JÖNKÖPING INTERNATIONAL BUSINESS SCHOOL
JÖNKÖPING UNIVERSITY

Regional Growth in Sweden

- A Study of Absolute Convergence among Swedish LA-regions

Bachelor thesis within Economics

Author: ANDERSSON, CAMILLA (840127)
EJSMONT, KAROLINA (840627)
Tutor: JAKOBSSON, ULF
WIBERG, DANIEL

Jönköping DECEMBER 2007

Bachelor Thesis within Economics

Title: Regional Growth in Sweden - A Study of Absolute Convergence among Swedish LA-regions

Authors: Camilla Andersson (840127)

Karolina Ejsmont (840627)

Tutors: Ulf Jakobsson

Daniel Wiberg

Date: 2007-12-20

Keywords: Convergence, absolute convergence, Solow growth model, regional growth, divergence, sigma convergence, income per capita, steady state

---

Abstract

The theory of economic growth predicts that poorer regions will eventually converge towards the income level of the wealthier regions (Barro & Sala-i-Martin, 2004). The aim of this Bachelor thesis is to establish if absolute convergence in Gross Regional Product (GRP) growth rates exists across LA-regions in Sweden during the period 1994-2004. The variables used in the model of absolute convergence are; the level of initial GRP per capita in the year 1994 and the growth rate of GRP per capita. The authors of this thesis find support of absolute convergence among Swedish LA-regions of 1.67 percent per year. Convergence estimations are also performed for high-, mid-, and low-performing groups of regions in respect to their income level per capita. The low-performing group of regions is in fact converging faster towards the income level of the wealthier regions in Sweden than the mid- and high-performing group. Alternative measurement of convergence is the so called sigma-convergence. The authors find that it only holds for the group of high-performing regions. However, this measurement cannot be considered reliable, as the existence of absolute convergence is necessary for sigma-convergence, but it is not sufficient.

.

Kandidatuppsats inom Nationalekonomi

Titel: Regional Tillväxt i Sverige – En Studie av Betingad Konvergens bland Svenska LA-regioner.

Författare: Camilla Andersson (840127)

Karolina Ejsmont (840627)

Handledare: Ulf Jakobsson

Daniel Wiberg

Datum: 2007-12-20

Nyckelord: Konvergens, betingad konvergens, Solow tillväxtmodell, regional tillväxt, divergens, sigma-konvergens, inkomst per capita, jämviktstillväxt

---

Sammanfattning

Ekonomisk tillväxtteori förutspår att fattigare regioner med tiden kommer att konvergera mot samma inkomst nivå som rikare regioner har (Barro & Sala-i-Martin, 2004). Syftet med denna Kandidatuppsats är undersöka ifall det förekommer betingad konvergenstillväxt av Brutto Regional Produkt (BRP) nivåer mellan svenska LA-regioner under perioden 1994-2004. Variablerna som används i modellen för betingad konvergens är den ursprungliga nivån av BRP per capita under år 1994, och tillväxtnivån av BRP per capita under perioden 1994-2004. Författarna av denna uppsats har funnit stöd för betingad konvergens bland svenska LA-regioner med en konvergenstakt på 1,67 procent per år. En estimering av konvergens är därtill utförd för hög-, mellan- och lågpresterande grupper av regioner med respekt till deras inkomstnivå per capita. Den lågpresterande gruppen har en snabbare konvergeringstakt mot den inkomstnivå de rikare regionerna i Sverige har, än vad de mellan- och högpresterande grupperna. Ett alternativt mått på konvergens är den så kallade sigma-konvergensen. Författarna finner att detta mått endast håller för gruppen av högpresterande regioner. Emellertid kan inte detta mått räknas som tillförlitligt, då förekomsten av betingad konvergens är nödvändigt för sigma-konvergens, men det är inte tillräckligt.

Table of Contents

Figures

Tables

Equations

1 Introduction

In this chapter a preface to the topic discussed throughout this thesis is presented together with research problem and earlier studies.

Sweden, as most of the countries in the world does not have perfect equity in income distribution among its citizens. The theory of convergence provides tools to diminish this income gap and reduce the inequality on regional basis.

Sweden is divided into *labor market regions*, LA-regions, which can be defined as geographic areas where people can expect to commute to work (Larsson, 2005). The income level of Swedish workers differs extensively among these areas. Jokkmokk for example, the region with the highest income per worker, has as much as 411 percent more GRP per capita than Pajala, the poorest region in Sweden (SCB).

The concept of how income distribution affects growth has always been subject to discussion. Economists have throughout decades developed models and theories that aim to explain the correlation between income distribution and growth. Previous researches have found that inequality in income distribution have contributed to growth among regions (Barro & Sala-i-Martin, 2004).

Absolute convergence is the process by which poorer economies over time catch up to richer economies in terms of their income or output. This has in empirical studies, such as Tondl (1999) and Persson (1997), been shown to be present among homogenous economies. The concept of convergence is explained with the help of the *Solow growth model* that is founded on the assumption of decreasing returns to capital (Solow, 1956). This implies that with time, divergence in incomes among regions will diminish and the same level of income per capita will be reached. This will occur if regions have the same production function, savings rate, population growth and depreciation of capital. Persson (1997), have found convincing evidence of convergence in per capita incomes among Swedish counties.

Swedish LA-regions can be assumed to be a homogenous group in respect to similar access to capital and other factors of production. According to the Solow growth theory, they should move towards equal level of income per capita (Gullstrand & Hammarlund, 2007).

Gullstrand and Hammarlund (2007) have found that Swedish municipalities in Northern Sweden move towards each other with the annual rate of 1.36 percent and Southern Sweden with 1.25 percent per year. The level of absolute convergence generally lies around 2 percent per year in a homogenous group of economies according to previous researchers, such as Barro and Sala-i-Martin (2004). This will be discussed in a later section of this chapter.

The goal of regional policy in Sweden is to promote growth and decrease divergence among regions in the country (Gullstrand & Hammarlund, 2007). Regional policy is used to induce convergence in income rates among Swedish regions in order to decrease the inequality more rapidly than the absolute convergence rate. Through this policy, the government hopes to increase growth in all regions and therefore boost the total national growth.

1.1 Problem

Concentration of economic activity is not spread equally throughout Sweden. Different growth rates prevail in regions of different size and geographic location. A credible explanation for this is the possibility that regions with a low level of income grow more rapidly than regions with a higher level of income (Gullstrand & Hammarlund, 2007). In order to test this, the LA-regions will be divided into three groups depending on their levels of GRP per capita in the year 1994: high-performing, mid-performing, and low-performing regions (see Appendix). This is performed in order to grasp the different catch-up performance among regions with different levels of income. If the results show that the low-performing regions grow faster, one can expect that regions with low-income levels will eventually catch up to regions with a higher level of income and absolute convergence prevails among Swedish LA-regions, all else equal (Persson, 1997).

1.2 Purpose

The aim of this thesis is to establish if the poorer labor market regions in Sweden in fact grow faster than the richer ones. The research question is:

- Does absolute convergence in GRP growth rates exist across LA-regions in Sweden?

In order to test this research question further, the model of absolute convergence can be modified and expanded for the purpose of this thesis by adding dummy variables. Three dummies are included to represent the authors division of LA-regions into low-performing, mid-performing and high-performing groups. This is conducted by ranking the regions according to their GRP per capita performance. Thus, the second research question is:

- Does the convergence differ between the selected groups?

1.3 Outline

The outline of the thesis is as follows: the next section of this chapter provides an overview of earlier studies concerning the topic of this thesis. In chapter two, economic growth theories will be introduced. In chapter three, the empirical results are presented, explaining the data used in the empirical investigation, as well as explaining the models. Furthermore, empirical analysis will be discussed in chapter four followed by a conclusion in chapter five.

1.4 Earlier studies

Several studies have been made on the concept of convergence across countries, as well as across regions. For example Tondl (1999) and Barro & Sala-i-Martin (2004) have made extensive studies on convergence among countries around the world. In the case of Sweden, Persson (1997), Lundberg (2006) and Gullstrand & Hammarlund (2007) have investigated convergence within the country.

Well known studies have been done by Barro and Sala-i-Martin (1991, 1992 and 2004) on convergence across regions within Japan and USA. They have also investigated the

convergence across regions in eight European countries and found evidence of β-convergence[1] that is consistent with the growth theory (Barro & Sala-i-Martin, 2004). Their research concludes that regions within a country have very similar speed of β-convergence, and the estimated β-value is approximately two percent annually. It would take between 25-35 years to halfway reduce the initial gap in per capita income (Sala-i-Martin, 2004). The convergence studies performed in many countries, as can be seen in Table 1, come to similar conclusions.

Tondl (1999) found absolute convergence among Western Europe during the time period 1950-1960 using regional gross value-added per capita as can be seen in Table 1. The speed of convergence was estimated to approximately two percent per year. Additionally, a time period between 1960 and 1973 was tested with GRP per capita as the income variable. This time, the speed of convergence was estimated to 3.3 percent per year.

In the example of convergence within Sweden as can be seen in Table 1, results show evidence of absolute convergence between counties of approximately four percent during the time period 1911-1993 (Persson, 1997). Persson (1997) has tested for conditional convergence as well. The estimated results show a convergence speed of 2-3 percent annually.

The high speed of convergence found by Persson (1997), compared to the findings of Barro and Sala-i-Martin, can either be explained by; the more mobile capital market in Sweden than in other countries, or that the cost of living has been taken into account (Gullstrand & Hammarlund, 2007).

Extensive study of convergence has been made by Gullstrand and Hammarlund (2007) for Swedish municipalities as well as LA-regions. In their research, average wage level for the time period 1993-2003 and GRP per capita in 2001-2003 have been estimated. The results point on a two percentage convergence speed when average wage level was estimated for municipalities. In the case of GRP per capita, the researchers could not predict any speed of convergence with certainty due to the short time period tested. In the case of LA-regions, the results were inconclusive for both measurements of income.

In the similar manner, the convergence between regions with different wealth in Sweden is explained by Lundberg (2004). In his paper "*Using Spatial Econometrics to Analyze Local Growth in Sweden"* (2004), the occurrence of convergence was tested among Stockholm's surrounding municipalities. In contrast to previous research, Lundberg (2004) found conditional divergence among municipalities around the Stockholm region.

[1] The notion of β-convergence, described by the author's refers to absolute or relative convergence.

Table 1: Earlier studies

Reference	Tested area, period, number of regions.	Comments	Convergence Results (%) Absolute	Conditional
Sala-i-Martin (1996)	USA, 1880-1990, 48.	Tested regions with average wage level.	1.7	
Sala-i-Martin (1996)	Japan, 1930-1990, 47.	Tested regions with average wage level.	1.5	
Sala-i-Martin (1996)	EU, 1950-1990, 90.	Tested countries with GRP per capita.	1.9	
Sala-i-Martin (1996)	Germany, 1950-1990, 11.	Tested regions with GRP per capita.	1.4	
Sala-i-Martin (1996)	UK, 1950-1990, 11.	Tested regions with GRP per capita.	2	
Sala-i-Martin (1996)	France, 1950-1990, 21.	Tested regions with GRP per capita.	1.6	
Tondl (1999)	Western Europe, 1950-1960.	Tested regions with Regions Gross Value-added per capita.	2	
Tondl (1999)	Western Europe, 1960-1973.	Tested regions with GRP per capita.	3.3	
Persson (1997)	Sweden, 1911-1993, 24, average wage level	Tested convergence among Swedish counties	4	2-3
Lundberg (2004)	Sweden, 1980-1999, 271.	Tested neighbouring municipalities around Stockholm, with average wage level.		d
Gullstrand & Hammarlund (2007)	Sweden, 1993-2003, 280, average wage level	Tested municipalities with average wage level.	2	1
Gullstrand & Hammarlund (2007)	Sweden, 1993-2003, 81, average wage level	Tested LA-regions with average wage level.	*	
Gullstrand & Hammarlund (2007)	Sweden, 2001-2003, 280/81, GRP per capita	Municipalities	*	*
Gullstrand & Hammarlund (2007)	Sweden, 2001-2003, 280/81, GRP per capita	LA-regions	*	*

d = studies that found divergence among the tested groups.
* = inconclusive result.
**= misleading results due to short time period tested.

2 Theoretical framework

This chapter of the thesis will be devoted to fundamental ideas of growth theory. The questions of why some regions or countries grow and develop faster than others are concepts that have puzzled economists for decades. Why are income levels different throughout regions or countries and will the inequality diminish eventually? First, Solow's growth theory will be presented to unravel the concept of growth. Secondly, the focus will be put on the concept of convergence as well as divergence and regional approach.

2.1 Solow Growth Model

A frequently debated question in economics is whether incomes per capita in different areas will eventually converge and stabilize on the same growth level or if they with time will differ even more from each other than they did to begin with (Barro & Sala-i-Martin, 2004).

The traditional growth theory states two main assumptions that are relevant for this approach. The first one is the assumption of constant returns to scale which implies that a twofold of inputs to production will generate twice as much output. This assumption prohibits restricted resources like land from the model. The second assumption states that given a fixed stock of labor, the productivity will decrease as the level of capital increases, hence decreasing marginal returns to capital. Further, it is assumed that international trade is absent and technology is given exogenously (Solow, 1956).

The following Cobb-Douglas equation is widely used as the measurement of productivity:

$$Y = K^{\alpha} L^{1-\alpha} \tag{1}$$

There is only one commodity produced and that is output, *Y*. Only the two factors of production; capital, *K*, and labor, *L*, are assumed to be used as inputs to production. The variable α is an output elasticity with respect to capital, whereas $(1- \alpha)$ denotes the output elasticity in respect to labor. These parameters measure the responsiveness of output to a change in capital and labor (Dornbusch, Fischer & Startz, 2004).

Equation (1) can be rewritten in terms of output per capita:

$$y = k^{\alpha} \tag{2}$$

The variables *y* and *k* denote output per capita and capital per capita respectively. Production is very dependent on the accumulation of capital that in turn is dependent on how much is invested (which depends on the rate of savings) and the depreciation of capital, all else equal:

$$K^{*} = sY - \delta K \tag{3}$$

Capital is accumulated at the rate *K** and the amount of income that is not consumed is saved and invested. The rate of savings is symbolized by *sY*. Depreciation of capital occurs in the production process at the rate δ (Dornbusch, et. al., 2004).

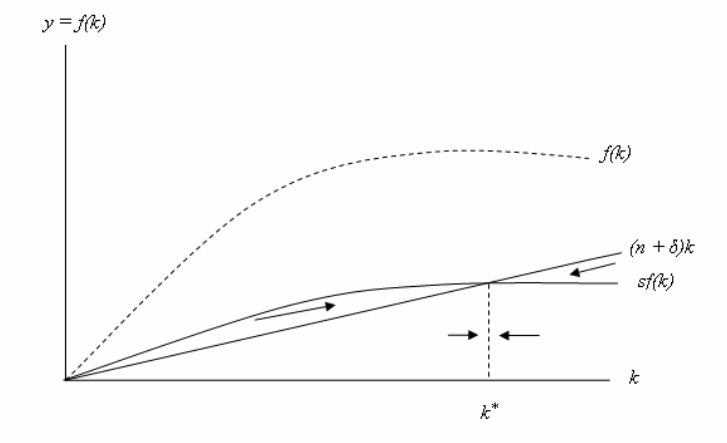
Equation (3) can be rewritten in terms of capital per capita. In order to simplify, the growth rate of the labor force is assumed to be equal to the population growth rate, *n*. This leads to the following equation that indicates capital accumulation per capita, *k**:

$$k^{*} = sy - (n + \delta)k \tag{4}$$

A high population growth will imply that a larger amount of savings is needed to keep the capital-labor ratio constant. Hence, we can conclude that population growth has a negative impact on the accumulation of capital. From these variables it can be deduced how fast an economy moves towards a *steady state* value for the production per capita (Solow, 1956.). This value is reached when all the parameters are constant. The steady state level of output, *y**, is shown by Equation 5 and displayed in Figure 1:

$$y^* = [s / (n + \delta)]^{\alpha/(1-\alpha)} \quad (5)$$

Figure 1 Equilibrium in the Neoclassical Growth model



Source: Todaro & Smith, 2006. p. 137

In equilibrium, the economy is no longer growing in per capita terms, where the steady state implies a combination of output per capita and capital per capita (*k** in Figure 1). At this point, the savings rate equal the investment required to maintain a constant level of capital per capita. If savings are above the steady state level, output will increase over time until the equilibrium is reached. This adjustment works both ways – either with too high or too low investment, an economy will be pushed towards its equilibrium level, as indicated by the arrows in Figure 1 (Dornbusch, et. al., 2004).

Robert Solow (1956) developed this model so it included technological progress, also labeled productivity, *A*. This is exogenous to the model and grows at a constant rate. The equation describing output per worker in steady state will be:

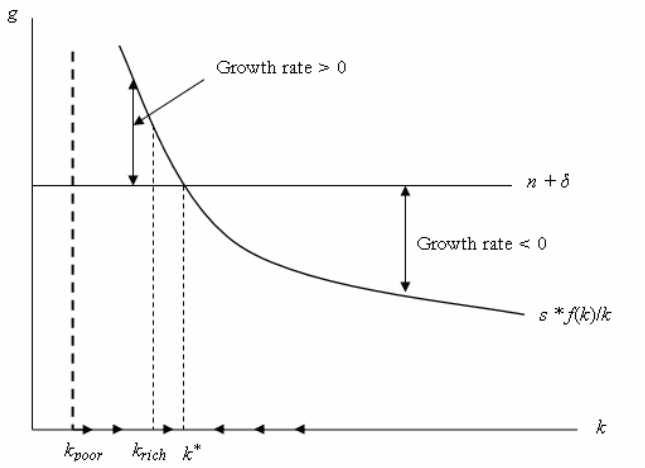
$$y^* = A [s / (n + g + \delta)]^{\alpha/(1-\alpha)} \quad (6)$$

This model differs from equation (5) in the sense that the economy is *growing* at an equal rate as the technological progress. Additionally, it should be mentioned that population growth and change in investments do not affect long-run growth of output per capita. The level of technology is a residual factor in explaining growth in the long run, and hence, growth can only be attained through technological improvement (Dornbusch, et. al., 2004).

2.2 Convergence

The concept of *absolute convergence* implies that due to diminishing returns to capital, poor economies should have higher growth rates than wealthier economies (Barro & Sala-i-Martin, 2004). This states that the economies will eventually catch up to the same level of income per capita. In order to illustrate the path towards the steady state level, two countries sharing the same production function and with the same saving rates, population growth, and capital depreciation will serve as an example (Barro & Sala-i-Martin 2004). The level of initial capital per capita differs between the countries implying that the growth rate is higher for the countries with lower level of initial capital per capita. This situation is illustrated in Figure 2.

Figure 2: Equilibrium in the Solow-Swan model



Source: Barro & Sala-i-Martin, 2004. p. 48

Capital per capita level is determined by the saving curve, $s * f(k) / k$ and the depreciation line, $n + \delta$. Since the countries are assumed to be equal in terms of savings, population growth and capital depreciation, the growth rate will be larger for the countries with initially lower levels of capital per capita. The growth rate, k, is measured by the vertical distance between the two curves. As can bee seen in Figure 2, the poorer country with a lower level of capital per capita, will have a positive growth rate where k will increase towards k^* (Barro & Sala-i-Martin 2004).

Evidence of absolute convergence has been found across the US states over periods from 1840 to 1988 by Barro and Sala-i-Martin (2004). Equivalent results are found for regions in Europe and Japan by the same writers.

However, this theory do not apply for the world as a whole, the economies must be a homogenous group with similar levels of technology, rates of investments, human capital accumulation, and population growth.

In the case of heterogeneous groups of economies, with different levels of the variables mentioned above, hence, different steady state levels, absolute convergence cannot be present. *Conditional convergence* can be explained as convergence of income towards its own steady state level. The country is anticipated to grow faster, the further below its own steady state level the country is (Barro & Sala-i-Martin, 2004).

The concept of convergence can be absolute or conditional as stated earlier. β-convergence is defined by Barro and Sala-i-Martin (2004) and can be explained as poorer economies grow faster than wealthier ones. Another measurement of convergence that is widely used is the concept of *sigma convergence* (also referred to as σ-convergence). This is defined as reduced divergence of GDP per capita across a group of countries or regions. Absolute convergence is a necessary condition for sigma convergence; however, it is not a sufficient one for reasons discussed in the next chapter.

2.3 Regional Approach

The main assumption of the Solow growth model, described in previous section, is that capital is characterized by diminishing marginal productivity. This implies that the accumulation of capital will lead to an increase in the total production while the output per capita is decreasing (Dornbusch, et. al., 2004).

The theory also states that the technology is available to everyone. Therefore, if a new technology is imposed in a region, all the economic players will be able to take advantage of it. It does not take into account the fact that differences in regional incomes can be explained by divergence in the technology available among regions. All the economic actors are also assumed to have identical preferences and institutions which implies that the amount of savings that control the amount of investment do not differ between the regions. This implies according to the growth theory, that regional differences in incomes per capita can simply be explained by the amount of capital per capita (Gullstrand & Hammarlund, 2007).

The amount of capital per capita cannot increase infinitely. Eventually a point is reached when more capital cannot increase production and the income per capita will reach its maximum level. The low-income regions will be able to increase their production faster than high-income regions and by that reach their level of income per capita. The rate at which the regions converge depends on how the population, capital per capita and savings rate develop:

- High population growth will decrease the income per capita growth.
- Depreciation of capital has a negative impact on regional growth.
- Increase in the rate of savings will lead to more investments that promote growth.

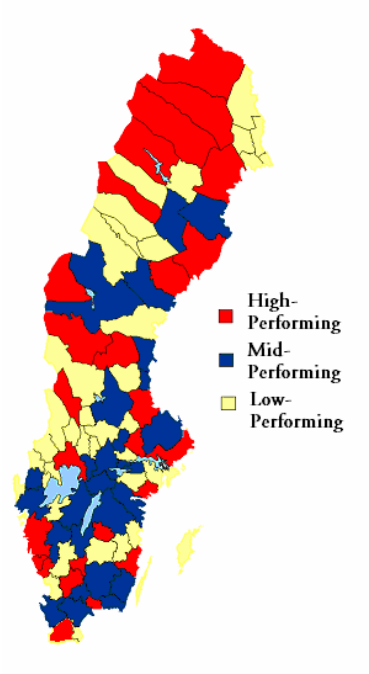
The classical growth theory can be extended to include human capital and technological progress. If the theory includes technological progress, individuals can increase their income per capita without changing the capital per capita level. This is possible due to the fact that the existing capital can be made more efficient with the help of the new technology so that the level of production can increase. If human capital is endogenous to the model, the income level per capita can be increased not only through the accumulation of physical capital, but also if human capital in the society rises (Martin & Sunley, 1996). Allthough these variables are added, the model still predicts diminishing productivity, hence absolute convergence between regions, so that the income levels will rise until all the regions have the same income level per capita (Gullstrand & Hammarlund, 2007).

The weakness of this model is its assumption that the only difference between the regions is the level of production. The lower this level is the higher is the potential to grow due to the possibility to acquire more units of capital and by that, increase production. If for

example savings rate, consumption or political decisions differed between regions, there would be no possibility for the regions to converge (Gullstrand & Hammarlund, 2007).

Figure 3 demonstrate the division of Swedish labor market regions into three groups according to their income level per capita in the year 1994, which has been used as a base year throughout this thesis. The groups are labeled as the high-, mid-, and low-performing regions and can be seen in Appendix for further study.

Figure 3: The division of Sweden into high-, mid-, and low-performing groups



Source: Authors own construction after NUTEK (2005) division of Sweden into LA-regions

Swedish LA-regions differ a great deal in respect to income levels per worker. The average income per capita among the high-performing group of 27 regions is 209922.8. This is as much as 151 percent higher than the average income level of the low-performing group also consisting of 27 regions that has an average income level per capita of 138855.3 (see Appendix for specification). Income level among the Swedish labor market regions is obviously unequally distributed in per capita terms. As convergence theory states, poorer regions will grow faster than wealthier ones given some level of homogeneity and by that eventually catch up to their performance (Gullstrand & Hammarlund, 2007).

As income differences exist among regions in Sweden, catch up performance can be anticipated. This provides an opportunity for the regions to eventually reach the joint level of income per capital that is higher than the initial level of income, all else equal.

2.4 Divergence

In the previous section, the Solow growth theory stated that the convergence of income levels was possible due to the assumption of diminishing returns of capital. In this section, the endogenous growth theory will be introduced. This theory takes into account other variables than physical capital as explanations for growth.

A different interpretation of the Solow growth model is made by Romer (1986). He expands the theory by adding human capital to the production function. The consequence of this is that the productivity of capital no longer needs to diminish as the accumulation of capital increases.

The endogenous growth theory does not predict convergence between the income per capita levels that the Solow growth theory predicted in the previous section. Instead more focus is put on the level of human capital. This is due to the assumption that the level of human capital creates new knowledge which is the engine of growth. Progressive acquirement of knowledge will lead to higher growth that is never-ending (Romer, 1986). The theory makes it possible to explain divergence in income levels within the regions by the acquirement of human capital. Growth is positively correlated with investments in R&D, and it is thereby possible to explain differences between income levels within regions by diversity in education (Martin & Sunley, 1996).

The weakness of this model is that empirical studies have not been able to verify that the productivity of capital could increase or be constant over time (Martin & Sunley, 1996). It is therefore difficult to explain the differences in long-run growths between regions.

The alternative to explain increasing diversity in growth rates between regions is to make technological progress endogenous to the model (Romer, 1990). Companies are assumed to hold some market power which implies that they can easier diversify their products from the competing firms. The imperfect competition leads to high mark-up prices paid by the consumers that generate high profits for the companies. Higher proportions of these profits will be spent on R&D that in turn will have some spillover effect on other firms and contribute to growth and development of the region.

Due to increasing R&D investments generating positive outcomes such as the development of new products, differences in regional growth can be explained by differences in the returns of R&D investments among regions. Possible reasons for this:

- The geographic location of the company. Companies in different regions have different proximities to the market.
- Business structure differs between regions and branches; if a company enjoys larger market power, it will also enjoy larger returns.
- Regions have different qualities of R&D.

A reason for divergence could be that economic activities tend to concentrate. This agglomeration makes it easier for innovations and knowledge to spread, which implies in turn that some regions grow faster than others (Fujita & Thisse, 2002).

3 Empirical Study

The previous chapter provided the necessary theories for understanding the fundamental logic behind convergence among countries and regions. This chapter will investigate empirically if regions in different parts of Sweden move towards an equal level of income per capita. In other words, the analysis will reveal if there is any support for the assumption of absolute convergence of incomes throughout Swedish LA-regions.

3.1 Method

First and foremost, the analysis is based on the data from the years 1994 to 2004. These years have been chosen as reference points due to the fact that no earlier data for GRP could be found. However this time period will give a fair view whether convergence takes place within regions or not.

Studies in this field use different measurements to describe the productivity per capita. The average income level for every municipality can be applied as the dependent variable for this analysis, it is however a variable that measures the income level of the citizens in the municipalities and does not account for the income earned by the workforce that commutes to work. This can affect the data if a large part of the regional workforce commutes to work. To avoid this problem, wage rate per capita can be used to capture productivity. The variable is a measurement for the income per employee for the municipality/region where the individual works (Gullstrand & Hammarlund, 2007).

Throughout this thesis, Gross Regional Product (GRP) will be used as a measurement of the regional production value. This variable is consistent with absolute convergence theory due to the fact that it takes into account both the compensation to the labor force and ownership of capital. However, practical issues also exist with this measurement. When regions are small, as on the municipality level or LA-regional level, then problems can occur with the geographical distribution of GRP. However, it is still assumed to be the measurement that captures production value in the most fitted way for the purpose of this thesis (Gullstrand & Hammarlund, 2007).

Secondly, division of Sweden into LA-regions is made due to their introvert nature. This implies that political actions in these areas are spread only throughout the municipalities within the same area (Cheshire & Magrini, 2000). Furthermore, this indicates that neighboring municipalities affect each other and the use of LA-regions will then reduce this possible problem.

The concept of convergence in GRP growth rates on regional level throughout Sweden has been subject to previous studies such as Persson (1997), Lundberg (2006) and Gullstrand & Hammarlund (2007). After a brief review of this research, an extension will follow with previous works in the field by dividing Sweden into three parts, as discussed earlier in the thesis. This will be a way to untangle the question of converging income-levels.

This analysis is carried out in three stages; (1) a regression analysis is performed to verify if the regions are converging in GRP growth rates. Are the poorer regions growing faster and catching up with the richer ones? (2) an extended model of absolute convergence is applied in order to capture the high-performing, mid-performing and low-performing regional differences. This is done in order to compare the converging rates within the groups. (3) a test for the existence of sigma-convergence is done in order to see if the divergence between regions is decreasing or increasing.

3.2 Data

This section will explain the data used in the empirical investigation. β-convergence is defined in chapter two as a concept of both conditional and absolute convergence. However, since regions in Sweden can be regarded as homogenous, absolute convergence will be the most appropriate approach. Throughout this thesis, when discussing β-convergence, references to absolute convergence are done.

The data material used consistently in this thesis originated from the time period between 1994 and 2004. Originally, the data was divided into 289 Swedish municipalities. However, each data set is summed up to the 81 LA-regions. All the data used is provided by SCB. The variables used in the cross-sectional regression equation are explained in Table 2.

Table 2: Variable Description

Variables	Definition
Growth rate, $Y_{i,T}/Y_{i,0}$	The dependent variable in the regression is the growth rate in GRP per capita for the time period 1994 – 2004, where $Y_{i,T}$ is the GRP per capita in 2004 and $Y_{i,0}$ is the GRP per capita in 1994.
GRP, $Y_{i,0}$	GRP per capita in 1994 is the initial GRP per capita and is the independent variable in the regression, which the focus is put on since its parameter gives the answer to the research question. If the parameter for initial GRP is positive, it implies that the higher a regions initial GRP is, the slower the GRP growth rate is.
Dummy variables, D_1, D_2, D_3	The LA-regions are divided into three groups according to their level of GRP per capita, and a dummy is created for each group, to see possible variations within the groups D_1 represents a high-performing group of regions, D_2 represents the mid- performing group of regions, and D_3 represents the low-performing group of regions, in terms of their level of initial GRP per capita.
Convergence coefficient, β	The convergence coefficient, β, indicates the speed of convergence, in percentage terms.
Speed of convergence, in years, h	The speed of convergence, h, indicates how many years it will take for the regions to eliminate half of the gap to their common steady state level.
Constant, α	Denotes a constant in the regression analysis

3.3 Model of Absolute Convergence

The model of absolute convergence is widely used for the purpose of determining convergence rates among regions. This model will be used to observe if there is any support for the assumption of absolute convergence of incomes throughout Sweden. This is estimated by the equation:

$$\ln\left(\frac{Y_{i,T}}{Y_{i,0}}\right) = \alpha - \beta \ln Y_{i,0} + \varepsilon_i \tag{7}$$

Where $(Y_{i,T} / Y_{i,0})$ shows the growth rate of GRP, α and β are the estimated parameters of this regression, while ε_i is the error term. With the help of the estimated coefficient β, that indicates the convergence in GRP growth rates across regions, the speed of regional convergence will be calculated. A positive β-coefficient implies that regions with low initial GRP per capita have higher growth rates. The model used in order to calculate the speed of convergence is:

$$(1/T)\ln\left(\frac{Y_{i,T}}{Y_{i,0}}\right) = x + \left[\frac{\left(1-e^{-\beta T}\right)}{T}\right]\ln\left(\frac{Y^*}{Y_{i,0}}\right) + \varepsilon_{i0T} \tag{8}$$

The variable $(1/T)\ln(Y_{i,T} /Y_{i,0})$ shows the GRP growth from the year 1994 to 2004, $\ln(Y^*/Y_{i,0})$ indicates the production gap per capita for region *i* to the average production per capita, Y^*. The coefficient $(1-e^{-\beta T})/T$ illustrate the speed of convergence.

In reality, it is hard to find an exact value of the per capita steady state. To be able to test equation (8) empirically, the intercept can be written as:

$$\alpha \equiv x + \left[\frac{\left(1-e^{-\beta T}\right)}{T}\right]\ln\left(Y^*\right) \tag{9}$$

Equation (8) is simplified to:

$$(1/T)\ln\left(\frac{Y_{i,T}}{Y_{i,0}}\right) = \alpha - \left[\frac{\left(1-e^{-\beta T}\right)}{T}\right]\ln\left(Y_{i,0}\right) + \varepsilon_{i0T} \tag{10}$$

The intercept, α, explain the steady state level of production and β point out the level of production that disappear on yearly basis.

If the term $((1-e^{-\beta T})/T)$ in equation (10) turns out to be negative, conclusion will be made that the regions with lower per capita GRP tends to grow faster than the regions with higher per capita GRP. Thus, regions converge to a common level of income per capita. (Barro and Sala-i-Martin, 2004)

In order to calculate the time required for one half of the initial per capita GRP from its steady state value to be eliminated, the following equation will be used:

$$h = \ln(2)/-\ln(1-\beta) \tag{11}$$

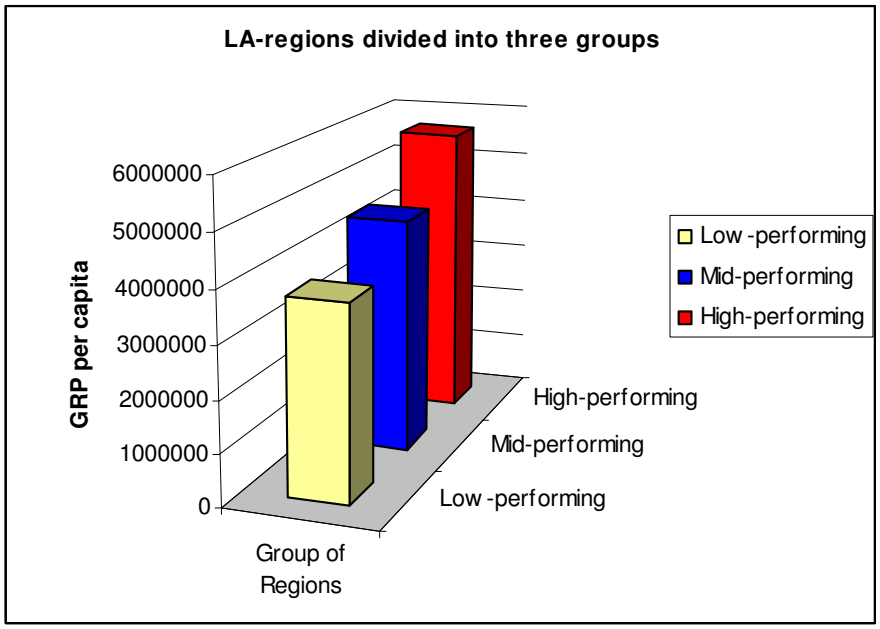
3.4 Extended Model of Absolute Convergence

In order to investigate convergence rates among groups with different levels of income per capita the model of absolute convergence can be extended with dummy variables indicating different levels of GRP per capita. The simplest way to address this is by introducing regional dummies to equation (7). The extended equation is:

$$\ln\left(\frac{Y_{i,T}}{Y_{i,0}}\right) = \alpha - \beta_1 \ln\left(Y_{i,0}\right) + \beta_2 D_1 + \beta_3 D_2 + \beta_4 D_3 + \varepsilon_i \qquad (12)$$

By expanding the original model with dummy variables, different groups of regions can be analyzed in respect to their catch-up performance. Three groups of regions were formed based on their level of GRP per capita, high-performing, mid-performing and low-performing regions. The difference between the groups in respect to their income level per capita can be seen in Figure 4.

Figure 4: GRP per capita in 1994



Source: Authors own construction with data for GRP per capita 1994, retrieved from SCB

Based on the theory of absolute convergence stated in chapter two, one can assume that the poorer a region is at the initial stage, the faster it should grow. By assigning dummy variables for these three groups, possible fixed growth effects for these groups can be distinguished, thus indicating whether a group of regions is converging faster or slower than the reference group. The dummy coefficients in equation (12) indicate the groups' deviation from the intercept of the reference group.

3.5 Regression Results

Equation (10) and (12) was estimated and analyzed through a cross-sectional OLS regression analysis. The results of the OLS-estimation of both the model of absolute convergence, equation (10) and the extended model of absolute convergence, equation (12), are presented in Table 3. The presence of autocorrelation is ruled out since the DW-value is between 1.49-1.53.

Table 3: Regression Results from OLS estimation of absolute convergence

Variables	All Regions	High-Income	Mid-Income	Low-Income
α	2.217064	2.535797	2.211796	2.757957
t-stat	(3.171643)	(2.699849)	(3.144400)	(2.948132)
β	0.016739*	0.0199826*	0.0167112*	0.0220963*
t-stat	(2.653070)	(2.300909)	(2.633185)	(2.570753)
Dummy-value	-----	-0.018107	-0.007268	0.030254
t-stat	-----	(-0.511093)	(-0.276331)	(0.871707)
F-value	64.18841	64.32382	64.22804	64.58105
Durbin-Watson stat	1.508771	1.538096	1.495732	1.504989
R^2	0.081809	0.091300	0.085350	0.064711

*=Significant at 5 % level. (1.658)

Explanation of the variables used in the regression analysis can be seen in Table 2. With 81 observations, the t-critical value is 1.658 at 5 percent significance level. So, when comparing the t-statistics the β-values are significant at the 5 percent level, when comparing the F-values to the critical F-value, the 5 percent significance was considered appropriate. For the country as a whole, the critical F-value is 4.00, with the numerator=1 and denominator=79, and for the groups of regions the critical F-value is 2.76, with the numerator=3 and denominator=77 (Gujarati, 2002).

The R^2 values of this regression analysis, as can be seen in Table 3, are somewhat low. However, in comparison with earlier studies such as Sala-i-Martin (1996) it is not unusual in this kind of studies. The R^2 values in Sala-i-Martin's absolute convergence analysis are for example the world as whole, the OECD countries, US states, Japan and Europe varies between 0.005 and 0.02.

3.6 Convergence Results

The obtained results from the estimation of the β-coefficient are shown in Table 4 and indicate that significant convergence in terms of per capita GRP has taken place in regions over the studied time period, 1994-2004. The model of absolute convergence, equation (10) is used to obtain the results of the β-coefficients for all regions. Additionally, the extended model of absolute convergence, equation (12), is applied to gather the results of the β-

coefficients of the high-, mid-, and low-income groups. Equations (7) and (8) in section 3.3 are used to calculate the speed of convergence.

Table 4: Calculated Absolute Convergence within Swedish LA-regions 1994-2004

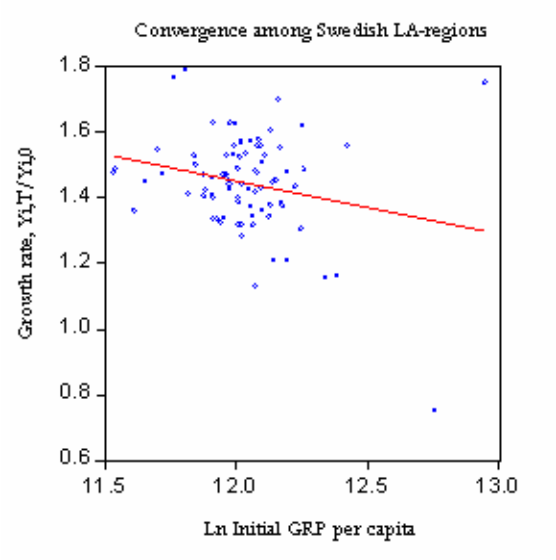
	Speed of convergence β	Speed of convergence h In years	Coefficient of variation
All regions	0.016739	41.41	0.2525<0.273523
High-performing	0.0199826	34.69	0.329784>0.309119
Mid-performing	0.0167112	41.48	0.03377<0.07732
Low-performing	0.0220963	31.37	0.117676<0.125937

In Table 4, it can be seen that there is absolute convergence between the regions in Sweden, shown by the speed of convergence coefficient, β. When comparing all the regions in Sweden the convergence speed is approximately 1.67 per cent per year, and it will take nearly 41.5 years to close half the gap to the steady state level of income between the regions within Sweden.

By dividing the country into three parts, high-performing-, mid-performing-, and low-performing regions, specific groups of regions have different speed of convergence. As can be seen in the table, convergence takes place in all three groups, with different speed depending on how well off the regions are. For example, in the low-performing group, the speed of convergence is approximately 2.2 per cent per year, and it will take almost 31.5 years to close half the gap between the regions within the group and the rest of Sweden. The speed of convergence in the high-performing group is about 2 per cent per year, and will close half the gap between the regions within the group and the rest of Sweden in almost 35 years. The mid-performing regions have the speed of convergence of 1.6 per cent per year, and will close half the gap between the regions within the group and the rest of Sweden in approximately 41.5 years.

In Figure 5 the growth rate versus the initial GRP per capita is presented. The log of the GRP per capita for 1994 is depicted on the horizontal axis, whereas the vertical axis plots the corresponding growth rate of per capita GRP from 1994 to 2004. The figure indicates existence of β-convergence among the Swedish LA-regions. Since the slope of the regression line points on a negative relationship between the variables, convergence occurs, although the fit is not perfect (Todaro & Smith, 2006).

Figure 5: Growth rate vs. initial GRP per capita



3.7 Sigma Convergence

Sigma convergence is closely related to absolute β-convergence and can be derived by rewriting equation (10) in discrete time, corresponding for example to annual data, as:

$$\ln(Y_{i,T}) = \alpha - (1-\beta)\ln(Y_{i,T-1}) + \varepsilon_{i,T} \tag{13}$$

Taken the variance of both sides, equation (13) can be written as:

$$\sigma^2_{Yt+T} = (1-\beta)^2 \sigma^2_{Yt} + \sigma^2 \varepsilon \tag{14}$$

Sigma convergence is observed when:

$$\sigma_{Yt+T} < \sigma_{Yt} \tag{15}$$

These equations make it easy to see the existence of β-convergence, and that it can generate diminishing dispersion, hence σ-convergence. The existence of β-convergence is necessary for σ-convergence, but it is not sufficient. This is due to the fact that σ-convergence depends on the variance of the error term, so even if the long-run steady state dispersion falls with β, it will rise with the variance of the disturbance term. This will lead to the consequence of that even though absolute convergence may be present, the dispersion between regions can be increasing ($\sigma_{yt+T} > \sigma_{yt}$). If the initial dispersion is below the long-run steady state value, dispersion may rise over time, even though β-convergence is present (Martin & Sunley, 1996).

Table 5: Sigma Convergence Results

	Mean	Standard deviation	Coefficient of variation	Median	Maximum	Minimum
All regions 1994	171977.1	43690.52	0.2525	165693.7	418834.6	101836.2
All regions 2004	247346.0	68076.24	0.273523	242384.7	733345.2	149784.5
High 1994	209922.8	53892.56	0.329784	192359.2	418834.6	177156.7
High 2004	296271.7	93327.66	0.309119	274453.6	733345.2	227047.1
Mid 1994	167153.3	5751.625	0.03377	165693.7	176224.9	158453.7
Mid 2004	242189.4	19082.72	0.07732	243626.5	274487.1	197635.7
Low 1994	138855.3	16651.26	0.117676	143692.9	156773.2	101836.2
Low 2004	203576.8	26126.28	0.125937	207231.2	242384.7	149784.5

In the table above, all the values necessary in order to investigate the regions' GRP per capita and the corresponding σ-convergence are shown. The region in Sweden with the highest GRP per capita (418834.6) which is 411.3 per cent higher than the region in Sweden with the lowest GRP per capita (101836.2) in 1994, and in 2004 the difference between the highest performing region (733345.2) is 489.6 per cent higher than the lowest performing region (149784.5). This would suggest that the richer regions are growing faster than the smaller regions, which also can be seen by the coefficient of variation (0.2525<0.273523).

When comparing only the high performing group of regions the highest performing region with the GRP per capita of 418834.6 is 236.4 per cent higher than the region within the group with the lowest GRP per capita (177156.7) in 1994, and in 2004 the highest region within the group (733345.2) is 323 per cent higher than the lowest performing region within the group (227047.1). This high performing group of regions clearly have convergence toward the steady state level, which is also proven by the coefficient of variation (0.329784 >0.309119).

The highest performing region in the mid-performing group has the per capita GRP of 176224.9, which is 111.2 per cent higher than the lowest performing region of the group (158453.7) in 1994, and in 2004 the highest performing region of the group (274487.1) is 138.9 per cent higher than the lowest performing region of the group. So, in this group, again, there is divergence against the rest of Sweden, and not convergence, when looking at σ-convergence, which is proved by the coefficient of variation (0.03377<0.07732).

In the low-performing group of regions, the highest performing region has the GRP per capita of 156773.2 in 1994, which is 153.9 per cent higher than the region with the lowest per capita GRP (101836.2). In 2004 the region within the group with the highest GRP per capita (242384.7) is 161.8 per cent higher than the region within the group with the lowest GRP per capita (149784.5), which again illustrate a diversion, and not conversion, of the group against the rest of Sweden, which also is proved by the coefficient of variance (0.117676<0.125937).

4 Analysis

This chapter will provide the reader with a careful examination of the estimated results obtained in chapter three and connect them to convergence theory presented in chapter two.

The parameter for initial GRP, $Y_{i,0}$, in the regression analysis indicates absolute convergence since the group of regions are considered homogenous. Barro and Sala-i-Martin (2004) have in earlier studies proved that absolute convergence holds for homogenous groups of economies.

Since the OLS-estimation results of equation (10) and (12) have positive β-values, the GRP per capita growth rates across the Swedish regions, as well as between the regions within the three groups (high-, mid-, and low-performing regions) have converged toward the common steady state level from 1994 to 2004.

With the positive β-values, there is clearly β-convergence among the regions in Sweden, meaning that the GRP per capita in the poorer regions are growing faster than the GRP per capita in the richer regions. The low-performing group will reach half way to the steady state level in 31.5 years, the mid-performing group in 41.5 years and the high performing group in 35 years. The low-performing group of regions will reach the common steady state level faster than the other two groups.

Barro and Sala-i-Martin (1991) studied the β-convergence for the USA during a different ten year time period. In their study they could see that the states were converging at a speed of between two and three per cent per year. Tondl (1999) did a similar study of different regions in Europe, and found the speed of convergence to be between two and three percent per year, which is the same as Barro and Sala-i-Martin found in USA. With a β-value of 0.02 (two percent speed of convergence), it takes approximately 35 years for the regions/states to eliminate half the production gap (Tondl 1999).

The σ-convergence results that were found in the regression do not show the same result as the β-convergence results. This does not mean that the results are misleading from the regression, since the existence of β-convergence is necessary but not sufficient for σ-convergence. As β-convergence depends on the parameter of the initial GRP, $Y_{i,0}$, whereas σ-convergence depends on the variances, they can provide different results.

For σ-convergence to hold, the coefficient of variation must be higher in the initial year (1994) than it is in the later year (2004), which only holds for the group of high-performing regions ($0.2525<0.273523$). In the regression for the Country as a whole the coefficient of variation in 1994 is smaller than in 2004, ($0.2525<0.2735$), which states that the divergence is greater in the later year than in the initial year. This does not mean that the divergence is growing between the regions, due to the specific problems of measuring the σ-convergence. The mid- and low-performing group also indicate greater diversion when comparing the coefficients of variation ($0.03377<0.07732$, and $0.117676<0.125937$ respectively).

The estimation performed in this thesis has reached similar results as earlier studies of convergence in Sweden, the speed of 1.67 percent annually. The speed of absolute convergence is approximately two percent annually among municipalities in Sweden (Gullstrand & Hammarlund, 2007). When conditional convergence was tested among Swedish counties, Persson (1997) reached results of 2-3 percent per year as can be seen in Table 1.

The second approach of this research is focused on how groups with different income level perform in respect to convergence speed. As stated earlier in this section, low-performing regions are found to grow faster than high-performing regions in Sweden. The convergence speed of low-performing regions is found to be 2.2 percent per year, whereas the group of high-performing is converging with a slightly slower speed of approximately 2 percent.

5 Conclusion

All the regression results estimated in the previous chapter describe absolute convergence among Sweden's regions. Even though the σ-convergence results do not show any catch up performance, the estimations of β-convergence proves that there is in fact convergence among the Swedish LA-regions. This is due to the fact that β-convergence is not necessary for σ-convergence to occur, meaning that the σ-convergence results might be miss-leading in some researches, as is the case in this thesis.

The results of this thesis are in line with the results of previous research. For example Gullstrand & Hammarlund (2007) found the speed of convergence of 2 percent per year among municipalities in Sweden, and Sala-i-Martin (1996) found the speed of convergence of 1.6, 2, 1.4, and 1.9 percent per year for France, UK, Germany and EU respectively. The research in this thesis is similar to both Barro and Sala-i-Martin's study of the US states and Tondl's study of the European regions. The writers found that the Swedish regions are converging at the speed of 1.6 percent per year, resulting in eliminating half the production gap in approximately 41.5 years.

The purpose of this thesis was also to investigate how convergence performance differs between groups with different income levels. The authors extended the model of absolute convergence for this purpose and found results in line with the convergence theory. When comparing only the high-performing regions in Sweden, the writers found that the group of low-performing regions has a speed of convergence of 2.2 per cent per year, resulting in eliminating half of the income gap in approximately 31 years. The high-performing regions have a slower speed of convergence of approximately 2 percent per year, and are then eliminating half of the production gap in almost 35 years.

By assigning the dummy-variables of high-, mid-, and low-performing regions, it was clearly shown that the low-performing regions are going to reach the common steady state level faster than the high-performing regions. For the country as a whole, it can be concluded that the low-performing regions are growing faster than the mid- and high-performing regions. This will eventually lead to the fact that all the regions will come to the same steady state level in the future, even though it will take many years.

For future researchers, there are several different approaches that can be investigated. As, for example, the level of convergence in the country can be examined more carefully by focusing the reaserch on other groups, such as larger regions vs. smaller regions. Other measurements as wage level can be used to compare the convergence rate of GDP per capita with the convergence rate of wage level. A longer time span can be examined in order to expand the research further.

References

Literature

Barro, R. J. & Sala-i-Martin, X. (1991), *Convergence across States and Regions*, Brookings Papers on Economic Activity, vol. 1991, no.1, p 107-182

Barro, R. J. & Sala-i-Martin, X. (1992), *Convergence*, The Journal of Political Economy, vol. 100, Issue 2, p. 223-251.

Barro, R. J. & Sala-i-Martin, X. (2004), *Economic Growth, 2th edition*, The MIT Press, Cambridge, Massachusetts

Cheshire, P. & Magrini, S. (2000), *Endogenous Processes in European Regional Growth: Convergence and Policy*, Growth and Change, vol. 31, p. 455-479.

Dornbusch, R, Fischer, S & Startz, R. (2004), *Macroeconomics, 9th edition*, McGraw-Hill, New York.

Fujita, M. & Thisse, J-F. (2002), *Economics of Agglomeration – Cities, Industrial Location, and Regional Growth*, Cambridge University Press, Cambridge

Gullstrand, J & Hammarlund, C. (2007), *Plats för tillväxt?* , Bilaga 2 till Långtidsutredningen 2008, SOU 2007:25

Gujarati, D.N., (2002), *Basic Econometrics*, 4th Edition, McGraw-Hill/Irwin.

Larsson, S. (2005), *Årsbok 2005 – Nya företag, Växande företag, Starka regioner*. NUTEK Förlag, Stockholm

Lundberg, J. (2004), *Using Spatial Econometrics to Analyze Local Growth in Sweden*. Centre for Regional Science (CERUM), University of Umeå

Martin, R. & Sunley, P. (1996), Slow Convergence? *Post-Neoclassical Endogenous Growth Theory and Regional Development*, ESRC Center for business Reasearch, University of Cambridge, Working Paper no.44

Persson, J. (1997), *Convergence across the Swedish Counties, 1911-1993*, European Economic Review, vol. 41, p. 1835-1852.

Romer, P. M (1990), *Endogenous Technological Change*, The Journal of Political Economy, vol. 98, p. 71-102.

Romer, P. M. (1986), *Increasing Returns and Long-Run Growth*, The Journal of Political Economy, vol. 94, p. 1002-1037.

Sala-i-Martin, X. (1996), *The Classical Approach to Convergence Analysis*, The Economic Journal, vol. 106, p.1019-1036.

Solow, R. M. (1956), *A Contribution to the Theory of Economic Growth*, The Quarterly Journal of Economics, vol. 70, p. 65-94.

Todaro, M.P & Smith, S.C. (2006). *Economic Development, 9th edition*, Pearson Education

Tondl, G. (1999), *The Changing Pattern of Regional Convergence in Europe,* p.1-43.

Internet Sources

NUTEK, *verket för näringsutveckling*, Retrieved 2007-11-26 at:
http://www.nutek.se

Statistiska Centralbyran, Statistics Sweden, retrieved 2007-10-15 at:
http://www.SCB.se

Appendix

High- preforming Regions	Real GRP per capita in 1994	Mid-performing Regions	Real GRP per capita in 1994	Low-preforming Regions	Real GRP per capita in 1994
Karlstad	177157	Kalmar	158453	Pajala	101836
Örnsköldsvik	178460	Kristianstad	158708	Övertorneå	102289
Umeå	178700	Sollefteå	158774	Haparanda	110135
Halmstad	179343	Skövde	160923	Överkalix	114750
Avesta	179500	Fagersta	161162	Årjäng	120636
Malmö	181246	Karlskrona	161549	Simrishamn	122678
Västerås	184443	Skellefteå	163287	Vansbro	128431
Nyköping	185279	Borås	163551	Strömstad	134083
Göteborg	185484	Eskilstuna	163835	Åmål	135593
Luleå	187094	Ludvika	163993	Sorsele	138434
Arjeplog	187432	Helsingborg	164683	Katrineholm	139411
Gävle	188885	Älmhult	165357	Kalix	143693
Gällivare	191018	Örebro	165357	Vilhelmina	143574
Storuman	192359	Bengtsfors	165694	Hagfors	143693
Ljungby	192958	Hudiksvall	165928	Hultsfred	144471
Sundsvall	193741	Östersund	166123	Strömsund	148158
Malung	196711	Uppsala	168453	Ljusdal	148386
Åre	197133	Linköping	170596	Filipstad	148508
Gnosjö	203407	Lycksele	171410	Västervik	148730
Falkenberg	208077	Norrköping	171817	Arvidsjaur	148984
Kiruna	209185	Trollhättan	173054	Arvika	150935
Oskarshamn	210049	Arboga	173240	Bollnäs	153092
Karlshamn	228200	Söderhamn	174754	Eksjö	154443
Härjedalen	238462	Karlskoga	174841	Sunne	154724
Stockholm	248499	Falun	175282	Mora	156525
Tranås	346263	Jönköping	176101	Lidköping	156630
Jokkmokk	418835	Växjö	176225	Gotland	156773

Source: Data provided by SCB, 2007

NUTEC's 81 LA-region 2005

1	Stockholm	45	Fagersta
2	Uppsala	46	Köping
3	Nyköping	47	Vansbro
4	Katrineholm	48	Malung
5	Eskilstuna	49	Mora
6	Linköping	50	Falun
7	Norrköping	51	Avesta
8	Värnamo	52	Ludvika
9	Jönköping	53	Gävle
10	Nässjö	54	Ljusdal
11	Tranås	55	Söderhamn
12	Älmhult	56	Bollnäs
13	Ljungby	57	Hudiksvall
14	Växjö	58	Sundsvall
15	Vimmerby	59	Kramfors
16	Kalmar	60	Örnsköldsvik
17	Oskarshamn	61	Strömsund
18	Västervik	62	Åre
19	Gotland	63	Härjedalen
20	Karlshamn	64	Östersund
21	Karlskrona	65	Storuman
22	Simrishamn	66	Sorsele
23	Helsingborg	67	Vilhelmina
24	Kristianstad	68	Umeå
25	Malmö	69	Lycksele
26	Halmstad	70	Skellefteå
27	Varberg	71	Arvidsjaur
28	Göteborg	72	Arjeplog
29	Trollhättan	73	Jokkmokk
30	Strömstad	74	Överkalix
31	Bengtsfors	75	Kalix
32	Borås	76	Övertorneå
33	Lidköping	77	Pajala
34	Skövde	78	Gällivare
35	Torsby	79	Luleå
36	Karlstad	80	Haparanda
37	Årjäng	81	Kiruna
38	Filipstad		
39	Hagfors		
40	Arvika		
41	Säffle		
42	Örebro		
43	Karlskoga		
44	Västerås