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Bachelor Thesis

Free Movement: The Economic Effects of Net Migration within the European Union

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Abstract

In the European Union increased aversion towards immigration is clearly seen. At the same time one of the EU's foundations is that of free movement, which is backed by economic theory of efficient resource allocation. This thesis researches the effects of net migration within the EU on GDP per capita for EU countries from 1998 through 2012 using a fixed effects panel data model. A clearly significant and positive effect of net migration on GDP per capita is found, contrasting the pessimistic public opinion and offering partial support in favor of the European Union's free movement stance.

Contents

1 Introduction

A single market is often characterized by the four freedoms - the free movement of people, goods, services and capital (European Commission, 2014a). These are also naturally cornerstones of the European Union as the single market it is. One of the most frequently debated freedoms is the free movement of people. Across the entire European Union we however currently observe an increased xenophobia (The Economist, 2012). In countries such as Sweden[1], the United Kingdom[2] and France[3], recent elections have shown wide support for parties that are inherently eurosceptics (The Economist, 2014) and can in essence be said to want to restrict globalization.

Especially in the aftermath of the global financial crisis in 2007-2008 these parties have been gaining in popularity (The Economist, 2012), particularly with discontented voter groups (Ford et al., 2012). The European Social Survey (2002) shows a belief that immigration has negative economic effects[4]. Indeed people are negative towards welcoming immi-

[1] In the latest swedish general election (fall 2014), the Sweden Democrats received 12.86% of the votes (Valmyndigheten, 2014).

[2] In the elections to the European Parliament (spring 2014), the UKIP party received 26.77% of the votes, more than any other party (European Parliament, 2014b).

[3] In the elections to the European Parliament (spring 2014), Front National (eng. National Front) received 24.86% of the votes which was the most of all parties (European Parliament, 2014a).

[4] 5.8% of respondents from all over EU (39 769 people) feel it is bad for the economy, while only 3% says it is clearly good. (Dataset: "Immigration bad or good for country's economy")

grants even from within the union, both from countries richer and poorer than their own[5]. Immigrants, the belief is, come in and take the available jobs from native citizens to their detriment[6]. Per definition the desire to restrict immigration both from poorer and richer countries means that the public is generally against labor mobility.

In contrast to this stands the freedom of free movement of people which the European Union must consider to have positive effects in order for the single market part of the union to be justified. According to the European Commission (2014b), labor mobility is considered to have a positive effect on economic performance.

In light of this, the question of which argument is in fact true must be raised. If free movement has a positive overall economic effect, it must logically also have positive economic effects for several countries. The current political situation would as previously mentioned however suggest that public opinion says otherwise.

To shed some light on this intricate problem it is the aim of this thesis to empirically examine the economic effects of migration. This is done by analyzing how the net migration rate from within the European Union affects GDP per capita in the EU. Using the net migration rate both immi-

[5] 9.7%/10.1% of respondents think none should be allowed from poorer/richer countries. (Dataset: "Allow many/few immigrants from poorer countries in Europe" and "Allow many/few immigrants from richer countries in Europe")

[6] 7.4% says that immigrants take jobs away, while only 1.5% say that they create new jobs. (Dataset: "Immigrants take jobs away in country or create new jobs")

gration and emigration are accounted for and furthermore, a percentage rate gives better comparability between countries. GDP per capita is used as the indicator of economic performance and chosen over GDP to allow for a standard of living interpretation.

The thesis studies the 27 countries that were members of the European Union per 2012[7] and over time since 1998. Specifically, the question this thesis intends to answer is stated as follows:

> *What effect does the net migration rate of European Union countries have on their respective GDP per capita?*

This thesis is organized into five sections. First, a theoretical and empirical framework is presented to be used in the subsequent analysis. Secondly, the data used for the analysis is discussed in detail to be followed by a section containing the econometric analysis and results. Finally, the thesis is concluded with a summary of the conclusions reached.

2 Theoretical Framework

For analyzing the effects of net migration on GDP per capita, a common empirical and theoretical framework is required. This section discusses,

[7] For a full list of the countries in the European Union and the years in which they entered, please see Appendix B, table B.1. For convenience, this data has been summarized here from the website of the European Union and its "EU Member Countries" section (European Union, nd).

in order, the importance of free movement of labor itself, why an efficient use of workers is desirable and finally considers a basic framework with the components of GDP per capita to be used in the econometric analysis.

2.1 Free Movement of Labor

A cornerstone of the European Union is free movement of labor as defined in article 21 (1) of the Consolidated version of the Treaty on the Functioning of the European Union (2007). The basic idea is that this makes for a more efficient use of workers within the union as a whole, resulting in a positive overall effect.

The joint EU/OECD report "Matching Economic Migration with Labour Market Needs" (2014) discusses among other things, the dynamic labor market of the European Union and the expected skill shortage within certain groups and countries. Skill shortages, says the report, are not only due to demographic factors, but also due to dynamic demand for certain types of labor.

2.2 Efficient Use of Workers

The desire to find an efficient use of workers originates from common economic theory of resource allocation, where labor moves from countries with low marginal products to countries with higher marginal products (Feenstra and Taylor, 2014). Large differences in output per worker exist between countries (Klein and Ventura, 2009). By moving qualified labor from where it is in excess to where it is needed, a more efficient overall allocation is reached. This since, a person creates more economic value to the union, if working in a country within the union where there is a demand for labor, than if unemployed or having their skills used in a less efficient way in another country in the union. The presence of substantial barriers to labor movement suggests that an efficient labor allocation is not reached (Klein and Ventura, 2009). In their study, Klein and Ventura (2009) explored the effects of output, capital accumulation and welfare from removing barriers to mobility of labor. Their findings are consistent with the aforementioned theory and intuition. Indeed removing barriers to labor mobility is of high importance as it results in increases in both output and welfare. Furthermore, they conclude that removing barriers through for example an enlargement of the European Union will undoubtedly have clear positive effects on output. An even greater effect, they write, will be seen with even more far-reaching global

agreements.

Perhaps contrary to intuition, Mountford (1997) states that the loss of competent labor, commonly known as "brain drain", may have positive economic effects even in the country of origin. He finds primarily two reasons for this. Firstly, when people are given the opportunity to move to a country with a higher wage level their return to education is raised and thus educational incentives increase. This increases human capital and can exceed the effects of the brain drain itself. Secondly, brain drain is shown to affect the educational class formation and the income distribution in the source economy, something that has positive effects on their economy. Thus, there is evidence that the countries in Europe from where people to a greater extent leave too may benefit from an increased international openness.

2.3 Factors Affecting GDP per capita

Analyzing the effects of net migration on GDP per capita requires an econometric model. To find the true causal effects of net migration, such a model needs to control for all other factors affecting GDP per capita. The data is presented in section 3 below and a formal econometric specification of the model is given in section 4.1.

There exists a large body of literature, including previous empirical

research papers, which have examined various effects on GDP. If a factor affects GDP it also by construction affects GDP per capita. Therefore these factors are relevant in this GDP per capita analysis as well and consequently this thesis draws inspiration from these.

Three factors presented by Boulhol et al. (2008) in an OECD published report are population change, human capital and physical capital. These factors are the foundation of the human capital augmented Solow model (Mankiw et al., 1990), an extension to the original Solow (1956) model. In their paper, Arnold et al. (2007) examined and found the long-run growth Solow (1956) model to be an applicable growth model for OECD countries.

Population change is in population growth literature (for example Andreev et al. (2013)) divided into two components: net migration and the natural population change (mortality and natality). Hence these factors are used.

Additionally, according to Ashraf et al. (2013) it is reasonable to assume that the lags for which the natural population change affect GDP can be long and are therefore difficult to estimate. Macroeconomic data all over the world counts people as part of the working age population from the age of 15. Observing the natural population change with a 15-year lag is therefore reasonable.

As suggested by Boulhol et al. (2008) human capital can be captured by the factors tertiary education rate and secondary education rate as proxies, representing the skill level of workers, while physical capital can be represented by the rate of investment in the economy.

Furthermore, research done on significant determinants of GDP, such as by Sala-i Martin et al. (2004) and Aiginger and Falk (2005), presents findings that the size of government spending's share of GDP has an effect on GDP.

Three monetary factors also explain changes in GDP per capita. Krugman and Wells (2013) describe how monetary policy and changes in interest rate affect aggregate demand and thus the GDP per capita. Inflation is found by Fischer (1993) to reduce growth by impeding productivity increases and reduced investment. Examples of these used in previous regression analyses of GDP can, among others, be found in the papers by Agalega and Antwi (2013) and Saymeh and Orabi (2013).

Differences in exchange rate can affect the economy in a country, for example by affecting the attractiveness of imports and exports (Krugman and Wells, 2013). It is for this reason sensible to control for this relative difference with currency rates against the euro.

2.4 Fixed-Effects Model Choice

For the econometric model, specified formally in section 4.1 below, a fixed-effects model is used over a random-effects model for several reasons.

Firstly, a fixed-effects model can account for both time-invariant country specific effects and time-varying country-invariant effects (Wooldridge, 2014). Here it is highly likely that there are specific factors and effects within a country that affects its GDP per capita (time-invariant country-specific effects) that needs to be controlled for. Analogously, there reasonably exists factors that affect all countries in a given year. Recent examples are the dot-com bubble in the early 2000s and the global financial crises in 2007-08 (time-fixed country-invariant effects). Using a fixed-effects regression model these factors need not be individually identified and are directly controlled for.

Secondly, it is reasonable to assume that the factors contribute to the GDP per capita in a structurally similar fashion across countries, primarily varying in intercept magnitudes.

Thirdly, a random effects model requires the country-specific effects to be fully uncorrelated with the regressors (Baltagi, 2013). It is reasonable to assume that country effects are instead non-random and correlated with

the regressors and therefore also the regressand. Hence, a fixed-effects model is again deemed more appropriate.

Fourthly, the choice of the fixed effects model is supported by the Hausman test, which is further discussed in section 4.2 below.

3 Data Overview and Analysis

In this section the data used for the analysis are discussed. A discussion on the validity of the data for each variable is held, as well as a presentation of the data sources. Moreover, descriptive statistics are presented and commented.

The data set is a panel data set with data from the 27 member countries European Union as of 2012[8]. We have an unbalanced dataset, meaning that a few years are missing for some of the countries. The time frame for the data is 1998 through 2012. While more history would have been favorable, the limited availability primarily of historic net migration data prevents this.

On request, the full data set is happily made available in electronic format. In Table 1 below, descriptive statistics are presented for the data set.

GDP per capita data is provided by Eurostat[9]. The data set is complete

[8]The European Union has since expanded to 28 countries.

[9]The specific data set used from Eurostat is "GDP and main components (output,

for the entire panel.

Net migration rate data is constructed from immigration and emigration data[10] publicly available from Eurostat. The data set has been restricted to include immigration and emigration from European Union countries only. There are some issues with missing data in the net migration dataset which should be noted. Generally, the data set is complete. Notable exceptions are Bulgaria which has data for only two years; Croatia, which is about 50% complete; France and Malta which only have data from 2006 onwards; Greece only from 2009; Hungary and Romania from 2008 and Spain from 2002.

The rate of government consumption as share of GDP is calculated from data on government consumption and GDP[11] publicly available from Eurostat[12]. Complete data is available for all years and countries.

Data on inflation rates is provided by the International Monetary Fund (IMF) and is given on an annual basis[13]. Complete data is available for

expenditure and income)" (Code: nama_10_gdp)

[10]Net migration rate is calculated as the difference between immigration and emigration rates, divided by the population. The explicit formula used is: $(immigration - emigration)/(population)$ The specific data sets used from Eurostat are "Immigration by five year age group, sex and country of previous residence" (Code: migr_imm5prv), "Emigration by five year age group, sex and citizenship" (Code: migr_emi1ctz) and "Population on 1 January by age and sex"(Code: demo_pjan).

[11]The explicit formula used is: $(governmentconsumption)/(GDP)$

[12]The specific dataset used is "GDP and main components (output, expenditure and income)" (Code: nama_10_gdp). GDP data is "Gross domestic product at market prices" (Million €) and government consumption "Final consumption expenditure of general government" (Million €).

[13]The specific dataset was collected through the World Bank Data Bank and has indicator FP.CPI.TOTL.ZG.

all countries.

Exchange rates are presented as EUR/national currency of each country, from data publicly available from Eurostat. With the exception of data for the Croatian Kuna for 1998, complete data is available for the entire panel.

Interest rate effects are captured by data on the EMU Convergence Yield. This is a long-term bond yield used by the EMU to check eligibility of joining the monetary union. Because this is measured in the same fashion across all sample countries and it is used by the EMU in such an important decision making process, it must be deemed to be valid and comparable data. Within finance this is a common measure of the interest rate level. Data is not available for Bulgaria before 2003; Cyprus, the Czech Republic, Hungary, Latvia, Lithuania, Malta, Poland and Slovakia before 2001; all years for Estonia; Romania before 2006 and Slovenia before 2002. Apart from this, the data set is complete.

The tertiary education rate is presented as the rate of the population between 25 and 64 years old which has completed education in levels 5-8, while secondary education rate shows the rate of the population between 15 and 64 years old which has completed upper secondary and post-secondary non-tertiary education in levels 3 and 4. Both are collected

from Eurostat[14].

The rate of investment as share of GDP has been constructed from from data on gross capital formation[15] and GDP[16] also publicly available from Eurostat[17]. The data is generally complete with exceptions for a couple of initial years for Estonia; until 2004 for Lithuania; the two initial years for Luxembourg and all of Poland.

Lagged crude rates of natural population change[18] is provided by Eurostat. The data set is complete, however for France, rates represent metropolitan areas only due to missing data. As mentioned above, a lag of 15 years is used. Consequently, the lagged crude rate for 2012 represents the crude rate for 1997.

A dummy variable indicating membership in the European Union is created from the list of member countries available on the European Union website (European Union, nd). Complete data is naturally available for the entire panel.

[14]The specific Eurostat dataset used for tertiary education is "Population with tertiary education attainment by sex and age" (Code: edat_lfse_07). The Eurostat dataset used for secondary education is "Population with upper secondary education attainment by sex and age" (Code: edat_lfse_06).

[15]The specific Eurostat dataset used is GDP and its main components (Code: nama_10_gdp) and its subset Gross fixed capital formation.

[16]The specific formula used is: $(Gross fixed capital formation/GDP)$

[17]Eurostat datasets used is EURO/ECU exchange rates - annual data (Code: ert_bil_eur_a), and Former euro area national currencies vs. euro/ECU - annual data (Code: ert_h_euro_a).

[18]Eurostat dataset used is "Population change - Demographic balance and crude rates at national level". (Code: demo_gind)

[19]The reader can find descriptive statistics for all countries (including Poland and Estonia which are omitted from the regression because of missing data) in Appendix B,

Table 1: Descriptive Statistics for Countries in the Regression[19]

Variable	Obs	Mean	Std. Dev.	Min	Max
gdppca	375	27242	19166	1583.9	113740
netmigrrate	304	0.0027	0.0060	-0.0248	0.0226
govconsrate	367	0.1976	0.0281	0.1237	0.2806
inflation	375	3.621	5.305	-4.480	59.10
exchanger	375	48.89	209.1	0.403	1943.6
emuconvyield	337	4.883	1.922	1.4	22.5
tertiaryeducrate	362	23.10	8.359	5.4	42.6
secondaryedurate	362	45.83	14.06	12.3	72.2
rateofinvestment	367	0.2280	0.0384	0.1171	0.3840
lag15natpopch	375	2.163	3.163	-7	12.6
eu	375	0.8293	0.3767	0	1

It should be noted that the problems of missing data largely relates countries who are recent members of the European Union. Therefore it is recognized that some unidentifiable bias may present itself. This can cause interpretational issues and the reader should take special note of this when drawing conclusions.

Because data is gathered for a range of countries, the possibility of differences in measurement should be noted. The interested reader is referred to the metadata sheets for each dataset from Eurostat[20], where methodology is discussed in detail. For the purpose of this thesis, these data sources serve as both the most and only viable sources.

As the descriptive statistics in table 1 show, all variables have reasonable data. That is, mean values are what can be reasonably expected and no

Table B.2. The differences are generally small.

[20]The reader is further referred to the footnotes above where all data sets are carefully noted with their respective codes for easy access.

extreme minimum or maximum values exist. Missing values as discussed per variable above is seen clearly in the table.

4 Econometric Analysis

In this section econometric analysis results are presented. All tests and regressions in this thesis are made in Stata. In the first subsection, the econometric model is introduced and discussed. Thereafter, a series of tests are conducted to check the data against the necessary assumptions for OLS best linear unbiased estimators using fixed effects. Finally, the regression analysis is presented and discussed alongside a discussion on the model significance.

4.1 Econometric Model

As noted in section 2.1 above, a fixed effects model is used. In section 2.3, factors affecting GDP per capita were presented and discussed. These variables are used as controls alongside our main variable of interest, the net migration rate.

From this the formal econometric model is specified as:

$$\begin{aligned} lgdppca_{it} = {} & \beta_1 netmigrrate_{it} + \beta_2 govconsrate_{it} + \beta_3 inflation_{it} \\ & + \beta_4 emuconvyield_{it} + \beta_5 lexchange_{it} + \beta_6 tertiaryedurate_{it} \\ & + \beta_7 secondaryedurate_{it} + \beta_8 rateofinvestment_{it} + \beta_9 lag15natpop_{it} \\ & + \beta_{10} eu_{it} + \beta_{11} time99-12 + a_i + u_{it} \end{aligned}$$

$$\forall t = 1998, ..., 2012, i = 1, ..., 28$$

where for country i and time t,

$lgdppca_{it}$ is the log of the GDP per capita,

$netmigrrate_{it}$ is the net migration rate,

$govconsrate_{it}$ is the government consumption rate,

$inflation_{it}$ is the inflation rate,

$emuconvyield_{it}$ is the interest rate,

$lexchanger_{it}$ is the log of the currency rate against the Euro,

$tertiaryedurate_{it}$ is the rate of the population who have completed tertiary education,

$secondaryedurate_{it}$ is the rate of the population who have completed secondary education,

$rateofinvestment_{it}$ is the rate of investment,

$lag15natpop_{it}$ is the rate of natural population growth with a 15 year lag, eu_{it} is a dummy variable indicating whether the country is a member in the EU or not,

$time$ is a series of time dummy variables from 1999 to 2012 (leaving 1998 as base group) capturing the unobserved time-specific effect,

a_i is the unobserved time-invariant individual effect,

u_{it} is the error term.

Logarithmic transformation is done for GDP per capita and exchange rate for two reasons, as is conventional in macroeconomic analysis. Firstly, it allows for a percentage interpretation in the regression analysis and secondly it makes the data more normally distributed.

4.2 Data Tests

In this section a series of data tests are discussed. First, the the choice of the fixed effect model is tested with a Hausman Test. Furthermore the assumptions required for linear regression in matrix form under the Gauss-Markow Theorem are discussed and tested. Under these assumptions the regression provides the best linear unbiased estimators (Wooldridge, 2014).

4.2.1 Hausman Test

The Hausman test is done by comparing the fixed effects and random effects regressions, where the null hypothesis is that both are consistent.

Failure to reject the null lends support to using random effects for efficiency reasons (Söderbom, 2011). Here, the null hypothesis is clearly rejected (see Appendix A, Figure A.1), adding to the mounting evidence supporting a fixed effects model.

4.2.2 Assumptions from the Gauss-Markow Theorem

Firstly, it should be noted that by construction, the model is linear in parameters. Secondly, there is no perfect collinearity between the regressors.

A more problematic assumption is that of a zero conditional mean, requiring the error term ut to have a zero mean conditional on the matrix $X = \{x_{it}\} \forall i, t$. Known as strict exogeneity, this is a very strict assumption, stating for example that even no future regressor values are allowed to be correlated with the error term. For this data set, there is an uncontrollable risk that this assumption does not hold, causing biased estimators. However, it is noted that the within-R^2 value from the regression is 0.96[21], which leads to the conclusion that these hypothetical biases originating from omitted variables must be small. Therefore, the regression analysis is done as if this assumption holds, however the reader should be aware of this critical assumption.

[21] The R^2 value is specifically discussed in the regression analysis below.

Fourthly, homoskedasticity and no serial correlation are both required for estimator efficiency. The test created by Baum (2001) to check for presence of heteroskedasticity through the modified Wald test for groupwise heteroskedasticity is conducted (see Appendix A, Figure A.2). Running this test, the null hypothesis that the data exhibits homoskedasticity is soundly rejected. It is therefore concluded that the data exhibits heteroskedasticity. Intuitively, this is expected. If GDP per capita grows more in country A than country B, the overall variance in $t + 1$ will be greater than in t, which is highly probable.

Furthermore, using the Wooldridge (2002) test for autocorrelation, the data is checked for serial correlation of the errors. From this test (see Appendix A, Figure A.3), the null hypothesis that there is no serial correlation is strongly rejected. Serial correlation too is easily explained by intuition. By construction, the European Union creates interdependence between its countries, and thus it is indisputable that member countries exhibit correlation both between each other today and over time.

Fifthly, a necessary assumption for statistical inference is the normality of errors (Wooldridge, 2014). This assumption is found to hold for this data set (see Appendix A, figure A.4).

4.2.3 Adjustments to Correct for Data Problems

The problems that need to be addressed in order to obtain efficient estimators are, as seen above, that of heteroskedasticity and serial correlation. Through clustering the standard errors on the countries when performing the regression, both of these problems are solved.

Clustering works by recognizing that data within the groups (here countries) can be similar and accounts for this similarity. In addition to fixing the issue of serial correlation, it also makes the regression robust to heteroskedasticity. The regression presented below is done with clustering on countries.

It should be noted that this correction strictly affects the standard errors and not the estimators. With clustering, standard errors are larger but more correct. A consequence is that significances are lower with clustering. For the interested reader, a regression without clustering is presented in Appendix B table B.2 for comparison, where this can be seen.

4.2.4 Data Test Summary

To conclude, the relevant assumptions for panel data regression analysis presented by Wooldridge (2014) are found to be problematic, but easily solvable. With the first three assumptions, which are deemed to hold, the

estimators are unbiased. In order for the estimators to also be efficient, the corrections described above for serial correlation and heteroskedasticity are made. The reader should also take special note of the zero conditional mean discussion. Statistical inference is possible as errors are normally distributed. In short, after these corrections, the regression is believed to present best linear unbiased estimators.

4.3 Regression Analysis

This section puts the results of the fixed-effects regression in focus. Firstly, brief comments are made on the overall model, followed by brief commentary on the control variables. After this, attention is turned to the variable of interest, the net migration rate which is discussed in greater detail. Finally, biases in the model are discussed. Regression results are presented in table 2 below.

Table 2: Regression Results

Variable	Coefficient (Standard Error)
netmigrrate	3.680*
	(1.820)
govconsrate	-2.428***
	(0.866)
inflation	0.007
	(0.005)
lexchanger	0.000
	(0.005)
emuconvyield	-0.008
	(0.005)
tertiaryedurate	0.008*
	(0.004)
secondaryedurate	-0.005
	(0.003)
rateofinvestment	0.319
	(0.398)
lag15natpopch	-0.041***
	(0.008)
eu	0.090
	(0.059)
t99	-0.005
	(0.013)
t00	-0.106***
	(0.022)
t01	-0.099***
	(0.025)
t02	0.016
	(0.028)
t03	0.222***
	(0.029)
t04	0.307***
	(0.035)
t05	0.356***
	(0.038)
t06	0.421***
	(0.036)
t07	0.557***
	(0.040)
t08	0.646***
	(0.044)
t09	0.581***
	(0.053)
t10	0.528***
	(0.048)
t11	0.586***
	(0.051)
t12	0.513***
	(0.054)
cons	10.28***
	(0.300)

Table Guide: *The main number is the coefficient; the number within brackets is the standard error and the stars after the coefficient indicates the significance level at 1 (***), 5 (**) and 10% (*).*

4.3.1 Model Significance

First of all, the model is of overall significance. A high F-value ($F(24, 24) = 60637.82$) is observed with a zero probability of observing such a high F-value if all coefficients would be jointly zero, ie. have no effects. Secondly, the model shows a high goodness-of-fit ("within R^2-value"), with a full 96% of the variance in the dependent variable explained by the independent variables with the fixed effects controlled for. Thus, this indicates that a potential omitted variable bias must be little however this very high R^2-value is most likely due to a very strong time trend which can also be seen as almost all time coefficients are highly significant. As the model attempts to fully capture the factors that affect GDP per capita, this result is pleasing and therefore allows the omission of any further bias discussions.

Included in the regression are 275 observations and 25 groups. It should thus be noted that Poland and Estonia are completely excluded from the regression, and thus from the subsequent analysis, because complete data is not available for all the years and factors combined. While this is unfortunate, the set of observations and groups are still large enough for use in regression analysis.

4.3.2 Variable Significance

On the subject of statistical significance, a number of coefficients are insignificant above the 10% level. These are the inflation rate, EMU convergence yield, exchange rate, secondary education rate, rate of investment and the dummy for EU membership.

It is necessary to briefly comment on these findings since it is contradictory to theory. Overall the reason for the insignificance is believed to be the relative similarity within the panel. The European Union by construction is in these factors relatively homogenous. Clearly it is difficult to explain variations in GDP per capita by factors which themselves vary very little between countries and over time. It is recognized that the theory behind the inclusion of these variables certainly still is valid in a global context.

4.3.3 Control Variables

Disregarding the insignificant variables from the discussion, the following significant variables are noted and briefly commented.

Firstly, government consumption rate shows a clear economic effect with a negative coefficient. This finding is consistent with previous research by Sala-i Martin et al. (2004) and by Aiginger and Falk (2005).

Secondly, the tertiary education rate shows slight positive effect on GDP per capita, which is expected and consistent based on the aforementioned research by Boulhol et al. (2008).

Thirdly, the lagged natural population change rate shows an unexpected negative economic effect on GDP per capita. A known demographic problem in many european countries is that not enough people are born. In the data, there are clear difference between western and eastern european countries in this regard. As western european countries in general have a higher GDP per capita, but at the same time show negative natural population change figures, this would affect the regression results in ways inconsistent with theory.

Finally, a brief comment on the time dummies, which with the exception of 1999 and 2002 are significant. All years apart from 2000 and 2001 show positive coefficients. The time dummies capture the time specific effect for GDP per capita, which has been previously discussed in the text.

4.3.4 Net Migration Rate

Shifting focus to the main variable of interest, the net migration rate, it can be concluded that the variable is of both statistical and economical significance. It is found that an increase in net migration rate has a clear

positive effect on GDP per capita. For every additional percentage point increase of net migration, the log of GDP per capita is found to increase by approximately 3.68. As can be seen, this is of substantial economic significance.

4.4 General Discussion

Initially, this thesis described how public opinion in the European Union is largely negative to immigration, believing that it has negative economic effects. Indeed as previously noted, the negativity towards immigration even from within the European Union contrasts the free movement cornerstone, which as previously noted is based on economic theory of efficient use of resources, and even more so of labor.

The results from the analysis present strong evidence against the public opinion: An increase in the net migration rate originating from within the EU has a positive overall effect on GDP per capita in EU countries.

Clearly, it is impossible for the net migration rate to be positive in all countries. Inevitably, some countries must have a negative net migration rate in order for others to have a positive rate. This is acknowledged. For a set of countries, here the European Union, migration must be a zero-sum game. For GDP to increase overall from migration there are two alternatives based on previously presented theory and common sense.

Either the benefits of the host country exceeds the losses of the country of origin or the country of origin benefits as well. Theory of efficient resource allocation supports the former, while research suggesting the latter do exist and has been previously presented. Additional empirical research into these effects would be beneficial.

It should be noted that the European Union supports migration in general. While these results do not specifically prove that migration in general have positive economic effects, they do, together with presented theory and previous research on economic effects for countries with negative rates, lend the theory credible support. Together with further research into effects of migration on origin country economies the notion that the free movement cornerstone is based on true effects is believable.

The question of how the countries of origin fare needs to be explored further in order to deepen the comprehension of how migration within the European Union affect the different union economies and the economy of the union as a whole.

5 Conclusion

The question that this thesis set out to answer was what effect net migration rates from within the EU have on the Gross Domestic Product

(GDP) per capita for the countries of the European Union. This is a topic which is widely discussed across all of the European Union where public opinion is swaying to it having negative effects, while the European Union itself is built on the idea that migration is positive.

From the results given by the data, it can be concluded that positive net migration rates within the EU have significant and positive effects on GDP per capita in EU countries.

Recognizing that migration is a zero-sum game, two possible explanations for an overall positive GDP effects can be seen. Either the benefits of the receiving country exceeds the losses of the origin country, or the origin country also sees positive effects.

Regardless of which, it must be concluded that public opinion seems to be wrong. In the case of the European Union's position on migration, these findings cannot directly confirm it. However the results together with existing theory and research provide support for their favorable stance towards migration.

5.1 Further Research Areas

As previously noted in the discussion, further research into the effects on countries with specifically negative net migration rates is needed. Some

research do as previously noted exist, suggesting that these countries can in fact also see positive effects. However, this has to be looked into further in order to fully examine the effect of free movement within the European Union.

An expansion of the geographical area would allow conclusions to be drawn about migration on a global basis. This could be a base for decisions about further expanding free movement by for example expanding the European Union or creating new trade unions and common markets.

From an EU perspective, the effect of blue card immigrants on GDP would be of importance. The "EU Blue Card" is a permit for high-skilled workers from a third country, wanting to enter the EU (The Council Of The European Union, 2009). In the data discussion it was noted that a limited time horizon was available for this analysis. Naturally it would be encouraged to conduct further research into this very area using a longer timespan to strongly validate the effects that this thesis have found.

Additionally, public opinion is noted to be stronger in some industries than others. Therefore, looking into the effects on an industry basis would be of interest. Would for example high-skilled labor have more positive returns than low-skilled labor?

Finally, net migration might have an effect on other economic indicators

than GDP per capita. Examples of indicators of importance, as often discussed in media, are wage levels and unemployment.

Appendix A Figures

This appendix gathers figures references in the text.

Figure A.1 - Hausman Test
H_0: difference in coefficients not systematic

$$chi2(17) = (b-B)'[V_b - V_B^{-1}](b-B)$$
$$chi2(17) = 281.8$$
$$Prob > chi2 = 0.000$$

($V_b - VB$ is not positive definite)

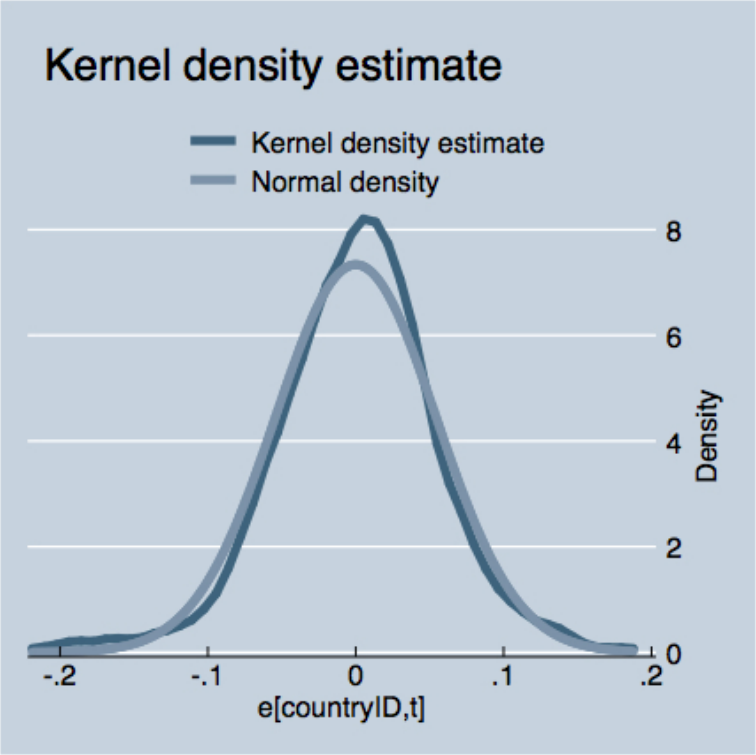
Figure A.2 - Modified Wald test for Groupwise Heteroskedasticity

$$H_0 : sigma(i)^2 = sigma^2 \forall i$$
$$chi2(25) = 1.7 \times 10^{25}$$
$$Prob > chi2 = 0.0000$$

Figure A.3 - Wooldridge Test for Autocorrelation
H_0 : no first-order autocorrelation

$$F(1, 23) = 305.487$$
$$Prob > F = 0.0000$$

Figure A.4 - Normality of Errors



Appendix B Tables

Table B.1 - List of European Union Countries

Country	EU Join Year	EMU Join Year
Austria	1995	1999
Belgium	1958	1999
Bulgaria	2007	Not in EMU
Croatia	2013	Not in EMU
Cyprus	2004	2008
Czech Republic	2004	Not in EMU
Denmark	1973	Not in EMU
Estonia	2004	2011
Finland	1995	1999
France	1958	1999
Germany	1958	1999
Greece	1981	2001
Hungary	2004	Not in EMU
Ireland	1973	1999
Italy	1958	1999
Latvia	2004	2007
Lithuania	2004	2007
Luxembourg	1958	1999
Malta	2004	2008
Netherlands	1958	1999
Poland	2004	Not in EMU
Portugal	1986	1999
Romania	2007	Not in EMU
Slovakia	2004	2009
Slovenia	2004	2007
Spain	1986	1999
Sweden	1995	Not in EMU
United Kingdom	1973	Not in EMU

Table B.2 - Regression Without Clustering

Variable	Coefficient (Standard Error)
netmigrrate	3.680*** (1.305)
govconsrate	-2.428*** (0.472)
inflation	0.007** (0.003)
lexchanger	0.000 (0.004)
emuconvyield	-0.008** (0.004)
tertiaryedurate	0.008*** (0.002)
secondaryedurate	-0.005** (0.002)
rateofinvestment	0.319 (0.261)
lag15natpopch	-0.041*** (0.004)
eu	0.090*** (0.025)
t99	-0.005 (0.028)
t00	-0.106*** (0.029)
t01	-0.099*** (0.028)
t02	0.016 (0.028)
t03	0.222*** (0.030)
t04	0.307*** (0.030)
t05	0.356*** (0.031)
t06	0.421*** (0.031)
t07	0.557*** (0.032)
t08	0.646*** (0.034)
t09	0.581*** (0.036)
t10	0.528*** (0.037)
t11	0.586*** (0.038)
t12	0.513*** (0.040)
cons	10.28*** (0.154)

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