms. These services are financed mainly through a local and proportional personal income tax that the local government (at least in formal terms) is independently free to adjust. However, even if the local income tax is increased in order to raise funds, this may have an opposite effect if it causes out-migration of high-income individuals. This means that a local government's ability to fulfill its obligations depends largely on the location's income distribution and the extent to which the public sector attributes of the municipality are attractive to high-income in-migrants. Because the expansion of the local public sector has been driven mainly by decisions made by politicians at the national level of government, the national government has felt a need to equalize financing opportunities and economic "conditions" among municipalities. For example, the grant-in-aid program to local governments aims to compensate municipalities with relatively small tax bases. The national government has also tried to affect local "conditions" through investments in and localization of new universities and university colleges[1] as well as other investments in the infrastructure such as railways and airports.

This paper examines the average income growth and net migration rates at the local level of government in Sweden. The main purpose is to get a better understanding regarding the most important factors explaining differences in average income growth and net migration rates between local governments in Sweden. To do this, we use of a broad set of explanatory variables. Of particular interest is the extent to which policy decisions at the national and local level of government have affected local average income growth and net migration. In addition, we also test the hypothesis of conditional convergence. That is, do municipalities with initially low average income levels tend to have higher average income growth rates compared to municipalities with initially high average income levels conditional on the other explanatory variables?

Analyses of average income growth and net migration rates are important for several reasons. Firstly, if the average (or per capita) income tends to grow faster in "poorer" regions than "richer" regions, average income levels may become more equal between municipalities. This makes the local growth pattern important from a distributional point of view. Secondly, as the local income tax constitutes the major source of funds for local government in Sweden, average income growth and net migration determine changes in local tax bases. Consequently, this will affect the local authorities' ability to finance from their own tax revenues the duties imposed on them by the national government.[2]

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[1] In Sweden, one of the differences between universities and university colleges is that university colleges do not have the right to examine doctoral students.

[2] In addition to differences in the local tax base across municipalities, local income tax rates and national grants-in-aid vary across municipalities, which implies that the ability to finance local public expenditures and also local public expenditures per capita varies between municipalities.

The literature on economic growth is quite extensive.[3]   Many studies have taken the hypothesis of convergence as the point of departure; that is, "poorer" regions grow faster than "richer" regions (either in absolute terms or conditional on other explanatory variables). Barro and Sala-i-Martin (1992, 1995 chapter 11) for example, find clear evidence of income convergence between U.S. states, Japanese prefectures, and European countries. Persson (1997) finds income convergence across Swedish counties. Other studies have focused attention on a broader set of possible determinants of regional growth. For example, Helms (1985) analyzed the impact of state and local income taxes on economic growth in U.S. states, and he found that the way in which local public revenues were used was the crucial factor. His results suggest that revenues used to fund transfer payments tend to reduce economic growth, whereas revenues used to improve public services such as highways, education, and public health tend to have a positive impact. Helms conclude that a high public service level attracts businesses and economic activity, whereas transfer payments do not have the same positive effect on economic growth. Glaeser, Scheinkman, and Shleifer (1995) did not find significant evidence of income convergence between U.S. cities, although they did observe that cities with low manufacturing exposure, highly educated inhabitants, and low unemployment rates grow faster in terms of population than other regions.

The results presented by Aronsson, Lundberg, and Wikström (2001) suggest conditional convergence between Swedish counties. They also report that the initial unemployment rate, the endowments of human capital, and regional public expenditures are important determinants of regional net migration. Fagerberg, Verspagen, and Caniels (1997) used a simultaneous equation model to analyze GDP per capita growth, employment growth, and migration using data on 64 European regions in the 1980s. They found innovation and diffusion of technology to be important factors for regional growth, while the industrial structure (a relatively high share of agriculture) tends to have a moderate effect on growth of the poor regions.

The empirical literature on migration is extensive. Treyz *et al.* (1993) analyzed net migration in the U.S. by deriving a theoretical model, which was empirically tested on an annual data set covering 51 U.S. regions from 1971 through 1988. They found net migration to be affected by relative measures of different economic "opportunity" factors such as the expected wage and the probability of receiving that wage. Davies, Greenwood, and Li (2001) provide a more recent study of place-to-place migration in the U.S. They apply a conditional logit approach where the decision to stay is one option along with all other potential alternatives. In accordance with Treyz *et al.*, Davies, Greenwood, and Li also find measures of income levels and unemployment rates to be important determinants of migration. Westerlund and Wyzan (1995) have analyzed the relationship between local public attributes and household migration in Sweden during the early 1980s. Among other things, they found the local income tax rate to be an important factor when it comes to short-distance migration.

This paper complements earlier studies of income growth and migration between Swedish counties (e.g., Persson 1997; Aronsson, Lundberg, and Wikström 2001) in at least two aspects.

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[3] Examples of cross-country studies include Baumol (1986), Romer (1986,) De Long (1988), Lucas (1988), and Barro (1991). Barro and Sala-i-Martin (1991); Blanchard and Katz (1992); Borjas, Bronars, and Trejo (1992); Glaeser, Scheinkman, and Shleifer (1992); Sala-i-Martin (1996); and Terrasi (1999) are examples of cross regional studies. See Quah (1996) for a more critical review of some of the empirical findings.

Firstly, this paper analyzes average income growth and net migration between municipalities instead of between counties. Such an extension of the literature is important in the sense that a more disaggregated analysis makes it possible to identify growth and mobility patterns that have not been captured in the previous studies. Secondly, although Aronsson, Lundberg, and Wikström, in contrast to Persson who estimate an unconditional growth model, uses a large set of explanatory variables, this is the first empirical paper (at least to our knowledge) to include measures of local public investments and political stability in the local parliament in the analysis of growth and mobility patterns at the local/regional level in Sweden. This paper also complements the analysis of household migration based on Swedish data by Westerlund and Wyzan (1995) in that we focus attention on net migration and average income growth. The empirical analysis in this paper is based on a panel data set covering 271 out of 284 Swedish municipalities from 1980 through 1990. This was the most recent and longest period for which we could find comparable data; that is, the same definition of the variables used in the empirical analysis throughout the period.

Methodologically, we follow Glaeser, Scheinkman, and Shleifer (1995) and Aronsson, Lundberg, and Wikström (2001) in that we use the initial conditions for a broad set of variables to explain the successive average income growth and net migration rates. In this study, the explanatory variables employed can be roughly divided into five categories: (i) indicators of economic "opportunity" factors such as the average income level, endowments of human capital, and unemployment rates; (ii) local and (iii) national policy decisions directed toward the local government sector; (iv) the political stability in the local council; and (v) the local socio-economic and demographic structure. Note that we, in contrast to Glaeser, Scheinkman, and Shleifer, analyze net migration rates, not population growth. Net migration differs from population growth in that it does not include fertility and mortality. This means that net migration may capture the extent to which municipalities are becoming more attractive to migrants. Finally, in analysis of regional economic growth it is of importance to recognize the close relationship between income growth and migration. Regions with high average income levels, all other things equal, are likely to be attractive to migrants, which could affect labor supply and/or the proportion of productive and unproductive individuals. This makes the parameter estimates in growth models difficult to interpret because average income growth may be due to migration and population movements. Therefore, we estimate the average income growth equation and the migration equation simultaneously.

This paper is organized as follows. The theoretical outline and empirical specification are discussed in Section 2. The data set used is described in Section 3. The results and interpretations are presented in Section 4, and concluding remarks are given in Section 5.

2. THEORETICAL OUTLINE

Below we briefly discuss the theoretical outline, the decomposition of the local tax base in two components, the selection of explanatory variables, and specification of the empirical model.

As mentioned in the Introduction, the local governments in Sweden mainly finance their expenditures through the local personal income tax. This means that the local tax base may be decomposed into two dimensions: the average income level and the population level. Following Aronsson, Lundberg, and Wikström (2001), we denote by $Y_{i,t}$ the average income level in

municipality i at time t, and by $L_{i,t}$ the population in municipality i at time t. Then the local tax base $B_{i,t}$ may be defined as

$$B_{i,t} = Y_{i,t} \times L_{i,t} \, .$$

Consequently, the dynamics of the local tax base, or its growth rate, between period t-T and t is given by

$$b_{i,t} = y_{i,t} + m_{i,t}$$

where $y_{i,t} = \ln(Y_{i,t}/Y_{i,t-T})$ is the growth rate of the average income level and $m_{i,t} = \ln[(L_{i,t-T} + \sum_{k=t-T}^{t} mig_{i,k})/L_{i,t-T}]$, where *mig* is net migration, is the net migration rate. By assuming that the rate of return on capital is equal between municipalities (i.e,. a common capital market), the attractiveness of a community for migrants will depend on the earnings "opportunities" as well as on characteristics that affect individual's well being. These factors are also assumed to explain differences in "productivity," or average income growth between municipalities.

From this, we define and estimate two equations, one describing the average income growth and one the net migration rate.

$$(1) \quad m_{i,t} = f^m\left(EO_{i,t-T}, LP_{i,t-T}, NP_{i,t-T}, PS_{i,t-T}, SE_{i,t-T}\right)$$

and

$$(2) \quad y_{i,t} = f^y\left(EO_{i,t-T}, LP_{i,t-T}, NP_{i,t-T}, PS_{i,t-T}, SE_{i,t-T}\right)$$

where the vectors *EO*, *LP*, *NP*, *PS*, and *SE* relate to indicators of earning potential or economic "opportunities," local policy variables, national policy variables, the political stability and local socio-economic and demographic structure variables, respectively.

3. EMPIRICAL SPECIFICATION

Empirical studies of regional growth have often used different measures of income level, endowment of human capital, and employment (or unemployment) rates as indicators of economic "opportunities" within a region (see Treyz *et al.* 1993; Westerlund and Wyzan 1995; Fagerberg, Verspagen, and Caniels 1997; Aronsson, Lundberg, and Wikström 2001; and Davies, Greenwood, and Li 2001). A negative correlation between the initial income level and the subsequent income growth is taken as evidence in favor of the hypothesis of income convergence (or conditional convergence), while a positive correlation between net migration and the average income level is often expected. This is because the regions with high average income levels and endowments of human capital are often considered "socially stable," which makes these regions, all other things equal, attractive for migrants. Other reasons relate to positive externalities

between individuals; a high average income level within a specific area is assumed to "spill over" and have a positive effect on the income level of new citizens. Hence measures of average income levels and endowments of human capital are expected to be positively correlated with net migration. Measures of employment (or unemployment) rates may be considered as indicators of the probability for a potential migrant to receive the average income level in a specific region. High unemployment rates in a region may have a positive effect on the subsequent average income growth if those who are unemployed tend to migrate to other regions in order to find jobs. Consequently, employment (unemployment) rates are expected to be positively (negatively) correlated with net migration and negatively (positively) correlated with the subsequent average income growth.

Net migration rates and the average income growth rates are also likely to depend on local and national policy decisions (see Helms 1985; Glaeser, Scheinkman, and Shleifer 1995; and Aronsson, Lundberg, and Wikström 2001). For example, the local income tax rate is one factor that might influence migration between municipalities located in densely populated areas near major cities, where the decision to move does not necessarily mean that people change their place of work (see Westerlund and Wyzan 1995). Similarly, the local government consumption per capita and local government investments per capita are likely to provide indicators of the present and expected future service levels, which makes them potential determinants of net migration and average income growth. In addition, in order to maintain national standards in local public services, national decision makers have felt a need to equalize opportunities between locations. For example, the location of universities or university colleges in particular areas together with intergovernmental subsidies are, in many respects, designed to affect the regional migration pattern and average income growth.

The growth pattern may also depend on factors that relate to the level of political stability and social factors. For example, in an analysis of economic growth based on a cross section of countries, Barro (1991) shows that political instability negatively affects growth. Glaeser, Scheinkman, and Shleifer (1995) provide more evidence that points to the importance of political and social factors for growth in U.S. cities. In order to control for political factors, we have chosen to include two measures of political stability within the local council: a Herfindahl Index to capture the degree of political fragmentation within the local parliament and a dummy variable to control for the effect of a strong political majority.

Socio-economic and demographic factors are potential determinants of net migration and average income growth. Using a panel data set covering the U.S. states during the 1980s, Partridge and Rickman (1999) analyzed the relationship between net migration and state employment growth in different industries. They found state employment growth that results from each industry in the state growing faster than its national average leads to larger in-migration compared to having a larger share of nationally fast-growing industries. Aronsson, Lundberg, and Wikström (2001) found a negative relationship between an industry index measuring the share of the labor force employed in the mining and construction industries and the subsequent net migration (see also Glaeser, Scheinkman, and Shleifer). We use an index measuring the share of local industry consisting of agriculture or manufacturing. In addition, demographic factors are controlled for by population density and the age structure of the population. Finally, a dummy variable is included to control for systematic differences for municipalities located in the

more sparsely populated northern part of the country where the distances between municipal centers are relatively large.

To be more specific, in our empirical specification, the growth rate of the average income and the net migration rate are assumed to depend on the following explanatory variables:

(i)   economic "opportunity" factors [the average income level (Y), the endowment of human capital (h), and the unemployment rate ($unemp$)];

(ii) local policy decisions [the local income tax rate (tax), local government expenditures per capita (exp), and local government investments per capita ($invest$)];

(iii) national policy decisions [a dummy variable indicating the presence of a university (u), a dummy variable indicating the presence of a university college (uc), and intergovernmental grants per capita ($grants$)];

(iv) political composition of the local council [a Herfindahl Index[4] ($herf$), a dummy variable indicating whether either the socialist parties or the non-socialist parties[5] have more than 2/3 of the seats in the local council (pol)]; and

(v)   socio-economic and demographic structure [the proportion of the local industrial structure consisting of agriculture or manufacturing industry 7($industry$), the percentage of the population aged 0-15 years ($age\ 0\text{-}15$), above 65 years ($age\ 65\text{-}$), population density ($dens$), and a dummy variable indicating whether the municipality is located in the northern part of the country ($north$)].

Explicit definitions of the variables are given in the Appendix. Previous studies of household migration based on Swedish data suggest that the net migration in the major city areas responds differently to fiscal and other characteristics compared with the rest of the country (see Westerlund and Wyzan 1995). To control for potential differences in the parameter estimates, we use a dummy variable (D) to indicate whether the municipality is located in one of the major city areas − Stockholm, Göteborg, or Malmö. Hence, the net migration rate is assumed to develop according to

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[4] The Herfindahl Index is defined as $herf = \sum_{p=1}^{P} SH_p^2$, where SH_p is the share of representatives from party p, $herf = 1$ (its maximum value) if a single party holds all the seats in the local council, and $herf = 1/P$ (its minimum value) when the seats are equally divided between P different parties.
[5] Here socialists are referred to as members of the Left Party and the Social Democratic Party, while non-socialists are members of the Conservative Party, the Center Party, the Liberal Party, and the Christian Democratic Party.

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\begin{aligned}
m_{i,t} = & \left(\alpha^m + \alpha_d^m \times D\right) + \left(\beta^m + \beta_d^m \times D\right) \times \ln\left(Y_{i,t-T}\right) + \left(\delta_h^m + \delta_{h,d}^m \times D\right) \times \ln\left(h_{i,t-T}\right) + \\
& \left(\delta_{unemp}^m + \delta_{unemp,d}^m \times D\right) \times \ln\left(unemp_{i,t-T}\right) + \left(\delta_{tax}^m + \delta_{tax,d}^m \times D\right) \times \ln\left(tax_{i,t-T}\right) + \\
& \left(\delta_{\exp}^m + \delta_{\exp,d}^m \times D\right) \times \ln\left(\exp_{i,t-T}\right) + \left(\delta_{invest}^m + \delta_{invest,d}^m \times D\right) \times \ln\left(invest_{i,t-T}\right) + \\
& \left(\delta_{grant}^m + \delta_{grant,d}^m \times D\right) \times \ln\left(grant_{i,t-T}\right) + \delta_u^m \times u_{i,t-T} + \delta_{uc}^m \times uc_{i,t-T} \\
& \left(\delta_{herf}^m + \delta_{herf,d}^m \times D\right) \times \ln\left(herf_{i,t-T}\right) + \left(\delta_{pol}^m + \delta_{pol,d}^m \times D\right) \times \ln\left(pol_{i,t-T}\right) + \\
& \left(\delta_{industry}^m + \delta_{industry,d}^m \times D\right) \times \ln\left(industry_{i,t-T}\right) + \\
& \left(\delta_{age0-15}^m + \delta_{age0-15,d}^m \times D\right) \times \ln\left(age0-15_{i,t-T}\right) + \\
& \left(\delta_{age65-}^m + \delta_{age65-,d}^m \times D\right) \times \ln\left(age65-_{i,t-T}\right) + \\
& \left(\delta_{dens}^m + \delta_{dens,d}^m \times D\right) \times \ln\left(dens_{i,t-T}\right) + \delta_{north}^m \times north + \varepsilon_i^m
\end{aligned}
$$

(3)

where the αs, βs and δs are parameters to be estimated and ε is the error term.

Only two of the municipalities located within a major city area contain a university. One of them also contains a university college. Therefore, potential differences in parameter estimates between the major city areas and the rest of the country are not estimated for these two variables, (*u*) and (*uc*). The average income growth is assumed to relate to initial conditions of the explanatory variables described above and, consequently, determined by

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\begin{aligned}
y_{i,t} = & \left(\alpha^y + \alpha_d^y \times D\right) + \left(\beta^y + \beta_d^y \times D\right) \times \ln\left(Y_{i,t-T}\right) + \left(\delta_h^y + \delta_{h,d}^y \times D\right) \times \ln\left(h_{i,t-T}\right) + \\
& \left(\delta_{unemp}^y + \delta_{unemp,d}^y \times D\right) \times \ln\left(unemp_{i,t-T}\right) + \left(\delta_{tax}^y + \delta_{tax,d}^y \times D\right) \times \ln\left(tax_{i,t-T}\right) + \\
& \left(\delta_{\exp}^y + \delta_{\exp,d}^y \times D\right) \times \ln\left(\exp_{i,t-T}\right) + \left(\delta_{invest}^y + \delta_{invest,d}^y \times D\right) \times \ln\left(invest_{i,t-T}\right) + \\
& \left(\delta_{grant}^y + \delta_{grant,d}^y \times D\right) \times \ln\left(grant_{i,t-T}\right) + \delta_u^y \times u_{i,t-T} + \delta_{uc}^y \times uc_{i,t-T} \\
& \left(\delta_{herf}^y + \delta_{herf,d}^y \times D\right) \times \ln\left(herf_{i,t-T}\right) + \left(\delta_{pol}^y + \delta_{pol,d}^y \times D\right) \times \ln\left(pol_{i,t-T}\right) + \\
& \left(\delta_{industry}^y + \delta_{industry,d}^y \times D\right) \times \ln\left(industry_{i,t-T}\right) + \\
& \left(\delta_{age0-15}^y + \delta_{age0-15,d}^y \times D\right) \times \ln\left(age0-15_{i,t-T}\right) + \\
& \left(\delta_{age65-}^y + \delta_{age65-,d}^y \times D\right) \times \ln\left(age65-_{i,t-T}\right) + \\
& \left(\delta_{dens}^y + \delta_{dens,d}^y \times D\right) \times \ln\left(dens_{i,t-T}\right) + \delta_{north}^y \times north + \varepsilon_i^y
\end{aligned}
$$

(4)

where the error terms, ε^m and ε^y, are assumed to have zero mean, variances σ_m^2 and σ_y^2, respectively, and covariance $\sigma_{m,y}$.

As recognized by Treyz *et al.* (1993), Barro and Sala-i-Martin (1995, chapter 11), and Fagerberg, Verspagen, and Caniels (1997), net migration and average income growth are interdependent and determined simultaneously. High average income growth signals high earning potential, which is likely to have a positive effect on net migration. Consequently, as net

migration increases, it may affect labor supply, which in turn is expected to have a moderate effect on average income growth. However, if those who move in to municipality *i* are relatively more productive compared to average citizens of municipality *i*, there may be a positive correlation between net migration and average income growth.[6] Barro and Sala-i-Martin deal with this by estimating an equation for average income growth where the systematic part depends on the initial level of average income and net migration, instrumenting for net migration in order to avoid endogeneity problems. Fagerberg, Verspagen, and Caniels (1997) take into account this interdependence by simultaneously estimating the growth and migration equations.[7] In addition, the average income rate is likely to be an endogenous variable in the growth equation. Therefore, $\ln\left(Y_{i,t-T-1}\right)$ is used as instrument for $\ln\left(Y_{i,t-T}\right)$ and, following Fagerberg, Verspagen, and Caniels, the two equations (3) and (4) are estimated simultaneously, in our case by using 3SLS.[8] By simultaneously estimating the two equations, it is (at least to some extent) possible to relate parameter estimates in the income growth equation to changes in labor supply and/or the proportion of productive and unproductive individuals.

4. DATA

The data used in this study originate from the official statistics on municipalities provided by Statistics Sweden (SCB) from 1980 through 1990. This period was chosen because we wanted to have as long a time series as possible and at the same time the freedom to use and elaborate with as many explanatory variables as possible. For instance, some of the definitions of the fiscal variables that stayed the same during the 1980s were changed during the 1990s. In addition, many of the variables in our data set have not been collected by SCB or had a different definition for the period prior to 1980.

During the 1980s, the number of municipalities varied between 279 in 1981 and 284 in 1990. Responsibilities and structures differ somewhat between municipalities. In contrast to the other municipalities, Gotland, Göteborg, and Malmö are responsible for the provision of health care, which is normally provided at the county level. This makes it difficult to obtain comparable data for these municipalities, and therefore they are excluded from the empirical analysis.[9] Municipalities whose borders were changed during this period are also excluded. This leaves us with a data set containing 271 Swedish municipalities.

Table 1 presents descriptive statistics of the variables in the data set. Unfortunately, we lack measures of the differences in price levels between municipalities. Therefore, all monetary variables are deflated by the national index for consumer prices.[10] Note that the average income growth (*y*) and the average income level (*Y*) are only measured for the population aged 20 or above. By measuring income in this way, we avoid some of the dependence between the age

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[6] For instance, senior citizens may be regarded as less productive since they most often do not work. It should also be pointed out that, in general, their migration does not affect labor supply.

[7] They also estimate an employment growth equation.

[8] The econometric software TSP is used to estimate the parameters of the different models.

[9] However, the municipalities located near the major city areas are, of course, still in the sample.

[10] Aronsson, Lundberg, and Wikström (2001) tried to explore regional variation in the cost of living using a regional housing price index instead of the national index for consumer prices. Their parameter estimates for the model using the regional housing price index were very close to those estimated using the national index of consumer prices.

composition of the population and the average income level. This is reasonable because we disregard natural population growth.

Net migration rates (m) and the average income growth (y) differ substantially between municipalities. While some municipalities located near the major city areas (Stockholm, Göteborg, and Malmö) have experienced large net in-migration during the period of study, many municipalities in the northern and middle parts of the country have experienced large out-migration. For instance, as a result of net migration alone, Sundbyberg near Stockholm has increased its population by 17 percent, whereas the population of Kiruna in the very north of the country has declined by 18 percent. The highest average income levels are also found near the major city areas, and the lowest is found in the sparsely populated areas in the north and midwest of the country. In 1981, the highest average income level was 2.19 times greater than the lowest income, and the corresponding figure for 1990 was 2.27 times.[11]

Human capital (h) is measured as the percentage of inhabitants with a university degree. This information has only been collected by Statistics Sweden since 1985. In order to obtain data on the variable h for the period 1981-1984, $h_{i,t}$ has been regressed on a constant, $h_{i,t-1}$, $h_{i,t-2}$, $h_{i,t-3}$, $h_{i,t-4}$, $h_{i,t-5}$, and $h_{i,t-6}$. Using ordinary least squares (OLS), this model explains 99.9 percent of the variation in h.[12] Based on this equation, h is calculated for the period 1981-1984. The highest endowments of human capital are found in the Stockholm area and in municipalities with a university. The unemployment rate ($unemp$) is measured in percentage points.

TABLE 1

Descriptive Statistics for Years 1981, 1984, 1985, 1986 and 1987

Variable	Mean	Std dev	Min	Max
Net migration rate 1981-1990	0.02	0.05	-0.18	0.17
Average income growth 1981-1990	0.19	0.02	0.12	0.26
Average income level (*Y*)	51.67	6.38	39.96	97.19
Human capital (*h*)	0.06	0.02	0.02	0.24
Unemployment rate (*unemp*)	0.02	0.01	0.00	0.09
Local income tax rate in percent (*tax*)	29.26	1.23	24.10	32.25
Local government expenditures (*exp*)	12.14	2.51	7.68	31.34
Local government investments (*invest*)	1.22	0.66	0.16	6.57
Intergovernmental grants (*grant*)	3.41	0.74	1.01	7.16
University (*u*)	0.02	0.14	0.00	1.00
University college (*uc*)	0.07	0.26	0.00	1.00
Herfindahl Index (*herf*)	0.33	0.06	0.21	0.54
Qualified political majority (*pol*)	0.16	0.37	0.00	1.00
Industry (*industry*)	0.49	0.14	0.10	0.80
Population density (*dens*)	111.12	359.38	0.30	3541.31
Population aged 0-15 years (*age 0-15*)	0.20	0.03	0.13	0.34
Population aged 65 years or above (*age 65-*)	0.18	0.04	0.05	0.27
North (*north*)	0.24	0.43	0.00	1.00

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[11] A more specific description of six municipalities, Danderyd, Kiruna, Berg, Borgholm, Sundbyberg, and Solna, is given in Appendix 2.
[12] The parameter estimates for this equation are reported in Appendix 2.

Primary and secondary education and social care account for a large proportion of local government expenditure (*exp*) (24 and 20 percent, respectively, in 1980, Statistics Sweden [1984]). These services are financed largely by a local income tax, where the tax rate (*tax*) is chosen by the municipality, and intergovernmental grants (*grant*). Local government investments (*invest*) may also be financed by income taxes or intergovernmental grants. Alternatively, they may be funded by loans or funds built up through budget surpluses. The number of universities (*u*) has been constant during this period while the number of municipalities with a university college (*uc*) has increased from 20 in 1981 to 22 in 1990.[13]

During this period, the elections for the local council took place every third year with the last election in 1988. Hence the Herfindahl Index (*herf*) and the dummy variable indicating a qualified political majority in the local council (*pol*)[14] for 1981 and 1982 correspond to the election in 1979, *herf* and *pol* for 1983-1986 correspond to the election in 1982, and so on. In the category socio-economic and demographic structure, the industry index (*industry*) is measured as the percentage of the local industrial structure consisting of agriculture or industry. Finally, the demographic variables are measured as the number of inhabitants per square kilometer (*dens*) and the share of the population aged 0-15 years (*age 0-15*) and above 65 years (*age 65*).

5. RESULTS

Earlier empirical work on economic growth and net migration has divided the data in time intervals of one (see for instance Davies, Greenwood, and Li 2001), five (Aronsson, Lundberg, and Wikström 2001), ten (Persson 1997) or more years (Glaeser, Scheinkman, and Shleifer 1995; Persson 1997). Using annual data, one may argue that a one-year interval is the most efficient way to use the data. On the other hand, it may be argued that it takes time, often more than a single year, for different policy decisions like investments to affect the local growth pattern. For instance, it may take many years for a new university or a university college to have an impact on local growth. Estimating equations (3) and (4) using a panel data set give a few options regarding the specification of t and T. Here, we have chosen to estimate three models. The first one, the "benchmark" model, is estimated using $t = 1990$ and $T = 9$. In the second model, $t = 1985$ and 1990, with $T = 5$; and in the third model $t = 1984$, 1987 and 1990, with $T = 3$. The latter two models are referred to as Models B and C, respectively.

Parameter estimates of the "benchmark" model are presented in Table 2. Columns with "Basic" estimates refer to municipalities located in counties that do not contain any of the major city areas (Stockholm, Göteborg, or Malmö), while the corresponding estimates for municipalities located in counties that contain one of the major cities are obtained by adding the "Basic" and the "Dummy" estimate. The inclusion of regional dummy variables, one for each county, is used to control for regional differences. To save space, these estimates are left out of Table 2.[15]

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[13] The large extension of the number of university colleges took place in 1976.
[14] Here, a qualified majority is defined as if either the socialist parties or the non-socialist parties have more than 2/3 of the seats in the local parliament.
[15] The inclusion of regional dummy variables mainly affects the explanatory power of the different models.

TABLE 2

Parameter Estimates of Equations (3) and (4), the "Benchmark" Model

Dependent variable	*m*		*y*	
	Basic	Dummy	Basic	Dummy
Constant (α)	1.641	-0.012	1.172	-0.572
	4.78	-0.01	6.03	-0.99
Economic "opportunity" factors				
Average income (β)	-0.195	-0.237	-0.149	0.101
	-2.43	-1.16	-3.15	0.98
Human capital (δ_h)	0.085	0.035	-0.007	0.033
	6.39	0.87	-0.81	1.89
Unemployment rate (δ_{unemp})	-0.014	0.007	0.005	-0.013
	-1.79	0.26	1.02	-1.16
Local government policy variables				
Local income tax rate (δ_{tax})	-0.086	0.278	-0.079	0.127
	-1.14	1.22	-1.91	1.27
Local government expenditures (δ_{exp})	-0.047	0.057	-0.012	-0.085
	-2.28	0.87	-1.16	-2.86
Local government investments (δ_{invest})	0.013	-0.030	0.003	0.009
	2.73	-1.82	1.08	1.12
National policy variables				
Intergovernmental grants (δ_{grant})	0.010	-0.091	-0.004	0.101
	0.66	-1.62	-0.46	3.51
University (δ_u)	-0.022	-	0.004	-
	-1.17	-	0.58	-
University college (δ_{uc})	-0.014	-	-0.002	-
	-2.06	-	-0.47	-
Political composition of the local council				
Herfindahl Index (δ_{herf})	-0.051	0.080	-0.033	0.076
	-2.86	0.91	-3.10	2.48
Qualified political majority (δ_{pol})	0.003	0.024	0.004	0.007
	0.47	0.91	1.19	0.70
Socio-economic and demographic structure				
Industry ($\delta_{industry}$)	-0.033	-0.024	0.000	0.002
	-3.59	-0.73	0.03	0.19
Population density (δ_{dens})	0.009	-0.019	0.000	0.005
	2.42	-2.24	0.14	1.23
Population aged 0-15 years ($\delta_{age0-15}$)	0.133	-0.113	0.100	-0.045
	3.11	-0.74	4.05	-0.93
Population aged 65 (δ_{age65-})	0.102	-0.070	-0.000	0.051
	2.93	-1.16	-0.03	2.15
North (δ_{north})	-0.008	-	0.008	-
	-0.51	-	0.83	-
R^2	0.66		0.63	

Note: t-values (given below the estimates) are heteroskedastic consistent using White's robust standard errors.

We will start by discussing the correlation between the economic "opportunity" factors and subsequent net migration rates (*m*) and average income growth (*y*). According to the estimates presented in Table 2, our model predicts a negative and significant correlation between the initial average income level (*Y*) and the subsequent average income growth (*y*). This implies conditional convergence in the sense that municipalities with low initial average income levels tend to grow faster than municipalities with high initial average income levels, conditional on the other explanatory variables. This is in line with previous studies using data on U.S. states (Barro

and Sala-i-Martin 1992, 1995) and Swedish counties (Persson 1997; and Aronsson, Lundberg, and Wikström 2001). However, this result is not significant for municipalities located within the major city areas (the sum of the "Basic" and the "Dummy" estimates is -0.048 with a t-statistic of -0.51). One explanation for the negative relationship between the initial income level and income growth, given in Aronsson, Lundberg, and Wikström (2001), is that capital mobility tends to make municipalities (in their case counties) more homogeneous over time. They also point out that the centralized system of wage formation during part of this period may have compressed the wage distribution. In terms of provision of local public services, this result indicates that differences in local tax bases between municipalities, all other things equal, tend to diminish over time and hence financing opportunities of local public goods.

For purposes of interpretation, it is important to recognize how the initial average income level (Y) affects the subsequent net migration (m). This relationship is negative and significant (the sum of the "Basic" and "Dummy" estimates is -0.432 with a t-statistic of -2.25), which is in contrast to the findings in Aronsson, Lundberg, and Wikström (2001). Such a result may suggest that high-income levels do not attract migrants. However, future earnings opportunities in a municipality not only depend on the average income, they may also depend on the initial endowments of human capital (h). Since the average income level (Y) and the indicator of human capital endowments (h) are highly correlated (the correlation coefficient is 0.86), it becomes difficult to identify separate effects of these two variables. For instance, if the human capital indicator is excluded from the migration function during the estimation, we still find support for the hypothesis of conditional convergence while the effect of the average income becomes positive and insignificant.[16]

The endowment of human capital (h) is estimated to have a positive effect on net migration also within the major city areas ($\delta_h^m + \delta_{h,d}^m = 0.121$ with a t-value of 3.06), while it has no significant effect on the average income growth. This is in line with the results presented in Aronsson, Lundberg, and Wikström (2001). One possible interpretation of this result is that the positive effect of human capital on income growth (productivity) is erased by the fact that the endowments of human capital also have a positive effect on net migration, which may affect the labor supply.[17] This result could also indicate that the proportion of productive and unproductive individuals remains approximately constant leaving the average income growth unaffected. We find in this model no significant effect of initial unemployment rates (*unemp*) on net migration or average income growth.[18]

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[16] Excluding h gives $\beta^m = 0.083$ (t-value 1.02), $\beta_d^m = -0.138$ (-0.90), $\beta^m + \beta_d^m = -0.055$ (-0.43), $\beta^y = -0.168$ (-4.16), $\beta_d^y = 0.200$ (2,46) and $\beta^y + \beta_d^y = 0.032$ (0.46).

[17] Net migration includes senior citizens, whose migration generally is assumed to have no affect on labor supply. However, if senior citizens are regarded as less productive (retired), their migration will affect the proportion of productive/less productive individuals.

[18] As pointed out to us by the editor, regressing m on levels of y and *unemp*, our approach assumes a disequilibrium process. Hence, the insignificant impact of y and *unemp* on m may be indicating that a disequilibrium does not exist; it does not necessarily indicate that changes in y and *unemp* would not induce a change in m. Differences in y and *unemp* can occur in equilibrium because of differences in household and producer amenities, including an equilibrium compensating differential by higher real income for higher unemployment.

Turning to the impact from previous fiscal decisions made by local governments, investments or investment ratios are often considered to be one of the key factors for economic growth (see for instance Barro 1991, and Mankiw, Romer, and Weil 1992). Here, we focus on the effects of investments made by local governments. The results suggest initial local government investments (*invest*) have a positive impact on net migration outside of the major city areas, although it does not influence the growth rate of the average income. Although investments cause in-migration, this result suggests that the proportion of productive and unproductive individuals within the municipalities remains almost constant, leaving the average income growth unaffected.

Local government expenditures (*exp*) are estimated to have a negative impact on net migration (outside of the major city areas) and average income growth (within the major city areas, where the t-value is -3.51). A negative correlation between *exp* and *m* is also found in Westerlund and Wyzan (1995), whereas Aronsson, Lundberg, and Wikström (2001) found a negative correlation between *exp* and *y* outside of the major city areas. However, in contrast with Westerlund and Wyzan, the results presented in Table 2 suggest that the initial income tax level (*tax*) does not affect net migration or average income growth. It is difficult to distinguish between different interpretations for these results because the local councils were not required to balance their budgets each year during this period. This means that the local government expenditures and income tax rates may not only reflect the current service level and cost for taxpayers, they may also signal future policy changes. In an attempt to distinguish between different interpretations of the effects of previous decisions made by local government, we extended the model to control for as many components in the local budget restriction as possible. In accordance with Fischer (1993), information on local budget surpluses was added to the model. However, because none of the other parameter estimates were significantly affected by this experiment, we have chosen not to present these results. Therefore, with no further interpretations, we only note local fiscal policy matter for the regional growth pattern.

The national policy variables are found to have no or little influence on net migration and average income growth. The results from the "benchmark" model suggest that intergovernmental grants (*grant*) given at the start of the period tend to have a positive effect on the average income growth within the major city areas (t-value of 3.52), while the location of a university college (*uc*) is predicted to have a negative effect on net migration. The latter result might be surprising, as a university college is often believed to cause in-migration, which has also been one of the strongest arguments for the expansion and localization of new university colleges in Sweden. This result could be explained by the fact that during this period students were not obligated to register within the municipality where they studied. Hence, student migration may not have been reflected in the official statistics. Therefore, it may have been the case that many students were registered to live with their parents in their "home" municipality although they actually lived and studied within another municipality. An alternative explanation for this result is that the number of new students who in-migrate are presumably as many as the number of graduates who out-migrate.

From the "benchmark" model, we find no significant impact from the establishment or location of a university (*u*) on the regional growth pattern. Beside the fact that student migration may not have been captured in the data or that the net effect of student migration is close to zero,

one possible explanation for this result is that the presence of a university or university college may have different effects on *m* and *y* depending on where it is located. That is, it might be the university in combination with the economic environment that is important for its effects on net migration and average income growth. It might also be the case that new and old universities and university colleges affect net migration and average income growth patterns differently. To investigate these two possibilities, we constructed a set of dummy variables (one for each university or university college), replaced the two dummy variables *u* and *uc*, and re-estimated the model. We also elaborated with different combinations of regional dummy variables along with the "new" dummy variables for each university or university college. These experiments did not produce any robust results regarding how the different universities (*u*) or university colleges (*uc*) affect net migration and the average income growth.

The political stability of the local council is potentially important for economic growth. Here, the political stability is characterized by two different measures, a Herfindahl Index (*herf*) that measures the political stability within the local council and a dummy variable that indicates a qualified majority of either socialistic or a non-socialistic representation in the local council (*pol*). The results presented in Table 2 suggest that *herf* is negatively correlated with *m* and *y*, which indicates that a more fragmented local council stimulates economic growth at the local level. This result is in contrast to what is often found in cross-country studies, namely that political fragmentation has a negative impact on economic growth. However, this result may be due to the fact that there were three elections between 1981 and 1990 and that *herf* and *pol* are measured for 1981.

The measures of socio-economic and demographic structure mainly affect net migration. The share of the local industrial structure consisting of agriculture and industry (*industry*) tends to have a negative effect on net migration outside of the major city areas, while it has no significant effect on average income growth. This result may be interpreted in terms of changes in labor supply; the out-migration from municipalities with this type of industrial structure offsets the decreased demand for agricultural and industrial workers. As a consequence, the average income growth is left unaffected. The population density (*dens*), proportion of inhabitants aged 0-15 years (*age0-15*), and above 65 (*age65-*) are found to be correlated positively with net migration outside of the major city areas. However, there is no evidence suggesting a different growth pattern for municipalities located in the northern part of the country (*north*).

It may be argued that the time interval used in the "benchmark" model is too long; i.e., the local public expenditures in 1981, for example, are unlikely to affect the growth pattern for the next nine years. Therefore, we have estimated two additional models. The first model, Model B, is estimated using *t* = 1985, 1990, and *T* = 5; the second model, Model C, is estimated using *t* = 1984, 1987 and 1990, and *T* = 3. The parameter estimates of these two models are presented in Tables 3 and 4. In the following, we will concentrate on differences between these two models and the "benchmark" model.

The results reported in Tables 3 and 4 support the hypothesis of conditional income convergence across Swedish municipalities outside of the major city areas. Although the significance of this effect vanishes for municipalities located outside of the major city areas in Model C, the results in Tables 3 and 4 suggest a negative correlation between *Y* and *m*, which is in line with

the "benchmark" model. However, in contrast to the "benchmark" model, the results from Models B and C indicate the initial endowments of human capital (*h*) have a highly significant positive effect on net migration and average income growth. Hence, this suggests (at least over a time interval of three to five years) that high endowments of human capital tend to attract highly educated (i.e., highly productive) individuals, which has a positive effect on the average income

TABLE 3

Parameter Estimates of Equations (3) and (4), Model B

Dependent variable	*m*		*y*	
	Basic	Dummy	Basic	Dummy
Constant (α)	1.837	-0.777	5.701	-5.723
	4.78	-0.94	5.74	-2.69
Economic "opportunity" factors				
Average income (β)	-0.187	0.018	-0.788	0.662
	-4.01	0.22	-6.29	2.84
Human capital (δ_h)	0.075	-0.004	0.226	-0.073
	10.76	-0.21	13.42	-1.51
Unemployment rate (δ_{unemp})	-0.016	-0.002	-0.030	0.047
	-4.09	-0.21	-3.23	2.06
Local government policy variables				
Local income tax rate (δ_{tax})	-0.004	0.166	0.172	0.460
	-0.10	1.81	1.71	2.39
Local government expenditures (δ_{exp})	-0.001	-0.019	0.154	-0.122
	-0.13	-0.66	5.30	-2.01
Local government investments (δ_{invest})	-0.004	0.017	-0.050	-0.007
	-1.54	2.45	-9.28	-0.49
National policy variables				
Intergovernmental grants (δ_{grant})	0.012	0.001	-0.023	0.001
	1.22	0.00	-0.96	0.02
University (δ_u)	-0.010	-	-0.067	-
	-1.07	-	-2.27	-
University college (δ_{uc})	-0.011	-	-0.040	-
	-3.53	-	-4.22	-
Political composition of the local council				
Herfindahl Index (δ_{herf})	-0.012	0.011	0.096	0.016
	-1.39	0.34	4.08	0.24
Qualified political majority (δ_{pol})	0.002	0.014	-0.007	0.46
	0.74	1.40	-0.88	2.42
Socio-economic and demographic structure				
Industry ($\delta_{industry}$)	-0.002	0.010	0.077	-0.068
	-0.52	0.70	5.40	-2.47
Population density (δ_{dens})	0.003	-0.007	-0.007	-0.003
	1.61	-1.65	-1.68	-0.34
Population aged 0-15 years ($\delta_{aged0-15}$)	0.035	-0.079	-0.202	0.177
	1.42	-1.21	-3.49	1.57
Population aged 65 years or above ($\delta_{aged65-}$)	0.043	-0.025	-0.119	0.182
	2.23	-0.84	-2.85	3.03
North (δ_{north})	0.002	-	0.041	-
	0.21	-	2.20	-
R^2	0.53		0.49	

Note: t-values (given below the estimates) are heteroskedastic consistent using White' robust standard errors.

TABLE 4

Parameter Estimates of Equations (3) and (4), Model C

Dependent variable	*m*		*y*	
	Basic	Dummy	Basic	Dummy
Constant (α)	0.585	0.003	3.024	-3.134
	2.97	0.01	6.44	-3.30
Economic "opportunity" factors				
Average (β)	-0.043	-0.068	-0.488	0.426
	-1.86	-1.43	-8.46	3.91
Human capital (δ_h)	0.046	0.004	0.140	-0.031
	9.95	0.40	12.68	-1.26
Unemployment rate (δ_{unemp})	-0.013	0.000	-0.028	0.051
	-5.11	0.05	-4.51	3.75
Local government policy variables				
Local income tax rate (δ_{tax})	-0.022	0.186	0.140	0.200
	-0.86	3.05	2.12	1.69
Local government expenditures (δ_{exp})	-0.004	-0.002	0.095	-0.082
	-0.53	-0.08	5.10	-2.22
Local government investments (δ_{invest})	-0.001	0.008	-0.035	-0.008
	-0.70	1.76	-9.43	-0.98
National policy variables				
Intergovernmental grants (δ_{grant})	0.023	-0.026	0.038	0.002
	3.00	-1.27	2.57	0.05
University (δ_u)	-0.006	-	-0.050	-
	-1.05	-	-3.07	-
University college (δ_{uc})	-0.007	-	-0.028	-
	-3.43	-	-4.40	-
Political composition of the local council				
Herfindahl Index (δ_{herf})	-0.022	0.022	0.096	-0.002
	-3.94	1.18	6.76	-0.06
Qualified political majority (δ_{pol})	0.003	0.010	-0.007	0.030
	1.51	1.45	-1.33	2.43
Socio-economic and demographic structure				
Industry ($\delta_{industry}$)	-0.004	0.007	0.035	-0.030
	-1.34	0.80	3.78	-1.94
Population density (δ_{dens})	0.002	-0.006	-0.005	-0.005
	1.71	-2.06	-2.06	-0.90
Population aged 0-15 years ($\delta_{age0-15}$)	0.054	-0.062	-0.173	0.120
	3.69	-1.50	-4.96	1.73
Population aged 65 years or above (δ_{age65-})	0.059	-0.036	-0.097	0.134
	5.73	-2.07	-4.44	4.04
North (δ_{north})	-0.004	-	0.006	-
	-0.76	-	0.47	-
R²	0.54		0.39	

Note: t-values (given below the estimates) are heteroskedastic consistent using White's robust standard errors.

growth. It should be noted that the positive effect is statistically significant for the major city areas in Models B and C.[19]

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[19] Model B: $\delta_h^m + \delta_{h,d}^m = 0.071$ (t-value = 3.79), $\delta_h^y + \delta_{h,d}^y = 0.152$ (3.34). Model C: $\delta_h^m + \delta_{h,d}^m = 0.050$ (4.96),

$\delta_h^y + \delta_{h,d}^y = 0.109$ (4.91).

In addition, the results presented in Tables 3 and 4 suggest that (outside the major city areas) the initial unemployment rate (*unemp*) is negatively related to *m* and *y*. One interpretation of this result is that over a time interval of three to five years high unemployment rates cause out-migration, which decreases labor supply. However, the decrease in labor supply during this time interval is not sufficient to adjust wages such that average income growth is positive. Therefore, initially high unemployment rates have a negative effect on the subsequent income growth. For the individual, high unemployment rates could also be an indicator of the probability of finding or keeping a job. Hence, another interpretation is that unemployment generates out-migration of relatively high productive individuals, which tends to have a negative effect on the average income level of those who stay. Over a longer time interval, this effect tends to vanish (see the "benchmark" model). Consequently, we conclude that high unemployment rates affect the local growth pattern over a time interval of at least five years. As individuals migrate from these regions, the unemployment rate decreases, which has a moderate effect on out-migration. Therefore, this effect is not captured in the "benchmark" model.

The impact of local policy decisions differs between the models. For instance, in Model C the local income tax rate (*tax*) is estimated to be related positively to *m* and *y*. (The t-values for the sum of the "Basic" and "Dummy" parameters are 2.97 and 3.56, respectively.) The parameter estimates for Models B and C also indicate a negative relationship between local government investments (*invest*) and the subsequent average income growth, while the positive correlation between *invest* and *m* from the "benchmark" model is no longer present. These results indicate that it takes time for investments to have a positive effect on the local growth pattern. However, as mentioned above, even if local policy decisions influence the local growth pattern, it is difficult to interpret the parameter estimates in our models because the local governments were not obligated to balance their budgets. Again, with no further interpretations of these results, we settle with the observation that local policy decisions seem to be important determinants of regional growth.

Turning to the measures of national policy variables, the parameter estimates of Models B and C indicate that the measurements of national policies directed at the local level of government are important determinants of regional growth. In particular, in Model C the national grant-in-aid program (*grant*) is predicted to have a positive effect on net migration and average income growth, at least outside the major city areas. Since the positive effect on income growth is not offset by in-migration, these results suggest that the national grant-in-aid program attracts highly productive (or high-income) individuals.

In addition to the negative relationship between the presence of a university college (*uc*) and net migration suggested in the "benchmark" model, the results reported in Tables 3 and 4 indicate a negative relationship between the presence of a university college (*uc*) and the subsequent average income growth as well as between the presence of a university (*u*) and both net migration and the subsequent average income growth. The negative impact on income growth could be partly explained by the fact that many of the newly established local universities and university colleges are located in small municipalities where they are the major employers in the region. This in combination with relatively low wages at universities and university colleges further explains this result. The negative effect on net migration may be explained by the fact

that much of the student migration at this time may not have been captured in the data or that the net effect of student migration is approximately zero.

The measure of political stabilization (*herf*) in Models B and C is estimated to have a positive effect on the average income growth. This is, in contrast to the results presented in Table 2, consistent with previous research, i.e., political stabilization is positively related to growth. Because elections were taking place every three years, we believe the results from Model C have greater efficacy than the results from the other two models. Therefore, we conclude that political stabilization (*herf*) is related negatively to net migration and related positively to the subsequent average income growth. By definition, municipalities with high a Herfindahl Index are characterized by stable political majorities within the local parliament, which means a low probability of a change of regime at the next election. This induces individuals with opposite political preferences to "vote with their feet." As a result, political stability together with a decreased labor supply and/or out-migration of low-income/productive individuals has a positive effect on income growth. The positive correlation between *herf* and *y* is also significant for the major city areas (t-value of 2.97), while the negative relation between *herf* and *m* is only statistically significant outside the major city areas.

Finally, let us comment on the relationship between the initial industrial structure (*industry*) and the subsequent growth pattern. In the "benchmark" model, the parameter estimates suggested a negative correlation between industry and the subsequent net migration. This negative effect is not significantly determined in Models B and C. Instead, the results presented in Tables 3 and 4 suggest a positive correlation between *industry* and *y*. It is difficult to give an explanation for these differences between the models. Therefore, we just settle with the observation that over a longer time interval, an initially high proportion of agriculture and industry within a municipality tends to have a negative effect on net migration. Over a shorter time interval this effect vanishes and instead our results suggest a positive correlation between the initial proportion of agriculture and industry and the subsequent average income growth.

5. CONCLUDING REMARKS

The main issue in this paper it to better understand what are the most important factors explaining differences in average income growth and net migration rates between local governments in Sweden. The paper is motivated from a local public finance perspective. Because local governments in Sweden mainly finance their expenditures through the local income tax, average income growth and net migration determine changes in local tax bases. Consequently, this will affect the local authorities' ability to fulfill the duties imposed on them by national government.

The results presented in this paper support the hypothesis of conditional income convergence across Swedish municipalities in the sense of a negative relationship between the initial level of average income and its subsequent growth conditional on the other explanatory variables. All other things equal, this suggests that financing opportunities across municipalities tend to equalize over time. This result agrees with previous studies of income growth using data on Swedish counties (see Aronsson, Lundberg, and Wikström 2001; and Persson 1997). The results also suggest that initial endowments of human capital have a highly significant positive effect on net migration and average income growth, the latter at least over an interval of three to five years.

This result also agrees with Aronsson, Lundberg, and Wikström. We also find a negative relation between the initial unemployment rate and the subsequent net migration and average income growth, at least over an interval of three to five years. This result indicates that although high unemployment rates cause out-migration, the decrease in labor supply is not sufficient or fast enough to adjust to the decrease in labor demand. Another interpretation is that unemployment generates out-migration of relatively highly productive individuals, which tends to have a negative effect on the average income level of those who stay.

From a policy perspective, our results suggest that both local and national policy decisions directed toward the local public governments are important determinants of regional growth. It is, however, difficult to give recommendations for local policy makers based on our results because local public expenditures and income tax rates not only reflect differences in service levels and costs for taxpayers, it may also reflect future policy changes. Another problem is related to the fact that during this period the local governments were not obligated to balance their budgets, which means that we need more information regarding the fiscal structure in the municipalities. However, our results indicate that local public investments undertaken in 1981 had a positive effect on subsequent net migration during the 1980s while leaving average income growth unaffected. This may indicate that the net migration caused by these investments does not significantly affect the proportion of productive and unproductive individuals. Therefore, from a policy perspective, local public investments are, in the long run, positive for the development of the local tax base. We also find political stability to be related positively to average income growth.

The effect of national policy decisions differs between the models. At least over a three- to five-year interval, the national grant-in-aid program is estimated to have a positive effect on net migration and average income growth. This result indicates that the program actually compensates municipalities with smaller tax bases. It has also been a conscious strategy from national policy makers that new universities and university colleges should be located in regions with a negative population trend. Surprisingly, our results suggest that the location of a university or a university college has a negative effect on net migration and (over a shorter interval) average income growth. We suspect that this result is due to the fact that student migration is not captured in the data and/or that student in-migration (new students) is approximately as large as student out-migration (graduated students). However, one explanation for the negative relationship between the presence of a university or a university college and the subsequent average income growth is the low wage increases at universities and university colleges and that such institutions constitute the main working site when located in sparsely populated municipalities. From the estimates presented in this paper, it is not obvious that a university or a university college in itself has a positive effect on the local tax base per capita.

Our results suggest that political stabilization has a positive effect on the average income growth and is related negatively to net migration. One interpretation of this result is that individuals with opposite political preferences tend to "vote with their feet" and migrate to other municipalities. As a result, the political stability together with a decreased labor supply and/or out-migration of individuals with relatively low incomes (low productive) has a positive effect on subsequent income growth.

Finally, the results presented in this paper indicate that individuals migrate from regions with an industrial structure consisting of a high proportion of agriculture and industry. However, this negative effect disappears when the time interval is shortened. Instead, when the model is estimated using a shorter time interval, there is a positive relation between the proportion of agriculture and industry within the municipality and the subsequent average income growth.

APPENDIX

Variable Definitions

Endogenous variables:

- Net migration, *m*: Defined as $\ln\left[\left(L_{i,t-T} + \sum_{k=t-T}^{t} mig_{i,k}\right)\Big/ L_{i,t-T}\right]$ where *mig* is net migration and *L* population.
- Average income growth, *y*: Defined as $\ln\left(Y_{i,t}/Y_{i,t-T}\right)$, where *Y* is the average income level.

Explanatory variables:

Economic "opportunity" factors (i):

- Average income level, *Y*: Measured in thousand SEK per year for the population aged twenty years or above.
- Human capital, *h*: Measured as the percentage of inhabitants with a university degree.
- Unemployment rate, *unemp*: The unemployment rate in percentage points.

Local government policy variables (ii):

- Local income tax rate, *tax*: Local plus regional income tax rate measured in percentage points.
- Local government expenditures, *exp*: Local government operating costs per capita. Measured in thousand SEK per capita.
- Local government investments, *invest*: Local government investments measured in thousand SEK per capita and include investments in roads, buildings, sport facilities and arenas etc.

National policy variables (iii):

- Intergovernmental grants, *grant*: Total intergovernmental grants. Measured in thousand SEK per capita.
- University, *u*: Dummy variable indicating the presence of a university.
- University college, *uc*: Dummy variable indicating the presence of a university college.

Political composition of the local council (iv):

- Herfindahl Index, *herf*: Defined as $\sum_{p=1}^{P} SH_p^2$, where SH_p is the share of representatives from party *p*.

- Qualified political majority in the local council, *pol*: A dummy variable indicating if either the socialist parties or the non-socialist parties have more than 2/3 of the seats in the local council.

Description of Six Municipalities

Danderyd, Stockholm

Average income level 1981	87.60
Average income growth rate 1981-1990	0.26
Population 1981	27 842
Net migration rate 1981-1990	-0.03

Kiruna, Norrbotten

Average income level 1981	55.58
Average income growth rate 1981-1990	0.17
Population 1981	29 705
Net migration rate 1981-1990	-0.18

Berg, Jämtland

Average income level 1981	39.96
Average income growth rate 1981-1990	0.23
Population 1981	9 003
Net migration rate 1981-1990	0.01

Borgholm, Kalmar

Average income level 1981	41.39
Average income growth rate 1981-1990	0.19
Population 1981	11 030
Net migration rate 1981-1990	0.08

Sundbyberg, Stockholm

Average income level 1981	58.52
Average income growth rate 1981-1990	0.15
Population 1981	25 717
Net migration rate 1981-1990	0.17

Solna, Stockholm

Average income level 1981	61.28
Average income growth rate 1981-1990	0.12
Population 1981	50 441
Net migration rate 1981-1990	0.02

Socio-economic and demographic structure (v):

- Industry, *industry*: The share of the local industrial structure consisting of agriculture or industry.
- Population density, *dens*: Inhabitants per square kilometers.

- Population aged 0-15 years, *age 0-15*: Share of population aged 15 years or below.
- Population aged 65 years or above, *age 65-*: Share of population aged 65 years or above.
- North, *north*: A dummy variable indicating whether the municipality is located in the northern part of Sweden.

Calculation of *h* for Years 1981-1984

The calculation of the variable *h* for years 1981-1984 is based on the regression $h_{i,t} = \alpha + \sum_{l=1}^{l=6} \beta_l \times h_{i,t-l} + \varepsilon_{i,t}$.

TABLE A1

Parameter	Estimates	t-values
β_1	0.607	5.93
β_2	-0.124	-1.31
β_3	0.018	0.19
β_4	0.468	2.61
β_5	-0.196	-1.29
β_6	0.142	2.05
α	16.639	2.19
R^2	0.999	

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