

The Effect of EU Accession on Regional Income: Empirical Evidence from the Eastern Enlargement of the EU

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Abstract:

The purpose of this thesis is to investigate how the wage levels of the new EU members in Central and Eastern Europe have been affected by key steps in the early EU accession process and to assess whether wage convergence is likely to take place in the near future. The key steps of EU accession investigated are the 1996 Two Echelon Summit, the 1997 Luxembourg Summit and the 1999 Helsinki Summit. To carry out the empirical analysis, a model based on the so-called New Economic Geography theory is used. According to the results, the internal market potential is the most important factor in explaining a region's wage level. Of the three key steps in the EU accession, only the 1999 Helsinki Summit had a significant effect on the wage levels in the accession countries. This effect is however very strong. Projections of possible future growth patterns for the EU region reveal that the increasing integration will be accompanied by a convergence in factor prices and income levels. This process is assessed to be faster for the wages within the EU region, for which a complete equalisation is estimated to occur in 2035. For the income levels a complete equalisation is not estimated to occur before 2104.

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1 Introduction

1.1 Background

In May 2004 the long debated and biggest enlargement in the history of the European Union occurred. Going from a union of fifteen, it expanded to 25 members. The inclusion of the Central and Eastern European countries holds a very strong symbolic significance. It represents the end of the transition process from socialism and centrally planned economies to capitalism and a free market, for most of the new member states. Although the transition and integration into the EU generally is seen as a large success, the change has been very fundamental and fast and there are still many uncertainties regarding the economic reality of the new member states.

The eastern enlargement was very different from preceding accessions into the EU. In relation to the old EU members, the Central and Eastern European Countries (CEECs) had a much lower income per capita than any other countries at the time of inclusion. The differences in wage levels between EU15 and CEECs were comparable to Mexico and the U.S. at the time of the NAFTA introduction. However, while the latter is only a free trade agreement the former implies a much stronger economic integration and this among highly heterogeneous countries. Specifically, EU involves, at least in theory, free mobility of labour and free trade of goods, in accordance with the single market principle.

The future economic development in the European region is very complex and difficult to foresee. There is a myriad of endogenous factors and possible exogenous shocks. In combination with all linkages, known and unknown, the number of possible outcomes becomes indefinite. At present date there is a large divide in the income levels within the EU. The integration process in the EU will however affect the income and wealth for countries, both in an absolute and relative sense, within the union. While most researchers (e.g. Berglöf and Roland, 2001) agree that a membership will have a positive impact on a nation's welfare, the magnitude of the effect is difficult to assess.

In 2001, income levels of the CEECs in relation to the old EU members were estimated in the range of one-third to 40 percent. The variance in the income level among the CEECs is however very large. These differences are in general associated with differences in living standards and labour productivity levels, both dependent on differences in factor endowments. Human capital endowments and total factor productivity levels are lower in the CEECs than in the EU15 countries. A large part of this

difference is accounted for by the poor quality of eastern capital stocks and technology. Another part depends on more intangible factors, e.g. institutional quality, respect and knowledge of commercial law and human capital (Baldwin et al, 1997).

Historical experience and theory predicts that, as a result of the inclusion into the EU, the factor prices in the CEECs will converge towards the levels of the EU15 countries. These predictions have also been supported by the large adjustments that have been taking place within the CEECs before and at the start of the accession process. Employment during the communist period was concentrated in industry and away from consumer-oriented services. Employment shares in agriculture were larger than in countries at comparable levels of GDP per capita. Jobs were concentrated in large conglomerations and in the public sector, while non-agricultural self-employment was nonexistent in most economies. During the transitional process there has been a structural reallocation of employment, from agriculture and industry to services, small private enterprises and self-employment. These structural changes emphasise the important role the accession into the EU has played for the CEECs (Boeri and Bruecker, 2001).

According to traditional trade theory (e.g. the Heckscher-Ohlin-Samuelson model) integration of economies that differ in their initial endowments will provide gains for all the countries involved. Moreover theory predicts that factor prices will converge (Navaretti and Venables, 2004). More modern theories have a stronger focus on why differences in factor prices might persist in the face of economic integration (Baldwin et al, 1997; Boeri and Terrell, 2002).

The question of how an EU membership will affect incomes and wages is interesting on several grounds. Large wage differentials create incentive for firms to relocate activities to low-wage regions. However, whether large investments will be undertaken depends on for how long such wage differentials are likely to persist. Specifically, will the old EU countries be able to maintain higher income and wage levels than the new member countries over time? If not, will the differences in income levels diminish over time and eventually equalise, or is it even possible for the new members to surpass and overtake the leading position from the old members within the EU?

This thesis deals with the effects of eastern enlargement on the wage levels in the new member countries of the EU. Explicitly the main focus is to study whether the CEECs has experienced a convergence in the relative wage levels during the initial steps of the EU accession process. The model used is based on New Economic Geography theory (NEG).

Also, in order to assess the future development within the EU region, projections have been made in the thesis, where the historic development of the different countries has been extrapolated into the future; in a strict *ceteris paribus* approach. This forecast has been done in order to assess a possible path for the wage and income development in the EU region over the next years.

1.2 Purpose

The purpose of this thesis is to investigate how the CEECs' wage levels have been affected by a number of key steps in the early EU accession period and if there is potential for a factor price convergence in the near future within the EU. Specifically, this study will examine the effect of three different EU Summits on the wage levels in the accession countries. Chronologically, the investigated Summits are: the 1996 Two Echelon Summit, the 1997 Luxembourg Summit and finally the 1999 Helsinki Summit. In order to assess the potential for factor price convergence in the near future, projections of the future wage development have been constructed for the EU members.

1.3 Contribution

The contribution with this thesis is twofold. First, this thesis studies empirically the effect of the eastern enlargement of the EU on the wage levels in the CEECs. To our knowledge, this has not previously been done. Second, regional data is used in the study which makes it possible to distinguish effects at a less aggregated level than in other studies. This in turn makes it possible to render more precise conclusions regarding the underlying factors behind wage differences across regions.

1.4 Outline

The remainder of the thesis will be structured as follows. In the next section a brief overview of the historic and current EU enlargement process will be given. There will also be a description of the key events in the accession process studied in this paper. In the third section the theoretical framework is explained. From a rather broad overview the section will narrow down the subject and finally emanate in the model of choice for the regression analysis in this study. In the fourth section, data collection and construction of all variables in the model are described. An overview of the regression results follow in the fifth section. This overview is followed by an analysis part, where the regression results are interpreted. In the section is also an empirical investigation of current GDP levels and growth rates within the EU region included. Based on these empirical descriptions of the current GDP levels, projections of the future income development within the EU region have been constructed. Finally, the last section consists of two parts; conclusions and suggestions for future studies.

2 The EU Enlargement Process

2.1 Implications of the EU Enlargement

The European Union was originally created by six founding states in 1952, but has grown over time and consists today of 25 member states. Up until present date, there have been five successive enlargements (see Table 2.1. in appendix). The largest occurred on May 1, 2004, when 10 new member states joined. The eastern enlargement increased the EU's geographic area by about 23 percent, its population rose by about 20 percent, and its GDP (at 2001 PPP) increased by about 9 percent. In sum the enlargement has had a very large impact on the economic preconditions of the EU.

From the onset of the enlargement many researchers and politicians have proclaimed that gains should arise from extending the market integration of EU, to a larger set of partner countries. Several beneficial factors have been argued. Among the main arguments are improved export and import conditions; theoretically resulting in increased investment levels, growth and employment. For the accession countries, the improved terms for imports and increased volume to the Western European countries is often proposed as the main driver for growth. However, many have also pointed out the risks and possible costs that accompany the enlargement. On labour markets, integration of commodity and factor markets is likely to entail both job displacement and job creation, with the net effect on the rate of unemployment being unclear a-priori. In addition to employment perspectives, domestic workers with low skill levels in the old member states may be hurt in terms of wage income, due to import competition and immigration, particularly if migrant labour from candidate countries is a close substitute. In opposite, other types of labour and other factor owners may gain, if they are complementary to migrant labour. Thus, there are distributional implications, in addition to the overall welfare effect of enlargement.

The EU will have 27 member states when further enlargement takes place in 2007 or latest 2008, with the addition of Romania and Bulgaria. Negotiations are also underway with other states. In order to join the European Union, a state needs to fulfill the economic and political conditions generally known as the Copenhagen criteria (the Copenhagen summit, June 1993). Also, according to the EU Treaty, each current member state and the European Parliament have to agree to any enlargement (Kohler, 2004).

2.2 Key Steps in the EU Accession Process

In Copenhagen in 1993 the main criteria of approval and acceptance into the EU for the Central and Eastern European countries were established. The conditions were however very vague; in essence the countries were invited to join but under very ambiguous and unclear conditions. This is also a feature that is evident throughout the entire accession process; the conditions for approval were always very vaguely defined and kept changing throughout the process.

In 1996, came the first serious discussions and guidelines regarding how the accession process of the potential new members was going to be conducted. The commission's opinion of 1996 leaned towards either a regatta start or an accession process where the countries were divided into two echelons. Under a regatta start, each country was going to be accepted as soon as they had undertaken the needed policy reforms on an individual basis. With two echelons, the countries in each group were going to be accepted on a collective basis at a preset date. Although the consensus pointed at the advantages of accepting the countries in group, concerns were raised that the latter group, knowing that they would not be accepted as soon as the first group, would lack incentives to implement proper policy reforms.

In the second key step in the accession process, the 1997 Luxembourg meeting, the EU commission decided that the second group countries, given that they had undertaken the proper reforms, could move up to the first echelon. This decision emphasised and gave all accession countries the same motivation to undertake the needed economic and political reforms since they now all could be accepted at the first date.

In the 1999 Helsinki summit, denoted as the third key step in the accession process, the conditions for acceptance were further reshaped when the two echelons were turned into a queue. All countries were now going to be accepted as soon as they undertook the needed reforms on an individual basis, in essence a return to the previously discarded regatta start.

In Copenhagen 2002 the Big Bang approach was accepted; all countries were now going to be accepted at once, despite any differences in the level of undertaken reforms. Finally, in May 2004 it happened; EU was enlarged from 15 to 25 members.

3 Theoretical Framework

3.1 The Baseline Model: Market and Supplier Access

Despite increasing international economic integration and mobility of manufacturing firms and plants, there are still very large differences in manufacturing wages. International firms are still reluctant to move production to low wage regions for several reasons, one is geographical location.

Geographical location can affect the per capita income in a region in several ways. Redding and Venables (2004) focus on two mechanisms: First, the distance of regions from the markets where they sell their product or service. Second, the distance for the region to other countries that supply the manufacturing industry with capital equipment and intermediate goods required in the production process. Barriers to trade and transport costs inflicts a penalty on more remotely located regions; both on their sales and on their imported inputs. Due to these market and supplier access penalties, these regions can only afford to pay relative lower wages. This constraint holds even if these regions, with a relative peripheral location, have the same technology and institutional quality as the other regions, located in the core region. Thus, the geography of access to markets and sources of supply can explain much of the inter-regional variation in per capita income.

Labour, as the relative immobile factor of production, is affected the most in factor remunerations of market and supplier access penalties. More central locations will offer higher wages for skilled labour (larger skill-wage premium). This in turn will increase the incentives for human capital accumulation, which in turn will further increase the skill-wage premium (Redding & Schott, 2004). Mion (2004) finds that the market access of a location has a significant positive impact on local wages in Italy. De Bruyne (2003) and Brakman et al. (2004) finds similar results for Belgium and Germany respectively.

“...the geography of access to markets and sources of supply is statistically significant and quantitatively important in explaining cross-country variation in per capita income.” (Redding and Venables, 2004, p.54)

In their model, Redding and Venables focus on the effect of market and supplier access in explaining spatial differences in wage levels. The model consists of three main relationships. First, a gravity-like relationship in which the two terms; market and supplier access are more precisely defined. Market

access; a measure of market potential, is defined as the export demand each region faces in relation to its geographical position and in relation to its trading partners (equation 1). Supplier access in turn is defined as a distance weighted measure of the location of import supply to each region (equation 2).

Market access is given by:

$$MA_i = \sum_j E_j G_j^{\sigma-1} T_{ij}^{1-\sigma} = \sum_j (T_{ij})^{1-\sigma} m_j \quad (1)$$

Where E_j equals region j 's total expenditure on manufactures. G_j is a price index (defined in equations 4-6), T_{ij} is an iceberg transport cost ($T_{ij} > 1$ and $T_{ij} = 1$ equals costless trade) and σ is the elasticity of substitution between varieties. $E_j G_j^{\sigma-1}$ is region j 's market capacity, denoted by m_j in the final expression.

Supplier access is given by:

$$SA_j = \sum_i n_i (p_i T_{ij})^{1-\sigma} = \sum_i s_i (T_{ij})^{1-\sigma} \quad (2)$$

Where n_i is the set of varieties produced in region i and the price, $p_{ij} = p_i T_{ij}$, equals the prices for sale in different regions. In turn, the price, p_i , is a constant markup over marginal cost. The supply capacity, s_i , equals $n_i p_i^{1-\sigma}$. Thus, the final expression equals the supply capacity with respect to the bilateral trade costs incurred.

The second relationship in Redding's and Venables' model is the wage equation. This zero profit condition determines the maximum factor prices firms can pay with respect to their market and supplier access.

The wage equation can be written as a log-linear function of the region's market and supplier access:

$$\begin{aligned} (w_i^\beta v_i^\gamma c_i)^\sigma &= A G_i^{-\alpha\sigma} \sum_j^R E_j G_j^{\sigma-1} T_{ij}^{1-\sigma} = A \left[\sum_i s_i (T_{ij})^{1-\sigma} \right]^{\frac{\alpha\sigma}{\sigma-1}} \left[\sum_j (T_{ij})^{1-\sigma} m_j \right] \\ &= A (SA_i)^{\frac{\alpha\sigma}{\sigma-1}} (MA_i) \end{aligned} \quad (3)$$

Where the left hand side of the wage equation contains the wage, w_i , the price of the internationally mobile factor of production, v_i , and a measure of technology differences, c_i . The term A is a constant.

In sum, the wage equation states that regions with better market and supplier access pay relative higher wages. The final relationship derived by the authors is a price index. This index suggests how the prices of manufactures should vary with the supplier access each region face.

The price index can be stated as:

$$G_j = \left[\sum_i n_i (p_i T_{ij})^{1-\sigma} \right]^{1/1-\sigma} \quad (4)$$

Where the term in square brackets is equal to the sum of supply capacities, weighted by transport costs; a measure of the supplier access for region j . An increase in the supplier access reduces the price index and the cost of intermediate goods; resulting in lower production costs in region j . Supplier access is directly related to the proximity to suppliers. The closer a region is to its suppliers, the lower production costs it will incur.

Redding and Venables capture market and supplier access through the use of country dummy variables¹; capturing all variables that theoretically will determine regions' propensities to demand imports from, or supply exports to all partners. Since all factors in the equations stated in the preceding section are not observable, the authors use several proxies. First, market and supplier access is divided into one domestic and one foreign part. Second, distance and border measures combined serve as proxy for transport cost. Third, GDP per capita is used as a measure of the price for immobile factors, the wage, denoted w_i (equation 3).

In the first set of estimates of the wage equation, the authors examine the unconditional relationship between economic geography and GDP per capita. Several conclusions are deducted. First, foreign market access when included alone seems to explain 35 percent of inter-regional variation in GDP per capita. However, domestic market access, when included on its own, seems to explain 73 percent of inter-regional variation in GDP per capita.

In order to evaluate the importance of proximity to large markets and sources of supply, the authors also conduct a hypothetical geographical experiment. Several developing countries with a peripheral location are moved closer to the world's centre of economic activity. The theoretical gains in GDP per capita are substantial. For Zimbabwe the gains are 80 percent and for Paraguay 58 percent. As the authors conclude; these findings are very interesting especially when evaluating the transitional effect on the CEECs from being located on the edge to Western Europe, where the income levels are relative higher.

Along the same line, Redding and Venables also investigate if a region's wage proxy is affected by which other regions they share their borders with. The border between Germany and the Czech Republic is, by the authors, predicted to have a substantial effect on the per capita income levels for

¹ For a complete specification of all dummy variables, see Redding and Venables(2004)

the Czech Republic. A theoretical removal of the border, the authors conclude, would for the Czech Republic result in a fall in income per capita with 26 percent. Thus the geographical proximity to Germany is of a very large importance for the Czech Republic. However, the authors also conclude that the same effect is not achieved if one eliminated the border between two low-wage developing countries. In this setting the removal of the border would yield a very small or no effect at all. Thus, Redding and Venables argue the gain for a low-wage country of closer regional integration to another low-wage country is small, relative to the gain from a closer integration with a high income country.

3.2 Variation of the Model I

The Redding and Venables market access model relies on very strong assumptions and focus primarily on spatial penalties. Nevertheless, the model is very complex. Breinlich (2005) derives a less complex model which still takes other factors into consideration. This model specification is also appealing because of its similarities with a gravity equation model. In this section Breinlich's model will be described. This should be considered a first step towards a model appropriate for using in this thesis.

According to Breinlich and other authors (e.g. Redding and Schott, 2004) the market access of a region will affect per capita income through at least two channels. Besides the direct transport cost savings that will benefit central locations, high market access will also increase the incentives for human capital accumulation by increasing the wage-skill premium. According to Breinlich this is also the case in the EU regions under study. More explicitly, market access shows a positive correlation with high and intermediate levels of education.

In Breinlich's study the market access of an EU region consists of three parts; national market access (regions in the same country), EU market access (regions in other EU countries) and rest of the world market access (non-EU countries). Breinlich concludes that market access explains 30-40% of income variations across the 193 EU15 NUTS2 regions used in the estimation. National market access is the dominant part of overall access, although its importance has steadily declined over the last two decades. Further, countries in peripheral EU-regions score considerably lower on the access measure, an empirical finding in line with the Redding and Venables market access penalty. Finally, countries with small home markets and a large home bias in trade tend to suffer a further access penalty.

In Breinlich's specification, focus lies on the manufacturing industry which produces with increasing returns to scale (IRS) and with product differentiation. Final demand for goods in location j is derived via utility maximization of the representative consumer's CES utility function. Also, free entry into the markets assures that long run profits will be equal to zero for the firms. Given the preconditions, Breinlich derives the following trade equation:

$$n_i p_i x_{ij} = \frac{E_i E_j}{E} \left(\frac{T_{ij}}{P_i P_j} \right)^{1-\sigma} \quad (5)$$

Where P_i and P_j represent the price indices for exporter i and importer j . E stands for total world expenditure. The trade equation, summing over all products produced in location i , express the value of total exports from i to j .

Equation (5) can be developed to a log-linear function:

$$\ln \left(\frac{n_i p_i x_{ij}}{GDP_i GDP_j} \right) = \alpha + (1-\sigma) \ln T_{ij} - \ln(P_i^{1-\sigma}) - \ln(P_j^{1-\sigma}) + \varepsilon_{ij} \quad (6)$$

Where E is subsumed in the constant and the GDP level serve as proxies for the expenditure levels (E) for each region. Transport costs (T) is assumed to be dependent on bilateral distances and dummy variables indicates whether national or EU borders are crossed. This estimation of the trade equation can be used to yield estimates of the price indices $P_i^{1-\sigma}$ and transport costs $T_{ij}^{1-\sigma}$. These estimates can in turn be used to calculate the market access for different regions according to equation (7). This market access measure can be compared with Redding's and Venables' specification (equation 1).

$$MA_i = \sum T_{in}^{1-\sigma} P_n^{\sigma-1} E_n \quad (7)$$

Equation (6) and (7) can finally be used as basis for the econometric specification of the Breinlich version of the wage equation:

$$\ln(w_i) = \alpha + \beta_1 \ln(MA_i) + \varepsilon_i \Leftrightarrow \ln(lcGVA_{it}) = \alpha_t + \beta_1 \ln(MA_{it}) + \varepsilon_{it} \quad (8)$$

Where, as proxy for the wage (price of the immobile factor) the author use the gross value added per head of the working population; $lcGVA_{it}$.

3.3 Variation of the Model II

As previously stated, Redding's and Venables' market access model is complex and relies on strong assumptions. Breinlich develop a less complex model which takes the form of a gravity equation model, but it still relies on strong underlying assumptions. Thus, further simplifications may be justified. These simplifications can in part be based on a model specification developed by Head and Mayer (2005).

Head and Mayer estimates a model on bilateral trade flows which share some features with the two preceding model specifications but is easier to work with. An additional important and attractive feature with the Head and Mayer specification on real market potential is that it connects Redding's and Venables' model with the original model within the field; Harris' specification (1954). Starting off in the Redding and Venables model, Head and Mayer estimate the influence of real market potential (RMP) on the wage and employment level in a region:

$$RMP_i = \sum_j \phi_{ij} \frac{E_j}{S_j} \quad (9)$$

Where E_j is equal to the total local demand available for all firms capable of serving market j . Similar to the Redding and Venables supplier access measure (equation 2), S_j measures the sum of supply capacities weighted by transport costs. Head and Mayer call this measure region j 's supply index. Finally, ϕ_{ij} is equal to $T_{ij}^{1-\sigma}$ and is called the "phi-ness" of trade. This term describes the relationship between trade costs and elasticity of substitution in demand. It ranges from 0, where T_{ij} and σ are high enough to eliminate all trade, to 1, where trade costs are negligible.

In order to connect the Redding and Venables model with the Harris model, Head and Mayer as a first step derive the Nominal Market Potential (NMP) measure. The only difference between the NMP and the RMP term is that the former implicitly treats S_j as a constant and approximates ϕ_{ij} with $\frac{1}{D_{ij}}$, where D_{ij} is a distance measure (equation 10).

$$NMP_i = \sum_j \phi_{ij} E_j \quad (10)$$

In essence, NMP can be thought of as a pure measure of the size of the available market.

In the next step, Head and Mayer replace their RMP measure with the simpler Harris market potential measure; HMP (equation 11). The obtained results with this measure are very close to the results obtained with the RMP measure. As Head and Mayer conclude; *“the results from the reduced HMP form proposed by geographers 50 years ago are remarkably similar to the ones from the structural model”* (Head and Mayer, 2005, p.20).

$$HMP_i = \sum_j \frac{GDP_j}{d_{ij}} \quad (11)$$

Finally, accessibility of a region to itself is modelled as the average distance between producers and consumers in a stylized representation of regional geography. The location d_{ij} gives the average distance between two points in a circular location; great circle distances. This relationship is modelled by Harris as $\hat{\phi}_{ii} = d_{ij} = (2/3\sqrt{area_i/\Pi})$.

Head and Mayer infer several important conclusions regarding affecting factors on a region's RMP. First, RMP becomes larger as one approaches the economic centre of Europe. Second, regions with a high E_i tend to have higher RMP. Adjustments in relation to differences in RMP between regions are, according to the authors, done in two ways. Movements of firms underlying the changes in S_i ,

reducing the profits to be made in the high-RMP regions, explains one part. The rest of the adjustment takes place with factor price adjustments; high RMP regions yield high wages.

3.4 The Model of Choice

The models in the preceding sections serve as base for the development of the final model of choice. As previously concluded, both Redding's and Venables' model and Breinlich's model are constructed under a complex set of preconditions and assumptions. Head's and Mayer's model is less complex and the authors also conclude that a model derived from the original Harris specification is a very good proxy for the Redding and Venables model.

The main model used in this thesis is based on Harris' and Head's and Mayer's market potential models. However, additional factors are incorporated in the model in order to capture some of the elements discussed by Redding and Venables and by Breinlich. Finally, variables capturing the key steps in the EU accession process, described in section 2.2, are included. These variables are included in order to assess the effect from the EU integration on regional wage levels in the CEECs.

The derived equation which will serve as main model for all tests in the thesis is essentially constructed of three parts, all discussed in the section following below.

For the main model, the main explanatory variable is the Market Potential (MP). This variable captures the attractiveness of locating in different regions in the investigated countries. Harris' original specification only takes one element into account, the market potential for region j with respect to all other regions' GDP-levels, weighted with the distance to region j . This model was designed in order to measure the market potential for a country. In order to infer whether there are any differences in the effect on a region's market potential from proximity to domestic versus foreign regions, two market potential measures are incorporated in the model of choice. First, the MPF measure is included; a variable that measures the impact from proximity to foreign regions:

$$MPF_j = \sum_{k \neq j} \frac{GDP_{fk}}{d_{jfk}} \quad (12)$$

Second, in order to account for the market potential effect from domestic neighbouring regions, the MPD measure is also included in the model:

$$MPD_j = \sum_{k \neq j} \frac{GDP_{dk}}{d_{jdk}} \quad (13)$$

The two market potential measures in the preceding equations only take into account the effect on region j 's market potential from other external regions. In order to also account for region j 's internal market potential, a third variable must be constructed. As described in equation (14), region j 's internal market potential (MPI) is equal to the regional GDP-level in relation to the geographic size of the region. Thus, the final variable brings regional differences in economic and geographic size into the expression for region j 's market potential.

$$MPI_j = \frac{GDP_j}{\left(2/3 \sqrt{\frac{area_j}{\Pi}}\right)} \quad (14)$$

The final, aggregated expression for region j 's market potential is equal to the sum of the three market potential measures; MPF, MPD and MPI, all expressed in logarithmic form:

$$\ln(MP_{jt}) = \ln(MPF_{jt}) + \ln(MPD_{jt}) + \ln(MPI_{jt}) \quad (15)$$

In aggregate, the market potential equation consists of three parts. The first two expressions on the right-hand side are summations of region j 's market potential relative to all external regions, domestic and foreign. The third part express region j 's internal market potential. In sum, the market potential for region j can be interpreted as a distance-weighted GDP measure depending on both external and internal market potential.

In order to capture potential effects the three key steps in the EU accession process might have had on the regional wage levels in the EU, a new set of variables are included in the model of choice. For each key step in the EU accession process a dummy has been included. The first dummy

denoted $D1_{TE96jt}$, is included in order to assess the potential effect of the 1996 Summit. The second dummy denoted $D2_{L97jt}$, the 1997 Luxembourg Summit. Finally the third dummy denoted $D3_{H99ijt}$, the 1999 Helsinki Summit.

The third part of the model consists of interaction-variables, constructed in order to measure potential effects on regional wage levels via interaction effects between the three key steps of the EU accession and the market potential measures for a region. In essence, these variables are included in order to account for the possibility that a region's market potential might have improved or deteriorated as a result of the accession process.

The main model consists in total of 4 components and 20 variables:

$$\begin{aligned} \ln\left(\frac{GDP_{jt}}{cap_{jt}}\right) = & \alpha + \beta_{1jt} \ln(MPF_{jt}) + \beta_{2jt} \ln(MPD_{jt}) + \beta_{3jt} \ln(MPI_{jt}) + \\ & \beta_{4jt} D1_{TE96jt} + \beta_{5jt} D2_{L97jt} + \beta_{6jt} D3_{H99ijt} + \beta_{7jt} \ln(MPF_{jt}) \times D1_{TE96jt} + \\ & \beta_{8jt} \ln(MPD_{jt}) \times D1_{TE96jt} + \beta_{9jt} \ln(MPI_{jt}) \times D1_{TE96jt} + \beta_{10jt} \ln(MPF_{jt}) \times D2_{L97jt} + \\ & \beta_{11jt} \ln(MPD_{jt}) \times D2_{L97jt} + \beta_{12jt} \ln(MPI_{jt}) \times D2_{L97jt} + \beta_{13jt} \ln(MPF_{jt}) \times D3_{H99ijt} + \\ & \beta_{14jt} \ln(MPD_{jt}) \times D3_{H99ijt} + \beta_{15jt} \ln(MPI_{jt}) \times D3_{H99ijt} + \sum_{t=1995}^{2002} \gamma_t Dummy_{jt} + \varepsilon_{jt} \end{aligned} \quad (16)$$

The first component, the three main variables, measures the market potential effects. The second component, the three EU dummies, adds the accession effects to the expression. If relative wage differences across regions is dependent solely on differences in market potential, these variables will have no effect. However, if the key steps in the EU-accession period had a significant effect on the income levels for the new EU members, the coefficients for these variables will be highly significant. Thus, these variables controls for exogenous effects on the income level, not explained by spatial differences. The third part of the main model consists of the interaction-variables. Finally, the fourth part equals a summation of dummies adjusting for inter-year differences in the data (1995 base year).

4 Data Description and Construction of Variables

4.1 Data Description

All data, except for geographical distances, is collected from the Eurostat database² and measure; GDP, population and area for all regions and countries. For both EU25 and non EU countries, data was gathered on both a NUTS2 and NUTS3 basis. Once all data was collected the datasets for all variables were manually filtered to a uniform NUTS2 level. In order to not have any inflationary distortions in the inter-regional calculations, all GDP measures are purchasing power parity adjusted (PPP). Both GDP and population are measured in millions. The distances are calculated in kilometres and the areas are calculated in square-kilometres.

In order to make the remainder of the section as easily comprehensible as possible, it is structured as follows. The construction of each variable is separately and in detail described below. A description of the basic assumptions that had to be made in the calculations and in the creation of the models is also included. These basic assumptions might have implications on the interpretability of the results and data. Hence, these potential implications are also addressed. The final part of this section describes how the projections and future forecasts for the EU region were constructed.

4.2 The Dependent Variable: GDP per Active Worker

The dependent variable is calculated according to the following formula:

$$\frac{GDP_{jt}}{cap_{jt}} \quad (17)$$

² www.eurostat.com

The expression is an alternative version of a per capita model since it does not use the total population in the denominator but instead the active workforce for each region. The rationale for this is simple; the alternative version used express each region's income per active worker. It is thus a more precisely defined proxy for the region's wage levels than what the regular GDP per capita (total population) is. The GDP level for each region was collected from the Eurostat database and is expressed in PPP millions. The per capita expression, active worker, was calculated by first gathering the entire employed population on a regional basis. Then the part of the population below 15 years (the next age dividing the dataset was 24 years) and above 65 years, was subtracted for each region. This calculation renders an estimate on each region's number of active workers. With the GDP levels on a regional basis in the nominator and the estimate for active workers in the denominator, the dependent variable; GDP per active worker, is finally estimated.

The wage proxy in the thesis is well established and often used in empirical studies (Head and Mayer, 2005; Breinlich, 2005). Nevertheless, it is inherently biased by one strong basic assumption. As displayed in equation (18); GDP per active worker in the population equals the sum of wages per capita and the capital rent per active worker in the population. The latter, a residual, will theoretically vary with a regions relative market potential. A better market potential will, *ceteris paribus*, result in larger capital investments which in turn will generate a larger residual expression affecting the proxy used. Also, a higher level of income will, *ceteris paribus*, result in higher investment levels, yielding a larger residual expression which in turn will have a positive effect on the proxy used. This effect can be a potential source for a systematic error. However, since the study is conducted on a regional, NUTS2, level, data on capital investments and rents can not be collected. Thus, although this source for a potential error is acknowledged, it can not be adjusted for.

$$GDP = wL + rK \Leftrightarrow \left(\frac{GDP}{L} \right)_j = w_j + \left(\frac{rK}{L} \right)_j \quad (18)$$

4.3 Independent Variables

4.3.1 MPD and MPF: Domestic and Foreign Market Potential

The measure for foreign market potential follows the equation:

$$MPF_j = \sum_{k \in F, k \neq j} \frac{GDP_k}{d_{jk}} \quad (19)$$

Where F is the set of regions outside the country of region j . Thus, region j 's foreign market potential is defined as the sum of all foreign regions' GDP levels weighted with their individual distances to region j .

The measure for domestic market potential follows the equation:

$$MPD_j = \sum_{k \in D, k \neq j} \frac{GDP_k}{d_{jk}} \quad (20)$$

Where D is the set of regions within the same country as region j . Thus, region j 's domestic market potential is defined as the sum of all other domestic regions' GDP levels weighted with their individual distances to region j .

The individual distances between all regions were manually calculated, one at a time, through the following procedure. First, all latitudes and longitudes for the major city in each region were collected. Second, the latitudes and longitudes were inserted into the great circle distance equation:

$$D_{ij} = R \times \arccos(\cos(\text{Lat}_i) \times \cos(\text{Lat}_j) \times \cos(\text{Long}_i - \text{Long}_j)) + \sin(\text{Lat}_i) \times \sin(\text{Lat}_j) \quad (21)$$

Where D equals the distance between the major cities in the regions i and j and R is equal to earth's radius. From the equation, distances between all cities in the sample were rendered.

The use of the great circle distance equation is due to Earth's sphere-like form. Although the Haversine formula is a more exact way to calculate distances across sphere-formed objects it is not

possible to use it in the market potential calculations. This is due to the large number of observations in the dataset and the complexity of the Haversine formula. The great circle distance equation is however a well established proxy for the Haversine formula, used for most distance calculations, except for in the aviation or military field.

Although the great circle distance equation is less complex than the Haversine formula, there are in general still some simplifying assumptions made in order to keep the complexity of the model at reasonable levels. The distances calculated in the equation are only approximately accurate for two main reasons. First, the latitudes/longitudes are only entered to 0.1° accuracy, allowing errors of up to ± 3.5 miles (since 0.1° of latitude is about 7 miles). This is not really a problem since all cities in general have a diameter larger than a couple of miles. Second, the calculations assume a spherical Earth with a diameter of 7920 miles. The real Earth is however closer to an oblate spheroid with an equatorial diameter of 7928 miles, polar diameter of 7902 miles, and mean diameter of about 7920 miles. Thus for very large distances of thousands of miles, additional errors of up to about 0.2% (i.e. up to a few tens of miles) could also be introduced depending on the direction of the shortest path. In the great circle distance equation used in the thesis, Earth's radius is assumed equal to 6371.64 km and one mile equal to 1.609 km (Sinnott, 1984).

In the dataset, smaller regions, which lacked any major city or where it was impossible to collect latitudes and longitudes, the closest major city in the nearby region served as proxy. Since the dataset consists of a very large number of cities (major city for all regions at NUTS2 level in entire EU25 plus Bulgaria and Romania) and distances were needed between all cities, the total number of distances calculated finally amounted to approximately 14500 combinations. Thus, it was not possible to calculate the distances manually and since all accessible websites only allow you to calculate the distances between cities one at a time, a model had to be created where the final product was a matrix with all cross-correlated distances. Once this distance-matrix was created a second matrix was constructed where all regions' GDP levels were inserted. Finally, the two matrices were cross-correlated. This step also created some difficulty, since all regions, of course, have an individual set of distances to all other regions which in turn are used as weightings for their individual market potential measures. Thus, a new model had to be created where all regions' GDP levels could be weighted with their unique set of distances to each individual region. Finally, from this model the two measures MPD and MPF could be extracted. MPD, only takes into account the distance-weighted GDP-levels within region j 's own country. MPF is the aggregate sum of all distance-weighted GDP-levels of all foreign regions in relation to region j . Before entering the main model, both market potential measures were converted into log-form.

4.3.2 MPI: Internal Market Potential

Each region's internal market potential was calculated according to the following equation:

$$MPI_j = \frac{GDP_j}{\left(2/3 \sqrt{\frac{area_j}{\Pi}}\right)} \quad (22)$$

Region j 's MPI is a measure of region j 's GDP level relative to its size. The equation makes the simplifying assumption of calculating all regions as circles. The MPI measure was also, before entering the main model, converted into log-form.

4.3.3 The EU Dummies

The EU dummies were all determined in the same way. The effect this study tries to capture is how the increased integration into EU has affected the wage and income levels in the accession countries. Thus, for the old EU countries, all dummies have the value of 1 across the entire time period. In the opposite standpoint, for the non EU countries all dummies have the value of 0 across the entire time period. Finally, for the accession countries the dummies take on the value of 0 before the underlying key step in the accession process took place, and the value of 1 after.

4.3.4 The Interaction Variables

In the main model (equation 16), there are nine different interaction variables included. These variables express all possible combinations between the main variables (MPD, MPF and MPI) and the three dummies (D1-3).

4.4 Projected Growth Rates and Future GDP Development

For the section with the projected GDP levels in the EU region all underlying calculations were made in the following fashion. First, all regions were divided into the three groups described in the section; EU15, new EU members and non EU. Second, all growth rates were calculated for each individual

region on a yearly basis for the years in the dataset. From these growth rates the average growth rate was used in order to calculate future projections, one year at a time. Third, along the same procedure the active workforce in each region was projected. Finally, the two variables were combined into projections of GDP per active worker until year end 2015. From these projections, the compounded growth rates were calculated in a rolling additive model, displayed in charts in the section of projections and forecasts. In the last projections, the estimations of the future convergence years in GDP and GDP per active worker were based on the average growth rates during the actual years in the sample.

5 Analysis

5.1 Regression Results

Five different specifications of the basic model were estimated for all regions. The first model that was estimated strictly follows the main equation derived in the theoretical framework section (equation 16). The model has a relative high explanatory power; the adjusted R^2 is equal to 0,883 (see Table 5.1. in appendix).

Several interesting features are evident from the regression results (see Table 5.2. in appendix). First, GDP per active worker in the regions seem to have been trending upwards over the studied years; all estimated coefficients of time-dummies are positive, significant and larger towards the end of the period. The difference between the 1996 and 1995 levels are statistically significant at a 5 percent level; the remaining years' difference is statistically significant at a 1 percent level. Second, the main variables; the three market-potential measures do all have the expected positive sign. However, only the estimated coefficients of MPD and MPI are statistically significant, the former at a 5 percent level and the latter at a 1 percent level. The estimated coefficient of the MPF variable, access to foreign markets, is not significant. Third, only the 1999 Helsinki Summit is significant among the three estimated coefficients of EU dummies. This estimate is however strongly significant (1 percent level). Fourth, of the nine estimated coefficients of interaction variables, which capture possible effects of the EU summit agreements on the three market potential measures for a region, only the three related to variables that contain the Helsinki Dummy are significant. For both MPI and MPF the interaction effect is estimated to be negative.

Given that the coefficient for the MPF variable was insignificant in the first model it is interesting to find that the interaction variable, incorporating the dummy and the MPF variable, is negative and significant at the 10 percent level. Thus, it may seem as if access to foreign markets has a negative impact on the income levels of a region in a new member country after the Helsinki summit. The interpretation of the results from model 1 will be discussed further in the subsequent section.

There are two interesting ways one could further enlarge the analysis on the first model. First, a test of whether the sum of the coefficients of $\ln(MPF_{jt})$ and $\ln(MPF_{jt}) \times D3_{H99ijt}$ differs from zero could help explain the relationship between the market potential measure and the EU integration. Second, it is possible that region-specific factors are correlated with both wage levels and the internal market potential measure, leading to endogeneity bias. One way to correct for these potential time-invariant differences across regions would be to include dummy variables for all regions. However, given the already very large and complex data set and that this added analysis would further expand the width of the thesis; these two tests are left for future studies.

Given the results for the first model, all EU dummies except the one capturing the 1999 Helsinki Summit were excluded in the second specification. The second model, derived and tested follows the specification:

$$\begin{aligned} \ln\left(\frac{GDP_{jt}}{cap_{jt}}\right) = & \alpha + \beta_{1jt} \ln(MPF_{jt}) + \beta_{2jt} \ln(MPD_{jt}) + \beta_{3jt} \ln(MPI_{jt}) + \\ & \beta_{4jt} D3_{H99ijt} + \beta_{5jt} \ln(MPF_{jt}) \times D3_{H99ijt} + \beta_{6jt} \ln(MPD_{jt}) \times D3_{H99ijt} \\ & + \beta_{7jt} \ln(MPI_{jt}) \times D3_{H99ijt} + \sum_{t=1995}^{2002} \gamma_t Dummy_{jt} + \varepsilon_{jt} \end{aligned} \quad (23)$$

The explanatory power drops marginally relative to the first equation, adjusted R^2 is equal to 0,882 (see Table 5.1. in appendix). In this setting only the MPI variable yields a significant estimate among the main variables. Also, the MPD variable does now hold a negative coefficient, a result not in line with theoretical predictions. The dummy and all the interaction variables for the Helsinki Summit are however strongly significant. For the interaction variables, only the MPD interaction variable is significant at the 5 percent level, the remaining two are significant at the 1 percent level. Finally, all year variables are strongly significant at the 1 percent level (see Table 5.3. in appendix).

There are interesting ways to enlarge the analysis also for the second model. As for the first model, to test whether the sum of the coefficients of $\ln(MPF_{jt})$ and $\ln(MPF_{jt}) \times D3_{H99ijt}$ differs from zero could increase the strength of the analysis. However, as already concluded, given the width of the thesis, these tests are left for future studies.

In order to investigate the outcome of a model without any EU dummies a hypothetical setting, where also the dummy capturing the Helsinki effect is excluded, is estimated (see Table 5.4. in appendix). In this specification, all market access measures are highly significant (1 percent level), but the explanatory power drops drastically (R^2 equal to 0,781). The estimated coefficient of MPF is negative, which clearly is inconsistent with theoretical predictions. Based on these results and the ones from the preceding tests, one can theoretically infer a conclusion. The Helsinki Summit does seem to have a strong positive effect on the GDP per capita levels in a region. This effect seems to work mainly directly, as captured by the coefficient on the dummy. The indirect effect on the impact of market potential measures of a region is in several instances negative.

Considering the preceding conclusions, it may be interesting to investigate the magnitude of the direct effect from the Helsinki Summit on the wage levels in the accession countries. Any model including both the dummy and the interaction variables will however be misleading since the interaction variables will amplify the magnitude of the dummy coefficient. Thus, in order to assess the direct effect of the Helsinki Summit a model is estimated where the Helsinki dummy is included on its own, without interaction variables (see Table 5.5. in appendix).

As predicted, the explanatory power increases markedly when the Helsinki dummy is included relative to the model with just the market potential measures (model 3). The fourth model specification has an adjusted R^2 equal to 0,823 (see Table 5.1. in appendix). The estimated coefficient of the Helsinki dummy is, when the interaction variables are excluded, equal to 0.619. This estimate implies an increase in the wage levels in the accession countries following the Helsinki Summit of approximately 86 percent³.

³ $e^{0.619} - 1 = 0.8571$

In all of the above specifications, the domestic market potential has none or very limited effect on the dependent variable. In several of the estimated models the coefficient of this factor is insignificant. In the models where it is significant, the size of the coefficient is very close to zero. Hence, in the fifth and final model specification the MPD variable is excluded. Thus, this model consists of the main variables MPF and MPI. As concluded above, due to the strong effect of the Helsinki Summit, the dummy with accompanying interaction variables is also included. The two other EU dummies are excluded in the final model since they, as concluded in the preceding model tests, both were insignificant.

The explanatory power of the final model is higher than for the preceding specification (adjusted R^2 is equal to 0,879, see Table 5.1. in appendix). Similar to the results for the first model, the estimated coefficient of the MPF variable is not significant, but has the expected positive sign. All other estimated coefficients are however highly significant at the 1 percent level. The coefficients of the interactions variables are negative, a result that we will discuss in the next section.

The potential extension in the analysis described above for model 1 and 2, to test whether the sum of the coefficients of $\ln(MPF_{jt})$ and $\ln(MPF_{jt}) \times D3_{H99ijt}$ differs from zero, could also be extended to model 5. However, as stated for the preceding models, these tests are left for future studies.

The final model specification is given in equation (24):

$$\ln\left(\frac{GDP_{jt}}{cap_{jt}}\right) = \alpha + \beta_{1jt} \ln(MPF_{jt}) + \beta_{2jt} \ln(MPI_{jt}) + \beta_{3jt} D3_{H99ijt} + \beta_{4jt} \ln(MPF_{jt}) \times D3_{H99ijt} + \beta_{5jt} \ln(MPI_{jt}) \times D3_{H99ijt} + \sum_{t=1995}^{2002} \gamma_t Dummy_{jt} + \varepsilon_{jt} \quad (24)$$

5.2 Interpretation of the Regression Results

The first equation, with all variables included, had the highest explanatory power of all tested equations with an adjusted R^2 equal to 0.883 (see Table 5.1. in appendix). Also, in this model, all the coefficients for the main variables have the expected signs. As in the studies by Mion for Italy, De Bruyne for Belgium and Brakman et al. for Germany, the regression results for the model implies that

improved market access have a positive impact on a region's wage level. However, it is only domestic and internal market potential that is significant among the three main market potential variables. Clearly, by comparing the level of significance and the size of the estimated coefficients one can infer that the internal market potential is the most important factor in explaining a region's wage level. A one percent difference in internal market potential between two regions will, *ceteris paribus*, result in a difference in wage levels of approximately 0.44 percent between the regions. Given the definition of the MPI factor, one can conclude that the geographic size and GDP level of the region itself is an important factor determining the overall wage levels in a region.

Redding and Venables divide their market access factor into two parts, one domestic and one foreign. They do also conduct their study on a country-level. This thesis on the other hand has a three part expression and is conducted on a regional level. Due to the differences in setup and basic assumptions, the results from this study can not be directly evaluated against the results in Redding's and Venables' study. One can on the other hand infer conclusions and arguments by comparing the results of the two studies.

Redding and Venables find that the most important factor in explaining GDP per capita is domestic market access which, when included on its own, seems to explain 73 percent of any cross country variation. The findings of this study imply that the internal market potential is by far the most important factor explaining variation in the wage levels across regions. Since Redding's and Venables' study is conducted on a country level, domestic market access can reasonably be treated as an equivalent to this study's MPI factor. Given this assumption, the results support each other, the main determinant in explaining wage or GDP per capita differences, inter-regionally or across country borders, are the internal market conditions of the region or country.

In Redding's and Venables' study foreign market access, when included on its own, explained 35 percent of cross country variations in GDP per capita. On a regional basis, this measure corresponds to the domestic market potential, defined as a distance weighted measure of other regions potential within the country borders. It is however also analogous with the foreign market potential; the distance weighted measure of the market potential of all regions located outside the domestic borders. Combined, these two measures equal a region's total external market potential, an equivalent to the foreign market measure in Redding's and Venables' study. The two authors argue that this measure is less important than the domestic market potential in explaining cross country variation in GDP per

capita, but nevertheless important. Based on the findings in this study, one can conclude that the same arguments hold on a regional basis.

In the first model, both the MPD and the MPF factor have a positive impact on the wage-level in a region. The magnitudes of the coefficients are however small in relation to the coefficient for the MPI factor. Two regions that simultaneously differ with one percentage point in both the MPD and the MPF factor will, *ceteris paribus*, have an approximate 0.18 percent difference in the relative wage levels. In comparison will, *ceteris paribus*, a one percentage point difference in the MPI factor between two regions result in approximately a 0.44 percent difference in the relative wage levels. Thus, not even the MPF and the MPD factors combined will have the same impact on regional wage levels as the MPI factor by itself. Further, in the setting given by the first model specification, only the MPD and the MPI measures were found significant, the MPF measure was not.

In the first specification, all three dummy variables, each capturing one key event in the EU accession process of the CEECs, were included. By observation, one can directly conclude that, on an individual basis, only the 1999 Helsinki Summit seems to have had any effect on the wage levels of the accession countries. Both of the other dummy variables are not significant on any reasonable levels. The Helsinki meeting, on the other hand, seems to have had a very strong positive direct effect. In the first model, the coefficient on the Helsinki dummy is equal to 3.58 and it is also highly significant (1 percent level). The magnitude of this coefficient is however somewhat misleading since it is inflated by the interaction variables. In order to estimate the direct effect of the Helsinki Summit, a model without interaction variables was estimated (Model 4). In this model the increase in regional wage levels in the accession countries as a result of the 1999 Summit is estimated to 86 percent. The result is highly significant.

The importance of the Helsinki summit is further emphasised by the fact that the interaction variables between the Helsinki dummy and the three main variables are all significant. However for the interaction variables, only the coefficient from the MPD interaction variable has a positive sign. This result can at a first glance seem counter-intuitive from a theoretical standpoint. It is reasonable to expect that the Helsinki summit would have a positive impact on the MPF factor, while none or only small effects on the MPD and MPI factor. Apparently this is not the case.

A theoretical interpretation of the negative coefficients on the two interaction variables can however be found. The coefficient of the main MPF variable measures the effect a one percent difference in

foreign market potential has on the wage levels for a region. The outcome of the Helsinki Summit were improved market conditions for the accession countries, i.e. lower trade and transaction costs and improved future prospects in terms of a faster EU accession process. In line with this reasoning, it was concluded that the wage levels increased for all accession countries with approximately 86 percent as a result of the Helsinki Summit. In the meantime the interaction variable for the MPF factor and the Summit displays a negative coefficient. This can be interpreted as, due to the improved market conditions following the Helsinki Summit, the relative importance of a region's geographical location to foreign markets, captured in the MPF factor, decreased. Thus, one can possibly interpret the negative interaction effect as an expression of that, as a result of the Helsinki summit, and the outcome in terms of e.g. lower trade costs, the geographical location within the EU region diminished in importance.

One can interpret the negative coefficient for the internal market potential of a region in a similar way. Before the 1999 Summit, the MPI of a region was very important. Given the lower international flow of goods, relative to after the 1999 Summit, a large home market and a region's internal economic activity was to a large extent determining the wage levels in a region. However, the negative coefficient on the interaction variable for the MPI serve as evidence that as the accession countries' access to the EU15 countries improved very markedly following the 1999 Helsinki Summit, the internal market potential of a region lost some of its' importance in explaining regional wage level differences. Thus, as given by the interaction variables, following the 1999 Summit the internal market potential of a region diminishes in importance.

The aggregate conclusion is thus that the 1999 Helsinki Summit reduced the importance of foreign as well as internal market potential for explaining inter-regional wage differences. It led foreign market potential to lose all its explanatory power and the internal market potential to lose some of its explanatory power for inter-regional wage differences.

When estimating the second model specification, where the EU dummy variables except the Helsinki variable was excluded, some features changed relative to the first model. The coefficient for the MPD variable became insignificant, although the interaction variable for the MPD factor remained highly significant. One way to analyse the implications of this result is to follow the same theoretical reasoning as for the interpretation of the negative MPF factor in the first model. Since the coefficient for the MPD variable is insignificantly different from zero, one can conclude that the domestic market

potential does not, in the conditional setting of this model, have any impact on inter-regional wage differences.

The Helsinki Summit does however bring about a change in the data. The interaction variable for the 1999 Summit and the MPD factor has a significant and positive coefficient. Thus, the relative importance of the domestic market potential seems to increase as a result of the Helsinki Summit. This finding can in turn be interpreted in the following way. Before the Helsinki Summit it was more important for a region to have a relatively high foreign market potential than to have a relatively high domestic market potential. This was due to higher transport costs and more barriers to trade, especially to the old EU countries. However, with the 1999 Summit the conditions change. The market conditions for the accession countries improve with respect to foreign markets, especially to the old EU countries. Geographic location is no longer as important as before since the overall trade conditions improve (e.g. lower transport costs and removal of barriers to trade) As a result the impeding factor for growth in regional wage levels is no longer to the same extent a low MPF factor. However, as the importance of having a high foreign market potential decrease, it becomes more important, for competitive reasons, to have a high domestic market potential. Thus, as a result of the Helsinki Summit, relative differences in domestic market potential will play a more important role in explaining differences in regional wage levels, which explains the positive coefficient on the interaction variable for the MPD factor. Relative to the first model, the explanatory power fell marginally for the second model, adjusted R^2 is equal to 0.881 (see Table 5.1. in appendix).

In order to investigate the relationship between the regional wage-levels and the market potential without EU dummies, the third model excludes all other variables except the three main variables and the time dummies. According to the results, a one percent improvement in the internal market potential will, *ceteris paribus*, result in approximately a 0.4 percent increase in the wage levels for the region. Thus, relative to the first model, there is a slight deterioration in the magnitude of the MPI coefficient. The coefficient for the MPD factor is highly significant in the third model. Still, the importance of the factor seems relative limited since the coefficient is marginally above zero (0.04). In the third model, the MPF factor enters negatively. When the negative interaction effect between the Helsinki Summit and the MPF factor is excluded, the effect of the MPF factor itself turns negative. This further emphasises the importance of the Helsinki Summit.

The fourth model includes the Helsinki dummy alone, without the interaction variables. As concluded above, the 1999 Helsinki dummy is still highly significant and the inclusion of the variable goes

unquestioned. For the main variables, only small changes relative to the preceding test are noticeable. The MPI factor is still by far the most important factor while the MPD factor is marginally above zero. While still negative, the coefficient for the MPF factor has dropped in magnitude relative to the preceding model.

The fifth model was remodelled with the MPI and MPF factors alone. The coefficients of all variables, except for the MPF factor, are highly significant. The coefficient for the latter does however enter with a positive sign as expected (see Table 5.6. in appendix). Similar to the previous models, the results generated in the fifth model also support the findings of Redding and Venables. In explaining inter-regional wage differences, the internal market potential of a region is by far the most important factor.

In sum, given the findings in all the tested models, several interesting conclusions can be deduced regarding the relationship between economic geography and wage differences on a regional level. Redding and Venables concludes that the most important factor is domestic market access when studying the effect on GDP per capita on a country-level. Similarly, the results in this study show that the most important factor determining inter-regional wage levels is the relative internal market potential.

Redding and Venables also conduct a hypothetical experiment where they move peripherally located developing countries closer to the economic centre of the world. They find that the gains in GDP per capita are substantial. From this finding they conclude that the transitional effects on the CEECs will be very substantial. Improvements in free trade agreements will in effect bring these countries closer to their richer neighbours and as a result improve their market access and finally their economic welfare. From the results in this study one can conclude that the most interesting period in the accession is clearly the one surrounding the 1999 Helsinki Summit, which was accompanied by large increases in the wage levels for the accession countries.

Another interesting conclusion drawn by Redding and Venables is that the gain for a low-wage country, of closer regional integration to another low-wage country is small, relative to the gains from a closer integration with high income countries. In order to capture differences in effects on wages from domestic versus foreign market potential, a separation of external market access was done in the study. Following the reasoning of Redding and Venables, the domestic market potential should have less impact on the regional wage level than the foreign market potential. The reason for this is that any

potential improvement in market access for the accession countries to the wealthier old EU countries will be captured by the MPF factor. In the MPD factor on the other hand only effects from the domestic regions are captured. Since the MPD factor is within the same country, this will theoretically not improve for the countries applying for EU membership through the accession stages more than indirectly through improvements in the MPF factor for all other domestic regions. Thus, the MPF factor should theoretically always have a larger impact than the MPD factor on the regional wage levels. For all tests conducted, the coefficient for the MPD factor is smaller than for the MPF factor. Thus, in line with the reasoning of Redding and Venables, one can conclude that for regions located in low-wage countries the foreign market potential is of higher importance than the domestic market potential. However, following the integration into the EU, the foreign market potential for the low-wage countries became less important while the domestic market potential became more important. Thus, as a result of the EU integration, there was a shift in importance between the two market potential measures for the accession countries. Most important, both before and after the integration is however a region's internal market potential.

In Breinlich's market access study across 193 EU15 NUTS2 regions, the focus lies solely on exports. The author concludes that, on average, doubling a region's market access leads to an increase in the wage proxy with approximately 24%. Breinlich separates the market access effect into three parts; national market access, EU market access and rest of the world access. Breinlich's study has a stronger focus on the external market access to other regions relative to the models used in this study. The author concludes that among the three measures, the national market access has the largest effect on wage levels in a region.

Since Breinlich only measures the market access effects on a national level he neglects to incorporate the effect of differences in the internal markets of the NUTS2-regions he compares. Thus, Breinlich fails to incorporate the effect a region's internal market potential has on the wage-levels. While the external market access, among which one part is the domestic market, is important in determining a region's wage level, the findings in this study show that the internal market potential is of much larger importance. Breinlich does however conclude that countries with small home markets and a large home bias in trade tend to suffer a further access penalty. Thus, indirectly do Breinlich's arguments support the conclusions drawn in this study; a region's internal market potential is very important when explaining regional wage level differences.

5.3 Projected Income Levels and Future Development in the EU Region

In this section, future income and wage levels in the EU are projected on the basis of present growth rates. To begin with, the income and wage levels for the regions of the accession countries are compared to the levels in the old EU countries and in the non EU countries. Thus, the regions are for comparative reasons divided into three different groups; old EU countries (EU15), new members (2004 accession) and non EU countries. The last group consists of the next accession group, regions in Romania and Bulgaria, that are going to be accepted into the EU in 2007 or latest 2008.

The regions in the EU15 countries are on average much richer than the accession countries. Throughout the entire time period the GDP levels, after being purchasing power parity adjusted, is approximately two times larger in the EU15 than in the regions of the new membership countries. For the non EU countries that are in the accession process today (Romania and Bulgaria) the PPP-adjusted GDP-levels is more than four times smaller relative to the EU15 (see figure 1). The picture does however change when one turns to the accompanying growth rates. At the outset of 1996 the GDP growth rate for the new EU members that at the time were in the accession stage, were above 8 percent. For the EU15 countries the growth rate at the same time was equal to approximately 5 percent.

Interestingly, as one moves along the different accession stages, the more aligned does the growth rates become. The growth rates do also converge completely in 1999, but from 2000 and onwards the gap increases again. In 2002, as the Big Bang approach of accepting all accession countries at the same time is accepted in Copenhagen, the difference in growth rates seems to have stabilised at an approximate 1 percent difference. Another interesting feature is that the non EU countries which start at much lower GDP levels seem to, during the years 1999 to 2002, experience the same growth pattern as the new EU members did in their early accession period. A short period with very high growth rates is replaced with a longer period when the growth rate slowly converges towards the more moderate levels in the EU15 (see figure 2).

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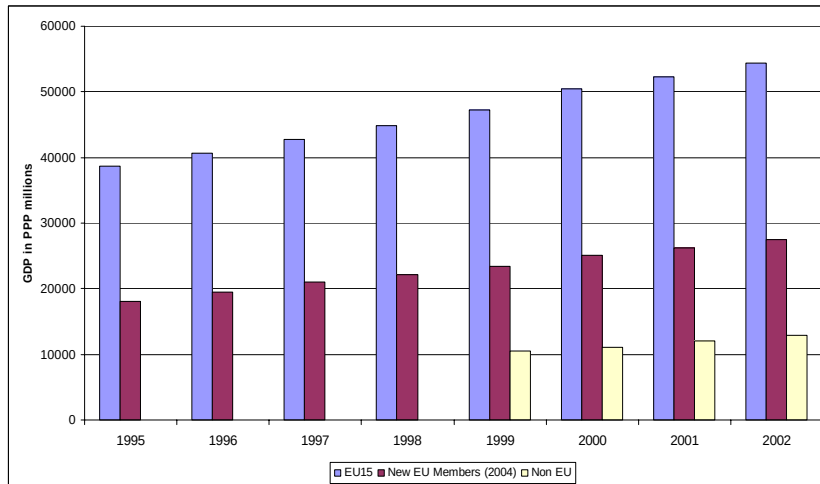


Figure1. GDP-levels: a comparison between the EU15, new EU members and non EU members, between years 1995-2002

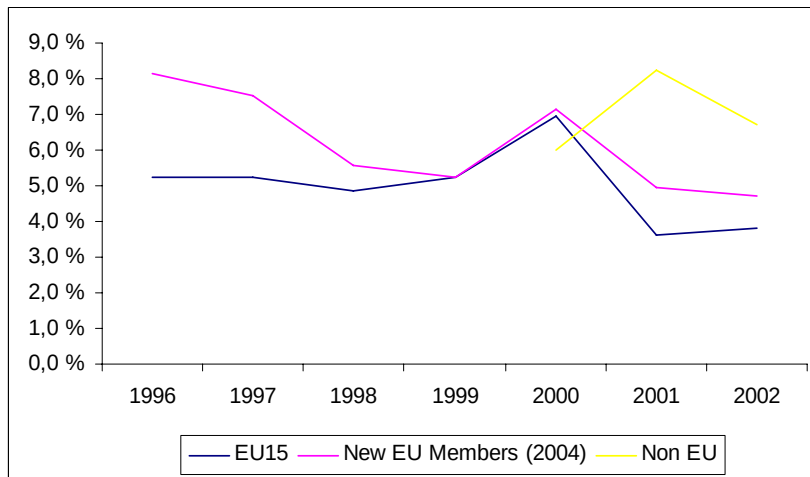


Figure2. GDP growth rates: a comparison between the EU15, new EU members and non EU members, between years 1996-2002

When studying the growth rates for the active workforce across the different country groups several interesting features are evident. First, the EU15 region has a much more stable and consistently positive growth rate over the years relative to the other two groups. Second, the growth rates in the new EU membership countries did, at the time of the Helsinki summit in 1999 reach a high and then turned negative in early 2000. After that period, the growth rates in the active workforce have converged between the new and old EU countries and are at mid 2004 marginally positive. For the non EU countries waiting for accession, the development has been less positive over the last years. After reaching a low of approximately negative 5.5 percent in mid 2002, there have been some improvements and positive rates were attained in 2004 (see figure 3).

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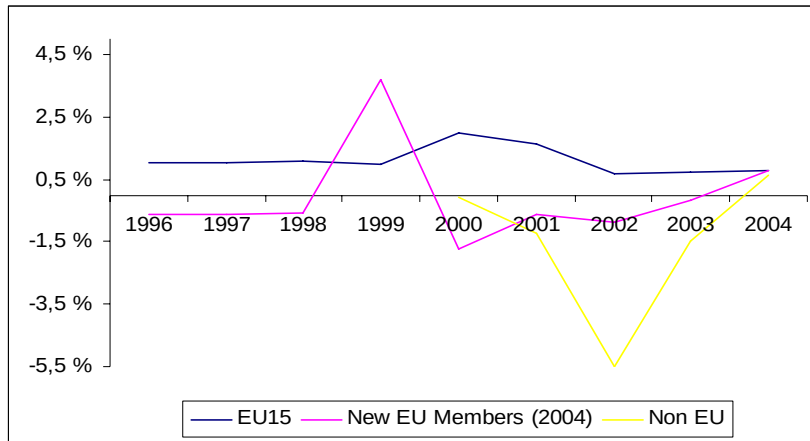


Figure3. Growth rates for the active workforce (15-65 years): a comparison between the EU15, new EU members and non EU members, between years 1996-2004

The differences in GDP on a per capita basis are fairly similar to the ones on aggregate basis; the country groups display almost identical patterns. The growth rate for the new EU members is higher on a per capita basis than on an aggregate level. This higher growth rate is partly due to the years with negative growth rates in the active workforce (2000 to 2003). In 2004, the growth rates in the active workforce align between the new EU members and the EU15 region. Thus after 2004 the new EU members will still have relative higher per capita growth rates, but this difference will now solely be dependent on the higher GDP growth rates for this region (see figures 1, 3 and 4).

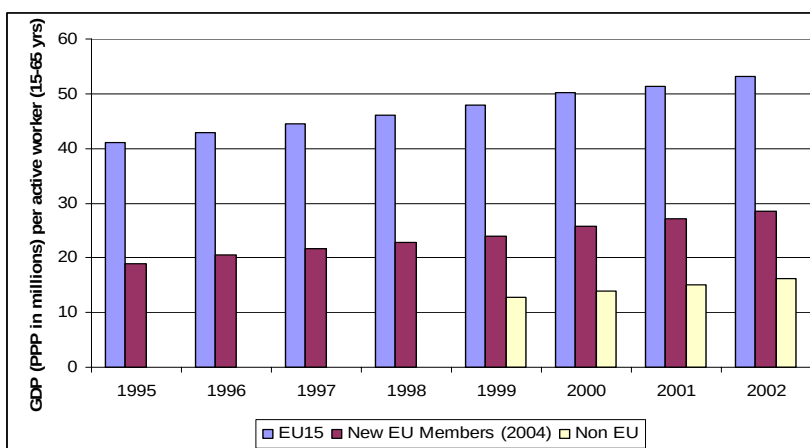


Figure4. GDP (in PPP millions) per active worker (15-65 years): a comparison between the EU15, new EU members and non EU members, between years 1995-2002

According to the regression results the EU accession process, as measured by the Helsinki dummy, had a very large effect on the wage levels of the CEECs. It was also evident that differences in the foreign and internal market potential lost some of its importance in explaining inter regional wage differences as a result of the integration process. An implication of this would be that over time and as a result of the continuous integration within the EU, the wage and income levels for all countries within the EU should converge towards the same level.

In this section of the paper projections of a possible future growth pattern for the EU region is conducted. In order to do these forecasts, the average growth rates for all regions were first calculated over the observed time period in the dataset. The estimated growth rates were then applied over a time period up until year end 2015. As a last step, the growth rates were accumulated and rebased for comparable reasons.

From the projections one can see that the small differences in GDP growth rates at present date will have very large effects over time, given that these differences will continue to exist. While the actual GDP growth rates converged between the old and new members within the EU over the time period 1996 to 2002 (see figure 2), the small differences that still exist will have serious implications. If one compounds the growth rates over the time period up until 2015, the small initial differences will lead to very different levels of aggregate growth in the GDP levels for the different groups. After rebasing the dataset to 1 at the starting date (1995), old EU members' average GDP level will have grown with a factor of approximately 2.7 up until year end 2015. For the new EU members the same factor is approximately equal to 3.5. Thus, the small initial differences will, in this thought experience, lead to that the new members' average GDP level will grow approximately 1.27 times more than the old members' until year end 2015 (see figure 5). This very simple projection supports the conclusions from the regression results. It does also follow the classical Hecksher-Ohlin framework of factor price convergence.

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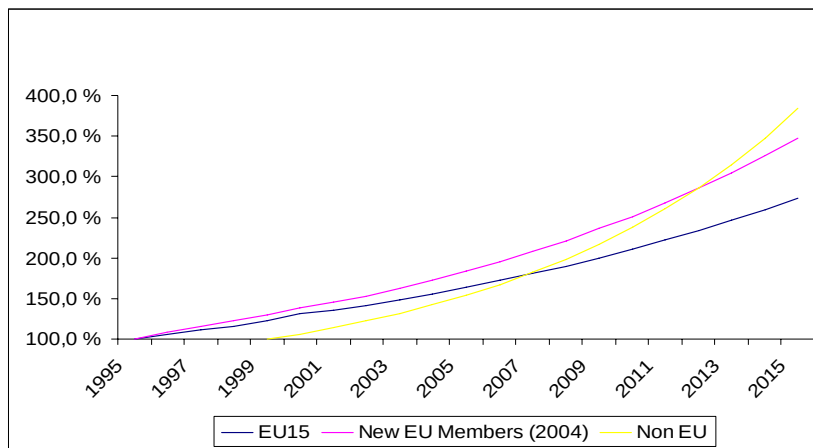


Figure5. Projected compounded GDP growth-rebased to 100%: a comparison between the EU15, new EU members and non EU members, between years 1995-2015

If one makes the same projections in GDP levels per active worker (the wage proxy used in all regressions) over the near future, an even more pronounced picture emerges. Until 2015, the old EU members' average GDP levels per active worker will grow with a factor approximately equal to 2.2. For the new members this factor is equal to approximately 3.4. Thus, at the end of 2015 the new members' average GDP per capita level will have grown approximately 1.54 times more relative to the old members (see figure 6). Once again, starting at very different levels (see figures 1 and 4) the implications of the projections is that there will be a convergence in factor prices and income levels within the EU area over the predefined time period.

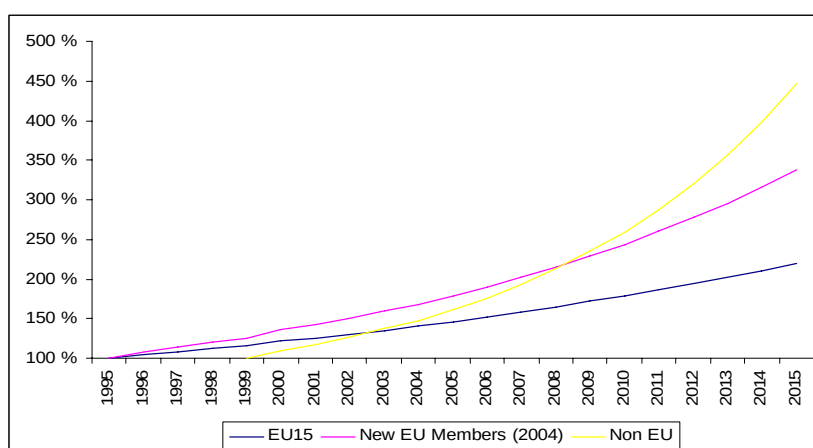


Figure6. Projected compounded growth in GDP per active worker (15-65 yrs)-rebased to 100%: a comparison between the EU15, new EU members and non EU members, between years 1995-2015

The projections do also include Romania and Bulgaria which are in the accession process right now, waiting to be accepted into EU latest 2008. Since the dataset covering this group does not start until 1999 there are some difficulties in comparing growth rates and projections with the two other groups of countries. Disregarding the differences in initial dates one can however make some very interesting observations. First, the initial growth rates are larger for this group relative to the other two groups and this difference leads to very large effects over time. Starting in 1999, the non EU groups' compounded average GDP growth level will, *ceteris paribus*, surpass the old EU members' in early 2007 and the new EU members' in mid 2012 (see figure 5). For the compounded growth rate in GDP per active worker, the non EU countries will, *ceteris paribus*, surpass the old EU members in early 2003 and the new EU members in mid 2008 (see figure 6). At the end of the projected period (2015) the non EU members will have a compounded GDP growth rate that is approximately 1.4 times larger relative to the old EU members' and 1.1 times larger than the new EU members'. For the compounded growth rate in GDP per active worker the difference will, *ceteris paribus*, be even more pronounced; approximately 2 and 1.3 times larger relative to the old and new EU members' respectively.

Given the conclusions based on the results from the regressions and the projected convergence pattern within the EU in this section, one might wonder when in time complete equalisation in income levels for all countries within the EU borders could occur. In order to investigate this matter, the average growth rates for the different EU regions in the time period given in the dataset was first calculated. These constant growth rates were then applied on the GDP level for the last year in the data sample (2002) and then continuously rolled forward. This was done in order to estimate future GDP levels for the countries in the sample. Once the future GDP levels had been projected, the exact years of convergence for the different groups of countries could be assessed.

As already concluded in the preceding section, the different groups of countries have very different starting conditions. The old EU members (EU15) have a large advantage in income levels to both the new EU members and the non EU members. Equivalently, the new EU members have a large advantage to the non EU members in income levels. Thus, there is a successive order in terms of GDP levels for the EU region. This order is however reversed when it comes to the growth levels in GDP levels for the countries. The non EU members outperform both the new and old EU members. The old EU members have the lowest growth rates. Thus, as concluded before there is an obvious convergence process taking place within the EU region.

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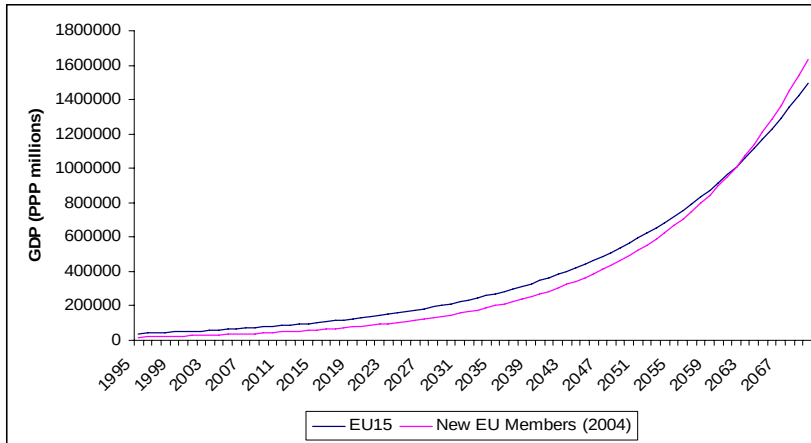


Figure7. Projected GDP levels at constant growth rates: a comparison between the EU15 and the new EU members, between years 1995-2070

The countries that were accepted into the EU in 2004 are, at present date, growing faster than the old EU members. If the new members will manage to keep growing at constant rates, their absolute GDP levels will continuously converge towards the GDP levels in the old EU countries, given that they also experience constant growth over time. If these assumptions hold, the GDP levels for the two groups of countries will be completely equalized in the year 2062 (see figure 7).

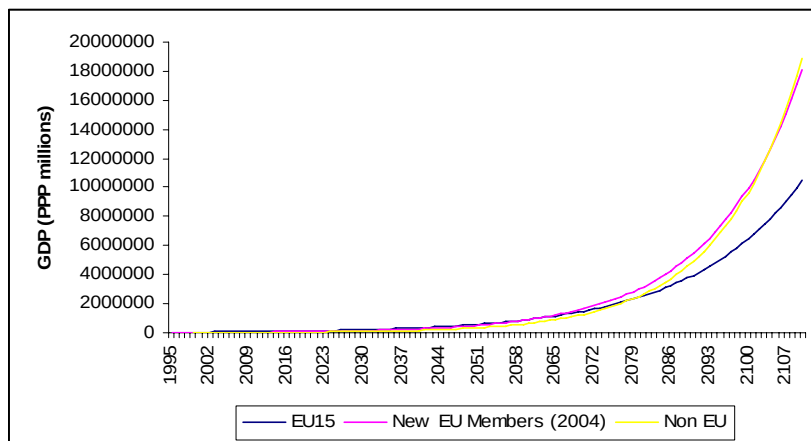


Figure8. Projected GDP levels at constant growth rates: a comparison between the EU15, new EU members and non EU members, between years 1995-2110

The non EU countries are starting from lower absolute GDP levels than what both the old and new EU members are doing (see figure 1). On the other hand, their growth rates are higher relative to both of the other groups. The combined effect of these starting conditions is that the convergence process between the non EU members and old EU members will take longer time than what is estimated for

the new EU members. However, since the new EU members are starting at lower absolute GDP levels than the old EU members, the GDP levels between the non EU members and the new EU members will equalise faster. The non EU members' GDP levels will be completely equalised to the new EU members' GDP levels in 2079. The old and new EU members' GDP levels will be equalised already in 2062, and the new members have a higher growth rate than the old members. As a result, the convergence process for the non EU members towards the new members will take longer time than relative to the old members. For the non EU members the GDP levels will not be completely equalised relative to the new EU members until 2104 (see figure 8).

In the preceding sections it was concluded that there is a convergence process taking place for the GDP levels in the EU region. Given the results from the last projections it is however very important to note that it will take a very long time before complete equalisation in the GDP levels can occur.

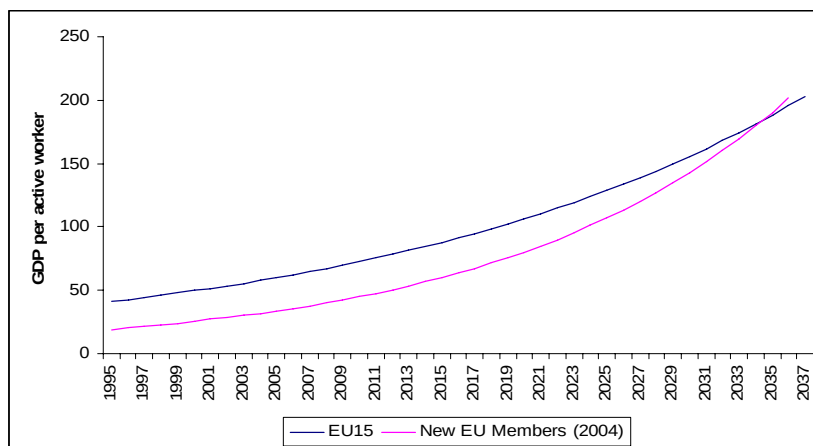


Figure9. Projected GDP per active worker levels at constant growth rates: a comparison between the EU15 and the new EU members, between years 1995-2045

The wage proxy used in the regression equations is equal to GDP per active worker. In order to investigate whether the wage levels can potentially experience the same convergence process as the GDP levels, a final set of projections were constructed. The projections for the wage proxies were calculated in the same way as for the GDP levels. In the first set, the convergence process in the wage levels between the old and new EU countries is studied (see figure 9). This process is faster than for the GDP levels. With constant growth rates, the wage levels in the new EU countries will be completely equalised with the wages in the old EU countries in the year 2035. Due to much higher initial growth rates, the convergence process for the non EU countries will be even faster. The wages

will be equalised for the non EU countries relative to the new and old EU countries in 2029 and 2032 respectively (see figure 10).

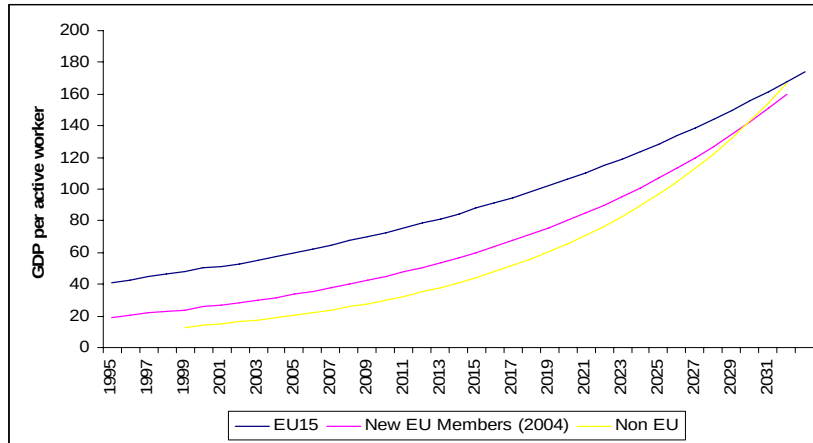


Figure10. Projected GDP per capita levels at constant growth rates: a comparison between the EU15, new EU members and non EU members, between years 1995-2035

To summarise; the conclusions from the projections all indicate that there is a convergence process taking place within the EU region in both income and wage levels. This process is taking place both for the new (2004) EU membership countries as well as for the countries currently in the accession phase. While the convergence in income levels across countries within the EU region will take a very long time, the convergence in wage levels can happen in the foreseeable future.

6 Summary and Conclusion

Historical experience and theory predicts that, as a result of the inclusion into the EU, the factor prices in the CEECs will converge towards the levels of the EU15 countries. The emphasis in this study was to investigate whether the CEECs has experienced a convergence in their wage levels relative to the old EU countries during the initial steps of the EU accession process.

In the framework of New Economic Geography theory, a region's wage levels can be expressed as a function of its market access. In this study, several specifications of regional wages as a function of market potential have been estimated. These specifications have included variables capturing different phases in the closer integration between the new EU members in CEE and EU15.

From the results some features of the market potential measures have come clear. First, the internal market potential is by far the most important factor in determining the wage level for a region. Second, although insignificant in several specifications, the coefficient for the foreign market potential factor is relatively large in the sample. Third, the domestic market potential variable do in all model specifications have a coefficient close to zero. It is also insignificant in several of the specifications. One can hence draw the conclusion that the domestic market potential has none or a relative limited effect on the wage level of a region. In aggregate one can conclude that, among the three market potential measures, the internal market potential is the most important followed by the foreign market potential and at last the domestic market potential.

In the regressions, three different key events in the EU accession process for the CEECs were included. Neither the Two Echelon decision in 1996 nor the Luxembourg Summit in 1997 was found to have any effect on the wage levels in the accession countries. The 1999 Helsinki Summit did on the other hand have a very large effect. According to the results, the outcome of the Helsinki Summit was an increase with approximately 86 percent in the regional wage levels for the accession countries.

The 1999 Summit did however not only affect the wage levels in the CEECs directly; also an indirect effect is apparent from the results. The interaction variables between the Helsinki Summit and the two market potential measures, MPI and MPF, capture a very interesting aspect of the EU integration process. Before the Summit the two market potential measures' effect on the regional wage levels are

relative large and positive. However, for both market potential measures, the interaction variables with the Summit are negative. The interpretation of this result is that, as a result of the accession process into EU, the market potential measures loses importance in explaining wage differences across regions. In the phrasing of Redding and Venables, the market access penalties of a peripheral location become less severe.

The conclusions based on the regression results do seem to support that there is an actual convergence process taking place within the EU region at present date. However, given the relative short time period in the dataset, and that a convergence process will take long time, no definite conclusions can be drawn by merely studying the historical development within the regions. In order to investigate the potential for a convergence process within the EU region over time, projections of the future GDP development was also calculated. In these projections, a convergence process in income and wage levels across the different countries became apparent. Given their different initial conditions, the new EU members are estimated to reach the income levels of the old EU countries only in 2062. The convergence in wage levels is however estimated to be faster; complete equalisation is estimated to occur in 2035.

For the countries that currently are in the accession process and that will join the EU in latest 2008, the equalisation in income levels with the old and new EU members is estimated to occur in 2079 and 2104, respectively. Thus, the income levels for the non EU countries are projected to be equalised to the levels in the old EU at a later date than for the new EU members. Interestingly, this timing in convergence does not hold for the relative wage levels. For the non EU members the wage levels will be equalised to the old EU members at an earlier date than for the new EU members. For the non EU members, a complete equalisation in wage levels relative to the wages in the new and old EU countries is estimated to occur in 2029 and 2032 respectively.

The interpretation of the projections is limited by the fact that it seems highly implausible for any of the investigated countries to maintain the present growth rates over an infinite time period. A more likely development is that growth rates will tend to converge within the EU region over time. Still the projections provides interesting insights in how the initial differences in growth rates can affect the future relative income and wage levels across the investigated regions. A higher initial growth, even if only for a couple of years, will be conducive to per capita income convergence. Even if this does not necessarily imply that the convergence has to lead to a complete equalisation across all EU countries,

it might serve as evidence for that a narrowing in income and wage levels do occur within the EU. It is however very hard, if not impossible, to foresee the actual outcome by only observing historic data.

Based on the research and findings in this thesis, there are several suggestions for future studies. First, as discussed in the results section, it is possible that region-specific factors are correlated with both wage levels and the internal market potential measure, leading to endogeneity bias. In a future study one could estimate whether this bias do exist in the data by including dummy variables for all regions in the dataset. These dummy variables would eliminate any potential time-invariant differences across regions. Thus, if the bias does exist in the data, a more precise estimation of the internal market potential measure would be rendered by following this approach. Second, the EU enlargement from 15 to 25 members happened in 2004. In this study, the main focus has been to investigate the effects from key events during the accession process preceding this date. From the findings, conclusions were drawn about a convergence process in the wage levels currently taking place in the EU region. It would be very interesting to investigate in the future whether this convergence process actually have led to a complete equalisation in the wage levels across the entire region. The second suggestion for future studies is to investigate if the new group of accession countries that will be accepted at latest 2008 will display the same pattern of development as the group studied in this thesis have. If this will be the case, more general conclusions could potentially be drawn about overall welfare effects, during the accession stage, attributed to countries joining the European Union.

7 Appendix

Table2.1. All membership countries in the EU, listed by accession date

Belgium	
France	
Italy	
Luxembourg	23 July 1952 (ECSC), 1 January 1958 (EEC)
Netherlands	
West Germany	
Denmark	
Ireland	1 January 1973 (EC)
United Kingdom	
Greece	1 January 1981 (EC)
Portugal	
Spain	1 January 1986 (EC)
East Germany	3 October 1990
Austria	
Finland	1 January 1995
Sweden	
Cyprus	
Czech Republic	
Estonia	
Hungary	
Latvia	
Lithuania	1 May 2004
Malta	
Poland	
Slovakia	
Slovenia	
Bulgaria	
Romania	1 January 2007/08
Croatia	
Turkey	in accession negotiations

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Republic Macedonia	of	candidate country
Albania Bosnia Herzegovina	and	potential candidate country
Serbia Montenegro	and	

Table5.1. Goodness of fit: comparison across models

	R-square	adj. R-square
Model 1	0,885	0,883
Model 2	0,882	0,881
Model 3	0,781	0,779
Model 4	0,825	0,823
Model 5	0,880	0,879
Model 6	0,880	0,879

Table5.2. Model 1: All Variables Included

Variable	Beta	Std. Error	t-value	Sig.
(Constant)	-1,301	0,877	-1,484	0,138
lnMPF	0,149	0,104	1,429	0,153
lnMPD	0,028	0,013	2,166	0,031**
lnMPI	0,442	0,017	25,285	0,000***
D1_TWOECH	0,493	1,925	0,256	0,798
D2_LUXEMBOURG	0,659	2,104	0,313	0,754
D3_HELSINKI	3,58	1,245	2,876	0,004***
D1_lnMPF	0,053	0,232	0,23	0,818
D2_lnMPF	-0,07	0,253	-0,276	0,782
D3_lnMPF	-0,268	0,148	-1,814	0,07*
D1_lnMPD	-0,051	0,021	-2,467	0,014**
D2_lnMPD	0,002	0,02	0,081	0,935
D3_lnMPD	0,035	0,012	3,043	0,002***
D1_lnMPI	-0,08	0,093	-0,86	0,39
D2_lnMPI	-0,009	0,111	-0,084	0,933
D3_lnMPI	-0,171	0,064	-2,668	0,008***
D96	0,08	0,035	2,273	0,023**
D97	0,113	0,034	3,295	0,001***
D98	0,14	0,034	4,075	0,000***
D99	0,1	0,034	2,969	0,003***
D00	0,148	0,034	4,367	0,000***
D01	0,176	0,034	5,133	0,000***
D02	0,211	0,034	6,116	0,000***

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Table5.3. Model 2: Only the Helsinki Dummy Included

Variable	B	Std. Error	t	Sig.
(Constant)	-1,073	0,656	-1,636	0,102
lnMPF	0,122	0,078	1,564	0,118
lnMPD	-0,006	0,007	-0,764	0,445
lnMPI	0,491	0,012	41,404	0,000***
D3_HELSINKI	4,443	0,696	6,380	0,000***
D3_lnMPF	-0,250	0,083	-3,016	0,003***
D3_lnMPD	0,019	0,008	2,442	0,015**
D3_lnMPI	-0,310	0,015	-20,379	0,000***
D96	0,097	0,033	2,926	0,003***
D97	0,130	0,033	3,914	0,000***
D98	0,156	0,033	4,677	0,000***
D99	0,098	0,034	2,907	0,004***
D00	0,146	0,034	4,291	0,000***
D01	0,174	0,034	5,050	0,000***
D02	0,209	0,035	6,025	0,000***

Table5.4. Model 3: No EU Dummies Included

Variable	B	Std. Error	t	Sig.
(Constant)	3,07	0,297	10,333	0,000***
lnMPF	-0,308	0,036	-8,652	0,000***
lnMPD	0,04	0,004	10,571	0,000***
lnMPI	0,397	0,008	46,951	0,000***
D96	0,098	0,045	2,188	0,029**
D97	0,135	0,045	2,998	0,003***
D98	0,165	0,045	3,645	0,000***
D99	0,228	0,045	5,021	0,000***
D00	0,275	0,046	5,999	0,000***
D01	0,302	0,046	6,529	0,000***
D02	0,335	0,047	7,204	0,000***

Table5.5. Model 4: Helsinki Dummy Included Without the Interaction Variables

Variable	B	Std. Error	t	Sig.
(Constant)	2,017	0,272	7,409	0,000***
lnMPF	-0,18	0,033	-5,525	0,000***
lnMPD	0,025	0,003	7,149	0,000***
lnMPI	0,338	0,008	40,869	0,000***
D3_HELSINKI	0,619	0,034	18,042	0,000***
D96	0,095	0,04	2,356	0,019**
D97	0,129	0,04	3,189	0,001***
D98	0,155	0,04	3,84	0,000***
D99	0,138	0,041	3,369	0,001***

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D00	0,182	0,041	4,386	0,000***
D01	0,206	0,042	4,946	0,000***
D02	0,238	0,042	5,671	0,000***

Table5.6. Model 5: MPD Excluded, Helsinki Dummy Included With the Interaction Variables

Variable	Beta	Std. Error	t	Sig.
(Constant)	-0,872	0,608	-1,436	0,151
lnMPF	0,098	0,072	1,356	0,175
lnMPI	0,485	0,009	53,921	0,000***
D3_HELSINKI	4,389	0,653	6,716	0,000***
D3_lnMPF	-0,234	0,078	-2,998	0,003***
D3_lnMPI	-0,295	0,013	-22,791	0,000***
D96	0,098	0,033	2,934	0,003***
D97	0,131	0,033	3,941	0,000***
D98	0,158	0,033	4,722	0,000***
D99	0,097	0,034	2,856	0,004***
D00	0,146	0,034	4,258	0,000***
D01	0,174	0,035	5,028	0,000***
D02	0,209	0,035	6,013	0,000***

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