The Determinants of Economic Growth in the Swedish Mountain Region – the Role of the Forest and Tourism Sector, and Protected Land

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Author:
Tommy Lundgren, Department of Forest Economics, SLU, Umeå

Abstract

This paper investigates the determinants of economic growth and growth patterns in the Swedish mountain area municipalities. Focus is on the effects of net migration, the forest sector, tourism, and protected land. We use a standard panel data setting with data containing 15 municipalities spanning the years 1985 to 2001. System equation GMM estimation results show that: 1) absolute convergence may be applicable ("poorer" regions grow faster than "rich" regions), but there is no evidence for conditional convergence among the mountain municipalities (additional assumption: different steady-states across economies); 2) forest industry employment have a positive impact on local economic growth and vice versa; 3) tourism does not have a significant effect, either positive or negative, on local growth and vice versa; 4) the development of national GDP is important for local economic growth (+), net migration (-), the forest sector (-), and tourism (+); 5) amount of protected land in relation to total land area does not seem to be important for the local mountain economy, except for tourism, where it has a statistically weak negative impact.

Contents

Introduction 1

The main objective of this paper is to study determinants of economic growth, growth patterns, and migration flows in the Swedish mountain area municipalities during the period 1985—2001. The main objective can be divided into three distinct sub-objectives: (i) convergence patterns in economic growth in the region will be assessed (absolute and conditional); (ii) forest sector activity, tourism sector activity and their impact on economic growth will be analyzed; (iii) the effect of protected land on regional economic growth, the forest sector, and tourism, is evaluated.

The Swedish government's decision to increase the amount of protected land, to some extent that will include productive forest land, has created a lively debate of how it will affect communities which are more or less dependent on income from forestry related activities. A fundamental question is whether such policy will hamper economic growth in these communities. Opponents of environmental protection claim that protected lands limit growth opportunities in adjacent communities by locking up potentially valuable natural resources and restricting extractive industries and other business activities. Proponents claim that extractive industries, such as logging and mining, are no longer the backbone of rural economies – instead, the presence of protected lands encourages growth by attracting tourists and potentially new residents through positive net migration. Studies in the US, for example Lorah and Southwick (2003) and Rasker and Alexander (2003), show that protected land has a positive effect on economic development in nearby communities. Jonsson (2004), using a standard growth model à la Barro and Sala-i-Martin (2004) with gross regional production as dependent variable, find that protected land in a part of the Swedish mountain area (8 municipalities) does not have a significant effect on growth during the period 1985—2001. In a study of economic growth and the amount of wilderness land in Norway, Skonhoft and Solem (2001) find a negative relationship; that is, high economic growth is associated with less wilderness land.

The effects of policy aimed at protecting the environment on forestry and local economies have been assessed by Berck et al (2000). Using a multi-county time series approach (VAR) to model the economy in timber-dependent counties in California, they find that there is no evidence that such policy has hampered local economic growth. Instead, it is nation-wide and federal economic growth that matters for local growth and poverty. Jonsson (2004) also try to measure the effect of forest sector business activity (in terms of timber harvesting) on local economic growth in a part of the Swedish mountain region. His results show that, during 1985—2001, there is no evidence that forestry activity (harvesting) have had a positive effect on local economic growth (measured as annual percentage growth in gross regional product).

The empirical literature on economic growth is vast and includes studies with data sets that are country specific, country panels, complete region panels for countries, and incomplete region panels within countries. The latter, that this study belongs to, is not very common. Especially when it comes to sparsely populated sub-urban areas like the municipalities in the Swedish mountain region. Traditionally, empirical analysis of economic growth is performed with the help of a single growth equation, or in some cases a growth equation and a net migration equation (see, for example, Barro and Sala-i-martin, 2004, or Lundberg, 2001). Furthermore, Swedish studies focus usually on the issue of convergence and fiscal or other public/political matters (see, for example, Eliasson and Westerlund, 2003, Aronsson et al, 2001, Lundberg, 2001, or Persson, 1997). In this paper, however, we add two equations to this setting; one for the demand for forest sector labour, and one for the demand for tourism sector labour. As far as we know, this multi-equation approach is novel in empirical growth modelling.[1]

The paper is organized as follows. Next section briefly describes the theory behind the empirical specifications. Section 3 presents some stylized facts from the region; growth rates, employment in tourism and the forest sector, and amount of protected land. Section 4 is devoted to empirical specifications, analysis, and results. Section 5 concludes.

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1 As far as we know, only a few studies, such as Lundberg (2001) and Aronsson et al (2001) estimate growth and net migration equations simultanously.

Theoretical background

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Barro and Sala-i-Martin (2004) and Aghion and Howitt (1998) outline and summarize the theoretical — and to some extent the empirical — work on economic growth. The work span from the neoclassical models with exogenously determined growth, to models with growth generated endogenously developed in the last two decades. Many empirical papers are aimed at testing the neoclassical theory, which predicts convergence in growth across regions.

In this section we briefly outline the basic structure of neo-classical growth theory. We believe this is pertinent to the subsequent analysis, since the issue of convergence, which is central in neo-classical growth theory, will be dealt with in the empirical application. Growth theory proposes that to sustain a positive growth rate of output per capita, in the long-run, continual augmentation of the stock of technological knowledge (technological progress) is necessary (Solow, 1956, Swan, 1956). Assume that aggregate production depends on capital and labour according to a CRTS Cobb-Douglas production function:

$$Y = F(K,L) = L^{1-a}K^{a},$$

with diminishing returns,

$$\frac{dF}{dK} > 0, \frac{d^2F}{dK^2} < 0, \frac{dF}{dL} > 0, \frac{d^2F}{dL^2} < 0.$$

Everybody in the economy supplies one unit of labour per unit of time and there is perpetual full employment. This means L equals the population. The population grows at rate n. In this setting, output per person, Y/L=y, depend on capital stock per person, K/L=k. Then per capita production can be written,

$$y = f(k) = k^{a}.$$

Capital evolves over time according to,

$$\frac{dK}{dt} = sF(K,L) - dK,$$
$$sF(K,L) = I,$$

where s is the rate of saving in the economy, and I is gross investment in capital. In per capita terms, the capital equation of motion is,

$$\frac{dk}{dt} = sf(k) - (n+\delta)k = sk^{a} - (n+\delta)k.$$

Note that the differential equation governing the capital-labour ratio is almost the same as the differential equation for capital. F(K, L) is replaced by f(k), and the depreciation rate is augmented with the population growth, n. Faster growth of the population will tend to reduce the amount of capital per capita in the same way as depreciation would. Under CRTS the absolute size of the economy, K, is irrelevant. Instead, what matters is the relative factor production, k.

Diminishing returns impose an upper limit to capital per person. A point will be reached where all saving is needed to compensate for depreciation and population growth; the steady state. The steady state capital stock, k*, is given by,

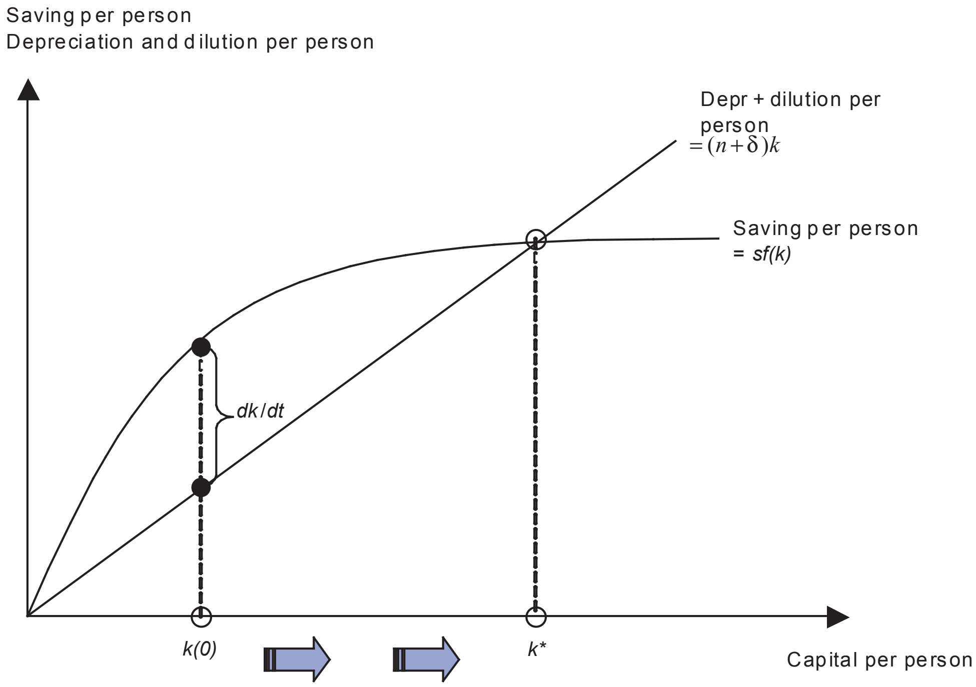

Figure 1. *The Solow-Swan neoclassical growth model.*

$$sk^a = (n+\delta)k,$$

$$k^* = \left[\frac{(n+\delta)}{s}\right]^{\frac{1}{a-1}}.$$

The corresponding steady state level for output per capita is given by $Y = (AL)^{1-a} K^a$. In steady state, output and capital will grow at the rate of population growth. Growth as measured by the rate of increase in output per person will stagnate and cease in the long-run. This model feature does not translate well into reality, where growth rates seem to be positive even in the long-run.

One way of dealing with diminishing returns is to assume exogenous technological change. Assume a productivity parameter A in the production function that reflect current state of technology, and that A grows at the rate g. The exogenously given rate g reflect progress in science. Then we have,

$$Y = (AL)^{1-a} K^a.$$

Writing the aggregate output this way makes technological progress the same as increasing the ”effective” labour force, AL, which grows at rate g+n. The only difference from previous model is that we substitute labour L for ”effective” labour AL, and we raise the ”effective” population growth from n to g+n. By the same reasoning as before, we see that capital and output per capita will approach a steady state. However, in this steady state, output and capital grows at the same rate as the effective population, AL. This means that per capita output and capital, in steady state, will grow at the exogenous rate of technological progress, g.

Consider two countries or regions with the same technologies, and the same values of the parameters that determine the steady state. Then, the country or region that begins with a low level of capital or output per capita must have a higher growth rate. Since $y = k^a$, we have that

$$\frac{dy/dt}{y} = a\frac{dk/dt}{k},$$

and they share the same value of a. Therefore the lagging country (with the lower k) must have a faster growth rate of output per capita. What this means is that the longer k is from k*, the higher the growth rate of capital per capita. This is referred to in the literature as conditional convergence. Convergence is often tested in the literature using the following equation;

$$\frac{1}{T}\log\left(\frac{y_{it+T}}{y_{it}}\right) = x - b\log(y_{it}) + \mathbf{\tilde{a}X_{it}} + \varepsilon_{it}$$

The equation says; growth rates can vary from country to country either because of differences in parameters determining their steady states, the term $\mathbf{\tilde{a}X_{it}}$, or because of differences in initial positions, captured by the term $-b\log(y_{it})$. An estimated value of b > 0 is taken as evidence for conditional convergence. An annual period-to-period model would be formulated as;

$$\log\left(\frac{y_{it}}{y_{it-1}}\right) = x - b\log(y_{it-1}) + \mathbf{\tilde{a}X_{it-1}} + \varepsilon_{it}$$

Here we would assume that economy will reach steady-state every period (in some sense). The above equation is our outset when conducting the empirical analysis. But first we present some stylized facts about economic growth, forest sector activity, tourism, and protected land.

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3 Some stylized facts from the region

This study focus on the 15 Swedish mountain municipalities during the period 1985 to 2001. From north to south, these are; Kiruna, Gällivare, Jokkmokk, Arjeplog, Sorsele, Storuman, Vilhelmina, Dorotea, Strömsund, Krokom, Åre, Berg, Härjedalen, Älvdalen, and Malung. From these municipalities we collect a set of cross-section-time-series variables each consisting of 255 observations in total (a panel data set).

The first problem one encounter when looking at economic growth in a region is what measure to use. Many possible variables could measure welfare; consumption, total production value, different types of income measures, etc. In figure 2 the total per capita income from employment is depicted for the years 1985 and 2001. It is obvious that there is variation across municipalities, with Kiruna and Gällivare showing the highest income levels, and that all show a positive growth in income between 1985 and 2001.

Figure 3 show per capita gross regional product (GRP) for all regions. Here we can see that there is greater variation between regions than in the case of income, and Jokkmokk show relatively larger production values compared to the other regions. This is due to the substantial amount of hydropower production in Jokkmokk. All municipalities, except Åre, have had a positive growth rate of GRP between 1985 and 2001. Why the difference between income and gross regional product? First, gross regional product is measured as value added; that is, the difference from the employment income measure is income from capital,

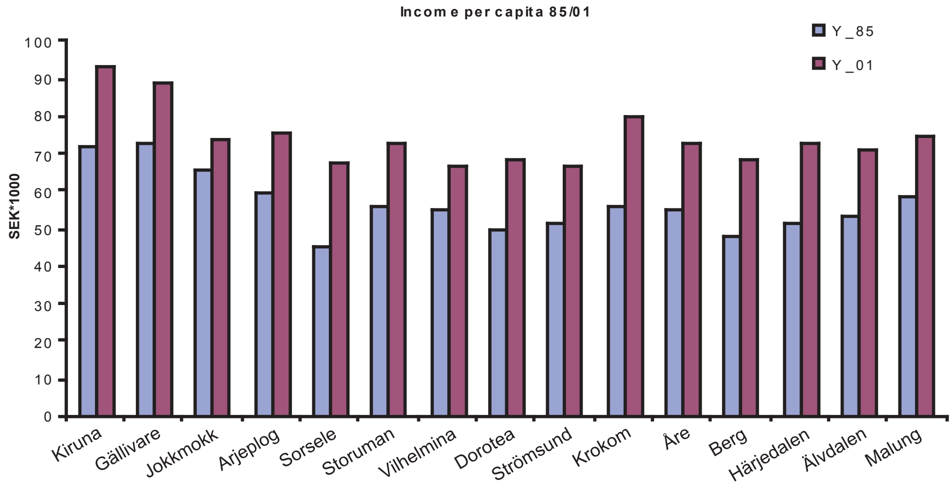

Figure 2. *Income from salary of municipality residents (per capita) 1985 and 2001.*

which in most cases would make per capita GRP different from per capita income. Second, there is also a difference in how the variables are measured; employment income being measured as income of municipality residents, and GRP being measured as value added for the firms located in the region. This means that if a firm suddenly move their HQ from Kiruna to, say, Luleå, then large production values will emigrate from the region. In this case, it will show up in the data as production value losses, even though the main production activitiy is still located in the region. Therefore, we have chosen not to use this measurement as an indicator of regional welfare. Instead we focus on per capita employment income.

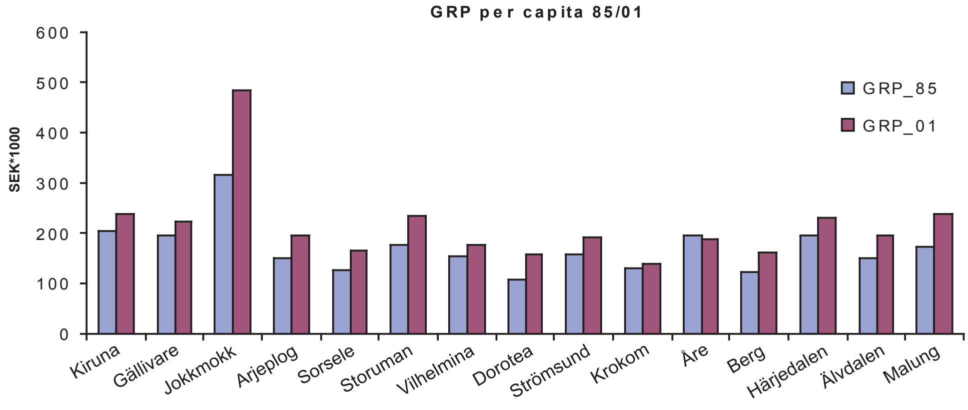

Figure 3. *GRP per capita in 1985 and 2001.*

In figure 3 we depict the regional growth rates between 1985 and 2001 for per capita employment income and per capita GRP. For the whole mountain region; average growth rate of GRP is 1.31%, and the average growth rate of income is 1.60%. Compared to the growth rate for national GDP, 1.59%, we can not find any evidence that the mountain region has lagged behind the rest of Sweden during 1985—2001. At least not if economic growth is measured as growth in per capita income from employment. In this figure it is obvious that the two different measures tells us ”different stories”, and since per capita employment is the more reliable measure, in terms of adequately measuring regional economic activity, we will only focus on this variable as an indicator of economic welfare from now on.

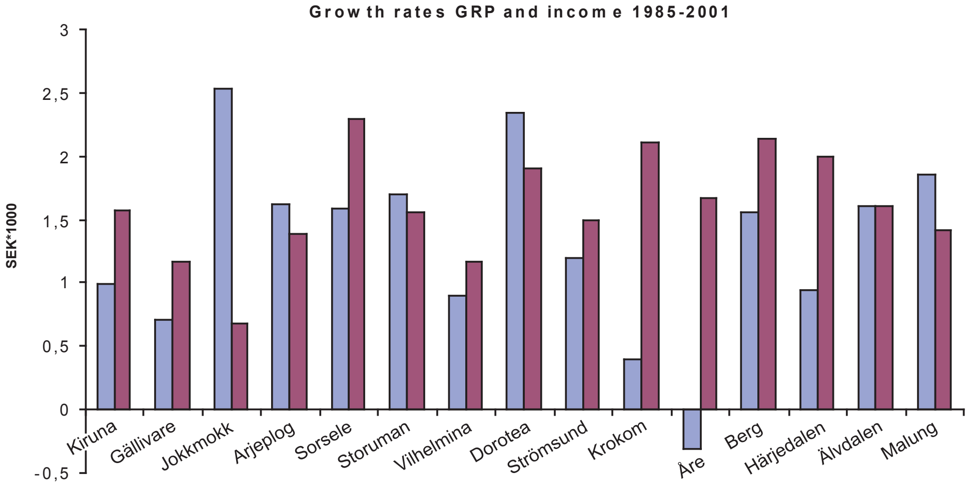

Figure 4. *Annual growth rates for GRP and income from employment 1985 to 2001.*

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Malung	-46	11	-5	48	95	-31	-5	-33	-10	102	-122	-24	-95	-115	-1	-82	-78
Älvdalen	6	16	11	38	-4	101	19	-27	-37	20	-7	-28	-19	-94	-73	-37	-2
Krokom	-58	-97	33	113	77	258	209	122	76	60	-138	1	-81	-208	2	-36	-64
Strömsund	-55	-133	-101	44	50	-24	-24	-89	-38	-45	-110	-92	-133	-104	-172	-159	-165
Åre	64	-58	-1	204	77	81	-13	-33	58	113	11	-18	-138	-100	-40	19	-119
Berg	-15	-49	49	20	80	90	83	-3	-7	3	21	-9	16	-23	59	-42	-47
Härjedalen	-118	-66	2	130	-3	-61	-26	-2	-6	-38	-22	-52	-77	30	-37	-109	-3
Storuman	-75	-92	-115	-94	-44	-102	-16	15	-115	-97	-9	-48	-36	-96	-71	-77	-92
Sorsele	-69	-21	-26	-54	20	-1	-15	-5	5	-34	1	-14	5	-24	-9	-42	-37
Dorotea	-16	10	8	-26	6	9	5	24	40	-122	10	-66	-13	-34	-38	19	-49
Vilhelmina	-52	-55	-92	0	39	-23	-59	-11	62	42	-104	-16	-22	-106	-46	-57	-138
Arjeplog	-3	-100	-21	2	13	-48	-3	0	16	-39	34	-64	-30	-38	-23	-51	-39
Jokkmokk	-12	-48	-10	24	-9	-99	-75	-51	-2	-19	-30	20	-63	-73	-103	-70	-42
Gällivare	-234	-301	-411	-313	-249	-215	-149	-89	29	-250	-276	-288	-290	-358	-419	-437	-289
Kiruna	-457	-249	-292	-370	-156	-417	-173	-144	-56	-270	-436	-274	-348	-172	-361	-511	-494

Table 1. *Net migration in all mountain municipalities 1985-2001.*

Forest industry and tourism sector employed 1985/2001

	Forest industry	*Tourism sector*
All mountain municipalities	11417/5328	5010/5161
Counties		
Norrbotten	2496/835	1736/1397
Västerbotten	2242/998	498/645
Jämtland	4877/2505	1908/2062
Dalarna	1802/990	868/1057
Municipalities		
Kiruna	679/335	859/704
Gällivare	949/263	596/388
Jokkmokk	503/174	166/189
Arjeplog	365/63	115/116
Sorsele	479/197	51/50
Storuman	728/273	191/299
Vilhelmina	638/320	203/239
Dorotea	397/208	53/57
Strömsund	1575/866	207/188
Krokom	831/475	163/273
Åre	527/225	774/770
Berg	663/398	164/188
Härjedalen	1281/511	600/643
Älvdalen	952/480	386/444
Malung	850/510	482/613

Table 2. *Employed in the forest and tourism sector 1985 and 2001.*

About 2% of Sweden's population live in the mountain region and the population density is 1.2 person per km2. Sweden's total population is 9 million, which translates into about 20 person/km2. The mountain region is suffering from depopulation and an aging population. Net migration flows are described in table 1, and employed in the forest sector and tourism sector in table 2. The figures show that there has been considerable negative net migration across all mountain municipalities (except Berg and Krokom where quite a few years are characterized by positive net migration). In the time interval 1985—2001, employed in the forest sector has decreased by 50%, while employed in tourism is virtually unchanged.[2] Some of the decrease in the forest sector is due to technical development in forestry, but a significant part is due to lower harvesting and other activities related to the forest sector.

Figure 5 describe the amount of protected land in each municipality (in relation to total land area) for 1985 and 2001. There

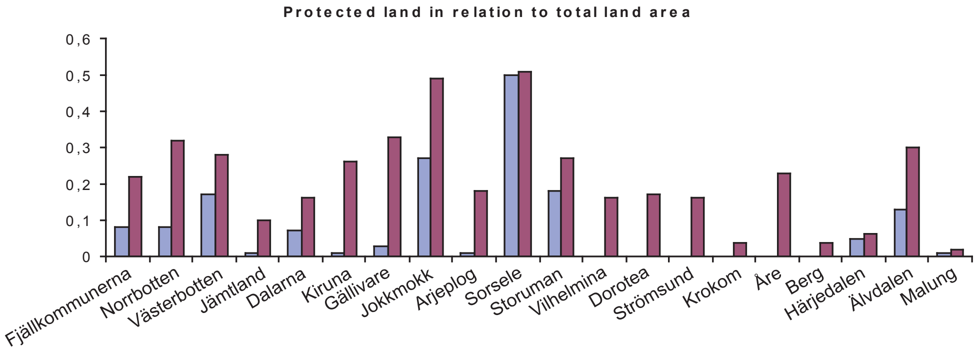

Figure 5. *Protected land in relation to total land area.*

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2 See Appendix 1 for details on sub-sectors included in the tourism sector (SNI-codes).

has been a considerable accumulation of protected land during the period; some municipalities starting at 0% and ending at 20—20%. Protected land in Storuman and Jokkmokk constitutes about 50% of total land. The question is: can we see any effects of the accumulation of protected land on economic growth in the mountain region? As the empirical analysis will reveal, we can not.

Figure 6 shows how initial amount of protected land (1985) and subsequent increases in protected land are related. It seems like municipalities with low protected land to total land area ratios in 1985 have higher growth of protected land in the periods thereafter (two regressions show this relationship; one linear and one non-linear).

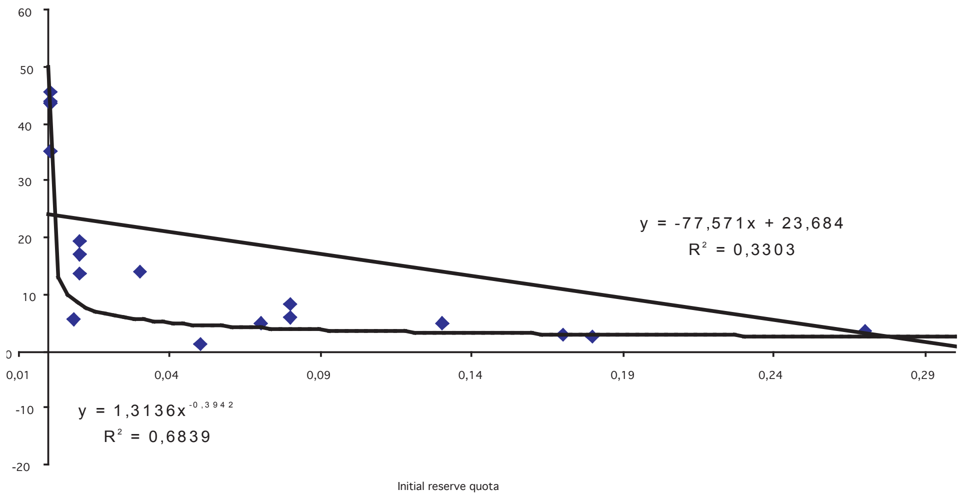

Figure 6. *Protected land accumulation growth in relation to initial reserve quota 1985.*

4 Empirical analysis

This section contains empirical modelling and analysis of data. First, we briefly investigate absolute convergence in a traditional setting (see e.g. Persson, 1997, or Barro and Sala-i-Martin, 2004). Then we proceed to upgrade the econometric model to include more equations, more regressors, and usage of the complete data set. That is, conditional convergence and assessment of the determinants of growth, where focus is put on the forest sector, tourism, and protected land.

When analyzing absolute convergence we assume that all municipalities have the same steady-state level of the economy. Then the growth equation, as discussed in the theory section, becomes,

$$\frac{1}{T}\log\left(\frac{y_{it+T}}{y_{it}}\right) = c - b\log(y_{it}) + \varepsilon_{it+T}$$

Average annual growth between the periods t and t + T depend only on the initial level of per capita income. In figure 7 we depict the relationship between average annual economic growth betweeen 1985 and 2001, and the initial income level 1985. A simple trend line (linear regression) is fitted to the data (R2 = 0.45) which shows that, using this modelling approach, the mountain municipalities are characterized by absolute convergence; those economies relatively poor in 1985 seem to have a larger average annual growth rate during the period 1985-2001.

Next, we want to assess the role of the forest sector, the tourism sector and protected land accumulation, and their impact on economic growth. Also, since the above analysis of absolute convergence is limited to 15 observations (only cross-section), we will now use all time periods between 1985 and 2001 (17 years times 15 cross-sections). To analyze conditional convergence and determinants of growth in the Swedish mountain area, we make use of the standard empirical growth model above (see, for example, Barro and Sala-i-Martin, chapter 11, 2004) augmented with three extra equations for variables which we assume to be determined within the local economy. In addition, the model is modified so that we make use of the complete data set at hand (17 time obs and 15 regions amount to a panel of 255 obs).

In the empirical analysis below, the variables are divided into endogenous variables and variables assumed exogenous. The endogenous variables are assumed to be determined within the local economy, while the exogenous variables are determined externally outside the local economy (the sub-index i denotes

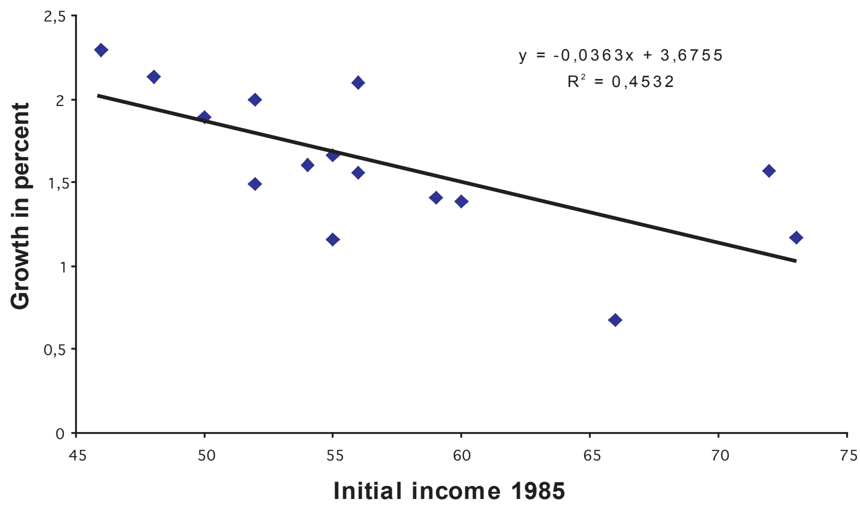

Figure 7. *Absolute convergence in the Swedish mountain municipalities (base year 1985).*

different municipalities, and the sub-index t denotes different time periods). [3]

Endogenous variables (all per capita):

$g_{it} = \log\left(\frac{y_{it}}{y_{it-1}}\right)$ = growth in income from salary

F_{it} = employment in forest industry
T_{it} = employment in tourism sector
N_{it} = net migration

Exogenous variables:

GDP*t* = national gross domestic product per capita
P_{it} = protected land in % of total land
TAX_{it} = tax rate
EDU_{it} = above high school education (per capita)
$DENS_{it}$ = population density; population/total land area
$PRODPOP_{it}$ = part of population at "productive" age (16-65 years)
TIMEt = linear time trend
Djt = a dummy for each county, j = NB, VB, Jämtland, Dalarna.

To simplify the notation, a vector for the exogenous variables is defined as follows;

$\mathbf{X}_{it} = [GDP_t, P_{it}, TAX_{it}, EDU_{it}, DENS_{it}, PRODPOP_{it}, TIME_t]$

Note that all variables in the subsequent analysis, except GDPt and TIMEt, are municipality specific.[4]

Each endogenous variable is represented by an equation which include the other endogenous variables, a vector of exogenous variables (including protected land), and county dummies. Also, the growth equation contains a "convergence" term. The system of equations could be estimated in reduced form, but since we are interested in the partial effects that endogenous variables may have on each other, we have chosen to estimate the complete system (reduced form "effects" of exogenous variables can, however, be calculated from this system by simple substitution if necessary). The complete model equation system is specified as follows:

$$g_{it} = a^g + b^* \log(y_{it-1}) + a_N N_{it} + a_F F_{it} + a_T T_{it} + \mathbf{a}_{ex}\mathbf{X} + \sum_{j=1}^{3} dum_{jg} D_j + e_{it}^g$$
$$N_{it} = b^N + b_g g_{it} + b_F F_{it} + b_T T_{it} + \mathbf{b}_{ex}\mathbf{X}_{it}^{'} + \sum_{j=1}^{3} dum_{jN} D_j + e_{it}^N$$
$$F_{it} = c^F + c_g g_{it} + c_N N_{it} + c_T T_{it} + \mathbf{c}_{ex}\mathbf{X}_{it}^{'} + \sum_{j=1}^{3} dum_{jF} D_j + e_{it}^F$$
$$T_{it} = d^T + d_g g_{it} + d_N N_{it} + d_F F_{it} + \mathbf{d}_{ex}\mathbf{X}_{it}^{'} + \sum_{j=1}^{3} dum_{jT} D_j + e_{it}^T$$

where,

$$b^* = -(1 - \exp(-b))$$

and b is the convergence parameter.[5] The parameter vectors associated with the exogenous variable vector, $X_{i,t,}$ in each equation are, a_{ex}, b_{ex}, c_{ex}, and d_{ex} respectively.

The system of equations specified above is estimated using a panel data instrumental variable approach — Generalized method of moments (GMM).[6] The covariance matrix is robust to heteroscedasticity (in the White sense) and autocorrelation of the first degree. The set of instrument variables is chosen so that they, at time t, are orthogonal to the error terms at time t. In other words, the instruments are assumed to be independent of the vector of error terms.

The estimation results are presented in Table 3 to Table 6. We will comment on some of the results.

Variable	Estimate	Stdev	t-statistic	P-value
Constant	-.228341	.050759	-4.49851	[.000]
$\log(y_{it-1})$	-.041134	.853558E-02	-4.81911	[.000]
F	.804496	.069298	11.6092	[.000]
T	.050230	.090556	.554680	[.579]
N	1.46784	.186987	7.84998	[.000]
GDP	1.70708	.089383	19.0985	[.000]
P	-.312095E-02	.010964	-.284652	[.776]
TAX	-.214817E-02	.217369E-02	-.988260	[.323]
TIME	.320319E-02	.874726E-03	3.66193	[.000]
UTB	-.866470E-02	.133975	-.064674	[.948]
DENS	.744036E-02	.412094E-02	1.80550	[.071]
PRODPOP	.286946	.062978	4.55630	[.000]
D11	.029148	.914745E-02	3.18650	[.001]
D12	.026347	.703226E-02	3.74661	[.000]
D13	.021488	.523662E-02	4.10338	[.000]

Table 3. *The growth equation (R-squared = 0.54)*

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2 Admittedly, some of the exogenous variables are "quasi"-exogenous, i.e., they could very well be defined as endogenous and have their own equation. Any problems of endogeniety are assumed to vanish as we use previous period values of these variables in the econometric analysis.

4 However, this does not mean that they can not be determined to a large extent from factors - such as national policy - outside the municipality. But the long-term levels of the variables can differ across regions.

5 Note that when the time period is 1 year, b* is the same as b. That is, , and in this case T = 1.

6 See, for example, Bond et al (2001) and Blundell and Bond (1999) for a discussion of the use of GMM in economic growth modelling and when estimating production functions.

Parameter estimates presented in table 3 suggests that there is conditional divergence in the Swedish mountain region, which is not in line with the results on absolute convergence presented above. Furthermore, the forest sector parameter is positive and significant indicating that higher employment in the forest sector is good for the local economy. The tourism parameter is also positive but not significant.[7] Other variables that have a positive significant effect on economic growth are net migration, national GDP, and part of population that is in productive age (16-65). Note that protected land does not seem to have any effect on economic growth.

Variable	Estimate	Stdev	t-statistic	P-value
Constant	.151954	.020734	7.32866	[.000]
G	.120531	.024616	4.89654	[.000]
F	-.277514	.019386	-14.3153	[.000]
T	-.511488E-02	.041737	-.122550	[.902]
GDP	-.251247	.046253	-5.43206	[.000]
P	-.358772E-03	.334396E-02	-.107290	[.915]
TAX	-.620486E-03	.732013E-03	-.847644	[.397]
TIME	-.134254E-02	.234817E-03	-5.71738	[.000]
UTB	.036870	.039332	.937402	[.349]
DENS	-.346385E-02	.974369E-03	-3.55497	[.000]
PRODPOP	-.166299	.022326	-7.44882	[.000]
D21	-.015899	.240018E-02	-6.62420	[.000]
D22	-.010363	.202781E-02	-5.11024	[.000]
D23	-.751622E-02	.148918E-02	-5.04723	[.000]

Table 4. *The net migration equation (R-squared = 0.27)*

Net migration is positively affected by local growth. That is, local economy growth seems to attract new residents. GDP, population density, and amount of residents in productive age are negatively correlated to net migration. This suggests that if the overall economy is doing well, people will move from this area of Sweden. Also, municipalities that are relatively dense in their population, and have a relatively large proportion of productive labour, will suffer larger from negative net migration. The results also suggest that protected land does not attract new residents.

Variable	Estimate	Stdev	t-statistic	P-value
Constant	.151954	.020734	7.32866	[.000]
g	.120531	.024616	4.89654	[.000]
T	-.277514	.019386	-14.3153	[.000]
N	-.511488E-02	.041737	-.122550	[.902]
GDP	-.251247	.046253	-5.43206	[.000]
P	-.358772E-03	.334396E-02	-.107290	[.915]
TAX	-.620486E-03	.732013E-03	-.847644	[.397]
TIME	-.134254E-02	.234817E-03	-5.71738	[.000]
UTB	.036870	.039332	.937402	[.349]
DENS	-.346385E-02	.974369E-03	-3.55497	[.000]
PRODPOP	-.166299	.022326	-7.44882	[.000]
D31	-.015899	.240018E-02	-6.62420	[.000]
D32	-.010363	.202781E-02	-5.11024	[.000]
D33	-.751622E-02	.148918E-02	-5.04723	[.000]

Table 5. *The forest sector equation (R-squared = 0.74)*

The forest industry and local growth is positively correlated. The results also suggest that if tourism goes up, forest sector activity goes down. The overall Swedish economy, GDP, acts as a drain on forest sector employment. Interestingly, protected land does not have any statistically significant effect on forest sector employment.

Variable	Estimate	Stdev	t-statistic	P-value
Constant	.067847	.022651	2.99528	[.003]
g	-.014674	.032227	-.455342	[.649]
F	-.620652	.039304	-15.7911	[.000]
N	.373627	.167964	2.22445	[.026]
GDP	.227976	.055946	4.07494	[.000]
P	-.010096	.584239E-02	-1.72801	[.084]
TAX	-.402064E-02	.987627E-03	-4.07101	[.000]
TIME	.835200E-04	.568314E-03	.146961	[.883]
UTB	.067047	.059089	1.13468	[.257]
DENS	-.030399	.152173E-02	-19.9763	[.000]
PRODPOP	.250358	.022534	11.1102	[.000]
D41	-.080803	.368366E-02	-21.9356	[.000]
D42	-.044647	.276970E-02	-16.1200	[.000]
D43	-.029382	.253109E-02	-11.6085	[.000]

Table 6. *The tourism equation (R-squared = 0.63)*

Tourism is positively related to net migration. If people are moving in (out) of the community, tourism employment goes up (down). Protected land is weakly (at 10% level) negatively correlated with tourism employment, i.e., more protected land less tourism.

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7 The model was modified to include tourism slope dummys for Åre, Malung, Kiruna, and Storuman (municipalities with a relatively large tourism sector), but none of the dummy parameter estimates were significant.

5 Conclusions

In this paper we have studied growth patterns and determinants of growth in the Swedish mountain municipalities from Kiruna in the north to Malung in the south. The analysis has focused on the effects on economic growth of forest sector and tourism sector employment, and the amount of protected land (in relation to total land area). Convergence, absolute and conditional, across municipalities is also investigated.

The results on convergence are not conclusive. Traditional growth equation modelling estimates reveals absolute convergence (in line with neo-classical theory); that is, using only the cross-section part of the data and assuming that all sub-regions have the same steady-state level of their economy, the results show that initially poor municipalities seem to grow faster than initially rich municipalities. However, utilizing the complete data set, and assuming that the sub-regions may have different steady-state levels of their economies, the results show divergence in per capita incomes (contradicts neo-classical theory).

Forest industry employment has a positive impact on local economic growth and vice versa, while tourism seems to have no significant effect on economic growth or vice versa. Growth of the overall economy in Sweden, measured as national GDP, seem very important for local economy. It is positively correlated with local economic growth and tourism, while negatively correlated with net migration, and forest sector employment. This means that local tourism employment is determined mainly by non-local factors. Furthermore, the results suggest that tourism employment is not a driving force for local economic growth. A possible explanation of the GDP-forest industry negative correlation is that the forest industry business cycle has a tendency to develop over time counter-cyclical to the overall economy. The negative correlation between net migration and GDP is probably due to the fact that as the overall Swedish economy is booming, people from the mountain area move to where they can find work; for example to cities at the coast such as Umeå, Skellefteå, and Luleå.

The amount of protected land in relation to total land area does not seem to have a significant effect, at least in the period 1985—2001, on local economic growth or on forest sector employment. This has two reasonable explanations: land protected have been either non-productive forest land, such as mountain tops and wetlands, or that the forest land protected was too young for harvesting, and the loss of income is not visible in the data yet. However, future increases in the amount of protected land, that includes productive forest land, may have a negative effect on local economic growth, since forest sector employment is a driving force behind growth. For tourism, however, protected land has a negative impact (at 10% statistical level). This effect may be a result of restrictions to business operations in land areas that are protected for some reason. These results also stand in contrast to findings in the US (see e.g. Lorah and Southwick, 2004) where protected land have been found to attract new residents and to be beneficial to local business activity.

In sum: forest sector activity is more important than tourism for local growth; net migration is positively related to local economic growth and negatively related to the economic growth of Sweden; protected land has had no effect on local growth or forest sector employment, however, tourism may be negatively affected.

An alternative modelling route would be to make use of vector auto-regressions to assess causation between endogenous — and possibly exogenous — variables of interest (see e.g. Berck et al, 2000). This approach would also take into account dynamics in a more thorough and adequate manner. We leave this for future research.

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References

Aghion, P. and P. Howitt (1998), Endogenous Growth Theory, MIT Press: Cambridge, MA, USA.

Aronsson, T., J. Lundberg, M. Wikström (2001), Regional Income Growth and Net Migration in Sweden, 1970 — 1995, Regional Studies 35(1), 823—30.

Barro, R. and X. Sala-i-Martin (2004), Economic Growth, MIT Press: Cambridge, MA, USA.

Berck, P., C. Costello, L. Fortmann, S. Hoffman (2000), Poverty and Employment in Timber-Dependent Counties, Discussion paper 00—52, Resources for the future.

Blundell, T. and S. Bond (1999), GMM Estimation with Persistent Panel Data: An Application to Production Functions, The Institute for Fiscal Studies, Working Paper Series No. W99/4.

Bond, S., A. Hoeffler, J. Temple (2001), GMM Estimation of Empirical Growth Models, Economics Group Nuffield College, University of Oxford, Economic Papers series number 2001-W21.

Eliasson, K. and O. Westerlund (2003), Vad förklarar skillnader i tillväxt mellan svenska regioner?, Institutet för tillväxtpolitiska studier (ITPS).

Jonsson, V. (2004), Avverkning, naturreservat och dess betydelse för ekonomisk tillväxt i åtta fjällkommuner 1985—2001, FjällMistra-rapport 6, SLU, Umeå, Sweden. Also published as a master thesis at the Department of Economics, University of Umeå, Sweden.

Lorah, P., Southwick, R. (2003), Environmental Protection, Population Change, and Economic Development in the Rural Western United States, Population and Environment 24(3), 255—71.

Lundberg, J. (2001), On the Determinants of Average Income Growth and Net Migration at the Municipal Level in Sweden, Working paper 34:2001, CERUM.

Persson, J. (1997), Convergence Across the Swedish Counties, 1911—1993, European Economic Review 41, 1835—52.

Rasker, R. and B. Alexander (2003), Working Around the White Clouds, Sonoran Institute, Tuscon, AZ.

Skontoft, A. and H. Solem (2001), Economic Growth and Land-Use Changes: the Declining Amount of Wilderness Land in Norway, Ecological Economics 37, 289—301.

Solow, R. M. (1956), A Contribution to the Theory of Economic Growth, Quartely Journal of Economics 70:1, 65—94.

Swan, T.W. (1956), Economic Growth and Capital Accumulation, Economic Record 32, 334—361.

Appendix 1

The tourism employment data is calculated by counting the amount of people employed in the following sectors:

SNI92 Keys for tourism employment data
55111 Hotels with restaurant, except conference centres
55112 Conference centres, with lodging
55120 Hotels and motels without restaurant
55210 Youth hostels etc.
55220 Camping sites etc. incl. Caravan sites
55230 Other short-stay lodging facilities
55300 Restaurants
55400 Bars
55521 Catering for the transport sector
61200 Inland water transport
62100 Scheduled air transport
62200 Non-scheduled air transport
63210 Other supporting land transport activities
63301 Activities of tour operators
63302 Activities of travel agencies
63303 Tourist assistance
92320 Operation of arts facilities
92330 Fair and amusement park activities
92340 Other entertainment activities
92520 Museum activities and preservation of historical sites
92530 Botanical and zoological gardens and nature reserves activities
92611 Operation of ski facilities
92612 Operation of golf courses
92722 Operation of recreational fishing waters
92729 Various other recreational activities
52485 Retail sale of sports and leisure goods
5021 Fish farming

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Layout: Anders Esselin, forskningskommunikatör FjällMistra.
E-post: anders.esselin@szooek.slu.se

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