Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

Departments of Economics

M.Sc. Economics

# "Assessing the effect of the common currency on economic growth in Eastern European transition countries: A Synthetic Control Approach"

**Master Thesis**

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# Abstract

This thesis studies the impact of the euro adoption on the economic growth in Eastern European transition economies. Applying the synthetic control method implemented by Abadie & Gardeazabal (2003) and Abadie et al. (2010) to sub-regional NUTS3 level data, the effect is heterogeneous and, in some cases presents a regional pattern. At an aggregate level, the effect of the common currency did not bring the countries to a common higher economic growth path. Malta and Estonia are the only two countries that experienced the benefits of the euro adoption, even though the positive effect was not lasting. The thesis then makes considerations about the presence of any drawbacks that might bias the results.

# I. Introduction

Following the fall of the Berlin wall and the dissolution of the Soviet Union, the European planned economies began a challenging transformation toward a more effective economic system, based on the principle of the market economy. The Eastern European countries started a wide-ranging price and trade liberalization and a privatization process (Svejnar, 2002), accompanied by generally conservative fiscal policies aimed at sustaining market institutions. The legal and institutional reforms were implemented to create a system that complied with the standards of the European Union. Some of those countries[1] joined the European Union during the 2004 EU enlargement, beginning the process of replacing their national currencies with a common European currency. The Euro, as common currency, was perceived as the last step towards European Integration. The process, as stated in the Maastricht Treaty of 1991, started with the free exchange of capital which was followed by the decision of maintaining fixed parities exchange rates among the different member states. Eventually, the process continued through a gradual introduction of the common currency together with the implementation of a single monetary policy carried out by the European Central Bank. The project's goal was to provide prosperous economic growth, consistent living standards across all regions and nations, macroeconomic stability, and microeconomic efficiency (European Commission, 1990). Various explanations have been advanced in the literature concerning the advantages and disadvantages of joining the euro area, specifically in terms of economic growth stimulation. However, the empirical studies, that assessed the economic effects of joining the Eurozone, focused only on the old Eurozone member states. Therefore, there is a lack of empirical evidence regarding the economic success or failure of the Eastern EU transition countries after adopting the euro. The recent adoption of the euro in those nations, coupled with the fact that most Eastern European nations have reliable time series starting only in the 1990s may be the cause of this gap in the literature.

The purpose of this thesis is to assess whether the introduction of the common currency Euro has improved or worsened the growth performance in the Eastern EU

[1] Cyprus, Estonia, Lithuania, Latvia, Malta, Slovenia, Slovakia, Czech Republic, Hungary and Poland entered the European Union in 2004, Bulgaria and Romania in 2007 and Croatia in 2013.

transition countries (Cyprus, Malta, Estonia, Lithuania and Latvia, Slovenia and Slovakia) by employing the synthetic control approach as identification strategy. The other Eastern EU transition countries, Bulgaria, Croatia, Czech Republic, Hungary, Poland and Romania have been used as potential control units.

After formally establishing the European Monetary Union in 1992, the euro was launched in 1999 in eleven EU countries, Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxemburg, the Netherlands, Portugal and Spain. In 2001 it was also adopted by Greece. Regarding the former socialist countries, Slovenia irrevocably fixed the parity between the euro and its currency in 2007, Malta and Cyprus did so in 2008, Slovakia in 2009, while Estonia, Latvia and Lithuania entered the eurozone in 2011, 2014 and 2015 respectively. The optimal currency area (OCA) theory pioneered by Mundell (1961), McKinnon (1963) and Kenen (1969) serves as a starting point for examining the consequences of entering in a monetary union. According to this theory, a group of countries belongs to an optimal currency area if the benefits deriving from participation in a monetary union are greater than the costs[2] (Mundell, 1961). These costs are higher when the economic shocks are "asymmetric", and if the institutions in charge are not able to use adjustment mechanisms different from the exchange-rate tool (Marelli et al., 2016). The theory highlights that members of a common currency area can adjust for asymmetric shocks and minimize their economic losses if they satisfy several requirements. These requirements include labour and capital mobility (Mundell, 1961), a high degree of openness of the economy, wage and price flexibility (McKinnon, 1963), and product diversification (Kenen, 1969). Some authors argue that the existing differences in the economic structures and in the labor market among the countries in a monetary union may amplify the macroeconomic fluctuations (Kenen, 1969; De Grauwe, 2020). This will raise the losses associated with monetary union membership. At the same time, there is a general consensus that an environment with stable exchange rates and credible monetary policy increases trade and supports competition and productivity. Indeed, most of the literature that relates to the trade effects of Euro adoption, claims that the elimination of transaction costs is one of the primary microeconomic benefits of

[2] The costs are mainly associated with relinquishing monetary and exchange rate autonomy as tools to stabilize macroeconomic shocks (European Commission, 1990).

joining a monetary union (European Commission, 1990). This favours the direct comparison of goods prices across countries. At the same time, the higher price transparency increases competition and businesses that were previously intimidated by exporting gain access to new markets (Barrell et al., 2008). Together, these elements encourage international commerce and investment flows (Alesina and Barro, 2002). Among the most often cited empirical studies, the estimates from Rose (2000) found, through the use of a gravity equation approach, that trade flows would increase up to 3 times if the two countries share the same currency. This implies that the European Monetary Union increases the volume of international trade. This finding was eventually revised by Baldwin and Taglioni (2006) since they encountered several econometrics shortcomings e.g. omitted variable bias, distortions, model misspecifications, and reverse causality issue that makes the aggregate estimates of the Eurozone membership and trade correlation deceptive. However, the evidence presented by Bun and Klaassen (2002), Micco et al. (2003) and Nitsch et al. (2008) showed that, even if the magnitude was overestimated by Rose (2000), EMU increased intra-EU trade volumes by 4 to 10 percent, depending on the estimation technique and model used. The positive effect on trade was mainly prompted by a wider range of products offered by the firms in the Eurozone area (Baldwin et al., 2008). The EMU caused other favorable impacts. The resulting elimination of the exchange rate risk and the volatility reduction stimulate foreign direct investments, which fostered the transfer of technology. This caused economies of scale and productivity gains, more investments, and thus economic growth (Pegkas, 2015). Evidence suggested that the Euro had a profound impact on intra-Eurozone foreign direct investment flows, which increased on average by about 30% (de Sousa & Lochard, 2011) as well as FDI flows from the Eurozone towards third countries (Petroulas, 2007; Baldwin et al., 2008). Through these channels, the monetary union may have indirectly impacted growth and employment, raising economic welfare (Barrell et al., 2008).

Estimating how the common currency, the Euro, has affected the growth trajectory of the selected countries presents some challenges, starting from choosing the right methodological approach to address potential endogeneity problems. First, it is crucial to define an alternative scenario from the one we observe in the treated country. Since random assignment is not an option in observational research, to determine the event's impact, it is required to compare the country that joined the euro area with a setup in which the country of interest did not join. Regression methods generally need a sizable number of treated units and compute the average treatment effect irrespective of the presence of structural differences. However, this study focuses on a few countries that share a transition process but differ in economic and social characteristics and the impact may vary significantly across units. Furthermore, due to the small sample size, it may also be arduous to identify a suitable control unit with similar pre-trend characteristics as the one being treated. Using another Eastern transition country that has not adopted the common currency as control unit may not be sufficient to support the common trend assumption. Empirical studies have employed matching and difference-in-differences DiD methods (Athey and Imbens, 2017) as identification strategies for drawing causal effects from observational data. However, unobserved confounders are considered to be constant over time, as well as in the fixed effect panel data models. This conflicts with the potential existence of time-varying unobservable confounders that could influence the outcome of interest.

The baseline strategy followed in this study to deal with these issues is to implement the synthetic control method. This is an analytical approach that consists of a data-driven control-group procedure (Abadie et al., 2010), whose rationale is to obtain a valuable and credible outcome that would have been observed in the treated group if the intervention[3] had not occurred. Technically, SCM estimates the treatment effect by creating a counterfactual of the treated unit using a convex combination of similar units not exposed to the treatment, thereby increasing the likelihood of the common trend assumption being true. Furthermore, Abadie et al. (2010) proved that once the best linear weighted combination of other donor regions has been established and a good match of the characteristics prior the intervention has been found, the time-varying confounding factor component will also be balanced. The method is used when the event takes place in a distinct unit (e.g., region, state, age group) at a differentiated point in time. This enables to assess the influence of an intervention, by comparing the outcomes between exposed and unexposed units and it provides reasonable estimation even in the

[3] The words “treatment” and “intervention” will be used interchangeably throughout the whole thesis.

case of small samples, differently from regression-based methods, which can perform poorly (Abadie, 2021). Abadie & Gardeazabal (2003) first developed the SCM in a study observing the impact of terrorism on the Spanish Basque region economy in the late 60s. Abadie et al. (2010) investigated the effect of California's 1988 tobacco control program, released with the statistical package *Synth*[4] for statistical software such as Stata, R, and Matlab to implement the method. Afterward, in 2015, the authors published an updated source of reference looking at the economic impact in West Germany after the 1990 reunification. As more studies were published regarding this new estimation technique and its valuable features, a growing number of researchers conducted empirical analysis[5] evaluating the macroeconomic impact of adopting the euro for some or all of the twelve early euro adopters (Fernández and Perea, 2015; Verstegen et al., 2017; Puzzello and Gomis-Porqueras, 2018; Gabriel and Pessoa, 2020).

The study investigates the effect of the Euro on the national growth path by using sub-regional data. By, doing this, we can exploit the large number and the diversity of the sub-regional areas to create a synthetic control for each unit. This should enhance the accuracy of the estimates and reduce potential biases. Also, looking at the geographical pattern of regional growth may reveal some intriguing development trends. Several economists have examined the impact of European Integration on economic growth over the years, identifying regional convergence clusters and heterogeneous effects depending on the structural features of groups of regions (Artelaris et al., 2010; Chapman & Meliciani, 2018). Therefore, this regional analysis can provide valuable insights.

Recently, authors have demonstrated that the data-driven algorithm proposed by Abadie & Gardeazabal (2003) to solve the predictor and donor weights is numerically unstable and it may not lead to the optimal solution (Becker & Klößner, 2018). Malo et al. (2020) developed a new mathematical approach based on NP-hard bilevel optimization, which led to the true optimal solution. Despite these new finding, this thesis uses the original data-driven approach suggested by Abadie et al. (2010).

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[4] (Abadie et al., 2011)

[5] The synthetic control method has been applied to various research topics to study the effect of immigration policy, and minimum wages. Synthetic controls are also used in other the social sciences, biomedical disciplines, engineering, natural science, etc.

The structure of the thesis is as follows. Section II presents the empirical methodology and addresses which contextual and data requirements for synthetic control empirical studies have to be satisfied for a correct use of the identification method. Section III describes the data and the descriptive statistics of the variables used. Results are reported in Section IV and discussed together with the robustness checks, and the conclusion follows.

## II. Empirical methodology

Abadie et al. (2010) provide a formal description of the Synthetic Control Method.

Suppose we observe a panel of $J+1$ regions over $T$ periods, and without loss of generality, only region $i=1$ is exposed to the intervention $D_{it}$, while the remaining areas are considered a set of potential controls called "donor pool".

The total number of $T$ periods is split into $T_0$ pre-intervention periods and $T_1$ post-intervention periods.

Following Rubin (1974), the main setting of the comparative case study is based on the potential outcome framework for treatment evaluation.

The intervention is indicated by $D_{it}$, a binary variable which takes value 1 if unit $i$ is exposed to the treatment at time $t$. Formally,

$$Y_i = \begin{cases} Y_{it}^I & \text{if } D_i = 1 \\ Y_{it}^N & \text{if } D_i = 0 \end{cases}$$

where $Y_{it}^I$ refers to the unit $i$ at time $t$ exposed to the intervention in periods $T_0+1$ to $T$, and $Y_{it}^N$ to the outcome variable for unit $i$ at time $t$ in the absence of intervention for the same periods.

The observed outcome $Y_i$ can be written in terms of potential outcomes and intervention binary variable as

$$Y_i = Y_{it}^N + (Y_{it}^I - Y_{it}^N)D_i$$

The treatment effect for the region $i$ at the time $t$ can be defined as

$$a_{it} = Y_{it}^I - Y_{it}^N$$

While the former is known in a way that $Y_{it}^I = Y_{1t}$, the latter is not observable. Therefore, the method aims to construct a credible counterfactual able to mimic the path that would have been observed in the absence of the treatment in the unit considered.

According to Abadie & Gardeazabal (2003) and Abadie et al. (2010), we suppose that $Y_{it}^N$ is given by a factor model:

$$Y_{it}^N = \delta_t + \theta_t Z_i + \lambda_t \mu_i + \varepsilon_{it}$$

where $\delta_t$ is an unknown common factor with constant factor loadings across units, $Z_i$ is a $(1\times r)$ vector of observed covariates not affected by the treatment, $\theta_t$ is a $(1\times r)$ vector of unknown parameters, $\lambda_t$ is a $(1\times F)$ vector of unobserved covariates, $\mu_i$ is an

$(F \times 1)$ vector of unknown factor loadings, and the error terms $\varepsilon_{it}$ are zero-mean transitory shocks.

The counterfactual construction is performed through a weighted average of the regions in the donor pool. These weights, derived from the factor model, are chosen to better approximate the relevant characteristics of the treated units during the pre-intervention period, thus creating the synthetic control unit.

Let $W = (w_2, \dots, w_{J+1})'$ be a $(J \times 1)$ vector of synthetic control weights subject to $w_j \geq 0$ for $j = 2, \dots, J+1$ i.e. no weight is negative; and $w_2 + \cdots + w_{J+1} = 1$, i.e., all weights sum to 1. The non-negative weight constraint is specified to avoid extrapolation outside the support of data, and consequently outside the convex hull of the donor pool[6].

Since each possible choice of $W$ represents a potential synthetic control for country $i$, the synthetic control method calculates each best weight $w_j^*$ such that,

$$\sum_{j=2}^{J+1} w_j^* Y_{jt} = Y_{1t}$$

for all $T$ periods before the intervention, fulfilling the assumption of perfect balance on pre-treatment outcomes, and

$$\textstyle\sum_{j=2}^{J+1} w_j^* Z_j = Z_1 \qquad \text{and} \qquad \sum_{j=2}^{J+1} w_j^* \mu_j = \mu_1$$

fulfilling the assumption of a perfect balance on the observed and unobserved covariates. Under these conditions, the bias of the synthetic control estimator is bounded by a function that goes to zero as $T_0$ increases[7].

The unbiased estimate of the intervention effect $a_{it}$ is now defined as:

$$\hat{a}_{1t} = Y_{1t} - \sum_{j=2}^{J+1} w_j Y_{jt}$$

for $t \in \{T_0 + 1, \dots, T\}$.

The comparability between the treated unit and its synthetic control unit is defined by a collection of preintervention characteristics, also known as predictors, as they are chosen to reflect their predictive power on the outcome of interest. The latter may consist

[6] The convex hull assumption will be explained in more detailed later in this section.

[7] The unobserved covariates $\mu_j$ cannot be fitted directly, but if there is perfect balance on pre-treatment outcomes and on the observed covariates, the synthetic control employs pre-treatment outcomes as proxies for $\mu_j$ (Abadie & Vives-I-Bastida, 2022)

of linear combinations of the outcome variable $Y$ in $t < T_0$, and other economic variables named covariates with explanatory power for $Y$. A covariate can either be time-invariant or time-varying; in the latter case, each point of time can be added separately as a covariate.

Let denote $X_1$as a $(k \times 1)$ vector of these preintervention characteristics for the treated unit and $X_0$ as a $(k \times J)$ matrix containing the same variables' values for the donor pool units.

By using a two-stage optimization, the data-driven procedure aims to find the synthetic control weights vector $W^*$ that minimizes the distance between the preintervention characteristics of the affected region and its synthetic control,

$$\|\mathrm{X}_1 - \mathrm{X}_0 W\|_V = \sqrt{(\mathrm{X}_1 - \mathrm{X}_0 W)' V (\mathrm{X}_1 - \mathrm{X}_0 W)}$$

called root mean squared prediction error RMSPE where $V$ is a $(k \times k)$ symmetric and positive semidefinite matrix with nonnegative components.

The first part of the optimization process[8], the inner optimization (Becker & Klößner, 2018), attempts to find nonnegative control unit weights $W$ for given predictor weights $V$ such that

$$\sqrt{(\mathrm{X}_1 - \mathrm{X}_0 W)' V (\mathrm{X}_1 - \mathrm{X}_0 W)} \overset{W}{\rightarrow} min$$

and $W^*(V)$ denotes the solution.

The outer optimization refers to the optimal predictor weights $V$ among positive definite and diagonal matrices such that the MSPE of the outcome variable $Y$ is minimized for the preintervention periods.

Recently, to determine the predictor weights, it has been developed the so-called "regression-based method". Kaul et al. (2022) provide a general summary of this method. For every $t < T_0$, the outcome variable is regressed on all economic predictors; the weight $\mathrm{v}_k$ is then set as

$$\mathrm{v}_k = \frac{\sum_t \beta_{t,k}^2}{\sum_{k=1,\ldots,K} \sum_t \beta_{t,k}^2}$$

[8] The inner optimization problem is a quadratic program (Becker & Klößner, 2018). There are several algorithms for computing the quadratic optimization problem available on R. The default package for *Synth* is *ipop*, but it is slow in big applications, whereas *LowRankQP* outperformed *ipop* both in terms of accuracy and speed. This study uses *LowRankQP* as algorithm for the optimization problem.

where $\beta_{t,k}$ $(k = 1, \ldots, K)$ are the regression coefficients. A larger squared regression coefficient of the economic predictor $k$ indicates that more weight $v_k$ is given to this predictor.

By computing the minimization of the MSPE, the researcher's goal is to find the best fit between the outcome variable of the treated region and its synthetic control before the intervention has occurred. A discrepancy in the outcome variable from time $t$ forward is interpreted as resulting from the intervention once the best fitting has been established.

After repeating the SCM procedure for each of the treated regions, the study focuses on the aggregate effect for each treated country, and the heterogeneous results across treated units[9]. The aggregate outcome for the treated country will be than calculated as an unweighted average of the NUTS3 level effects.

In estimating the causal effect of a specific intervention, in experimental studies usually units are randomly divided into two groups, where one group is exposed to the treatment and the other is not (Holland, 1986). The difference in the outcome between the two groups can be estimated as the causal effect of the treatment, since no factors outside the randomization affected its assignment. Differently, in any observational study as this one, randomization is not possible. Therefore, it is necessary to use reliable control units similar to the treated units during the pre-treatment period to identify the causal effect of the euro adoption. Given the non-experimental context, any confounding difference, which is a potential source of bias between the units receiving the treatment and not receiving it, cannot be removed by the randomization (Angrist & Pischke, 2009). Therefore, to avoid biases that would interfere with the correct interpretation of the effect, there are some assumptions to respect. According to the zero-mean restriction of the error term in the factor model, the treatment is independent of the potential outcomes conditional on the observed $Z_j$ covariates and the unobserved $\mu_j$ factors. This theory emphasizes that the treatment is exogenous, and no reverse causality exists. Some

[9] The use of multiple treated units with large number of potential control units has been expanded in recent contributions (Abadie & L'Hour, 2021); however, this thesis performs the original data-driven synthetic control approach for each disaggregated unit.

authors argued that countries joined the Eurozone for political reasons rather than economic reasons (Gabriel & Pessoa, 2020), thereby supporting this assumption. The other assumption is the overlapping or common support. It requires that the control group unaffected by the intervention is able to match the units of interest across all covariates. In this way, the values of $Z_1$ and $\mu_1$ can be closely reproduced with a convex combination of $Z_1$ and $\mu_1$ from the donor pool (Abadie, 2022). Conversely, if this does not happen, the pre-treatment synthetic control estimates may contain significant biases, resulting from unobserved heterogeneity or sample selection, for instance, making it difficult to determine the intervention's causal effect.

Researchers should be concerned about the existence of some threats to validity (Abadie, 2021). Regarding the first assumption, it is crucial to ensure that the intervention will not alter the result before it is implemented, as some economic agents may react before the treatment occurs, or it might be the case that some intervention features are set up before the intervention enactment. One potential anticipation effect could be caused when the countries pegged their currencies to the Euro, entering the European Exchange Rate Mechanism. These potential anticipation effects can be tested including different intervention years in the analysis, so-called in-time placebo tests. Another threat to validity for the independence assumption is that no spillover effects are detected (interference of the intervention effect between units) which can be ruled out through in-space placebo tests. In the situation where units affected by spillover effects are included in the donor pool, the researcher should be aware that the counterfactual outcome without intervention may be potentially biased.

For the estimation to be capable of tracking the path of the outcome variable of the affected unit, an adequate number of pre-treatment periods must be used (Abadie 2010). Similarly, in the post-treatment period, the design should take into account any delayed effects of the intervention. The potential control units should not be affected by any intervention similar to the one of interest. Moreover, it should be checked that there are no significant idiosyncratic non-transitory shocks affecting the outcome variable to neither the treated unit nor the potential control units during the study period. In principle, the SCM assumes that the all units are affected by the same structural process, but the intervention of interest. If common shocks are encountered during $T_0$, it is presumed that the synthetic counterfactual is able to take them into account, whereas if these shocks happens in the $T_0 + 1$ it is harder to exclude that the units are affected by factors which the other group is not. Correspondingly, for the credibility of this statistical method, it is recommended to include in the donor pool only units characterized by the same structural and development process of the treated one (Abadie et al., 2015). Selecting the donor pool units that have been affected by similar regional economic shocks as the region of interest is thus desirable. In modelling the Euro adoption effect using the synthetic control method, the European Union membership should be taken into account, which could have had an impact on the economic growth (Campos et al., 2019). This can be done restricting the donor pool to countries members of the European Union.

Another thing to keep in mind is that units in the donor pool should have predictor variable values that are both higher and lower than those affected by the intervention. Otherwise, it would be impossible to recreate the treated unit in the pre-intervention period. As previously anticipated, the constrain applied to the weights in the synthetic control construction process is aimed to avoid extrapolation outside the available data and thus outside the convex hull of the donor pool. The convex hull condition says that once the synthetic control is constructed, the researcher should check whether the differences in the characteristics of the affected unit and the synthetic control are small, i.e. $X_{11} - w_2 X_{12} - \cdots - w_J X_{1J} \approx 0, \ldots, X_{k1} - w_2 X_{k2} - \cdots - w_J X_{kJ} \approx 0$

In mathematical terms, the convex hull assumption is accepted when the set $(X_{11}, X_{21}, \ldots, X_{k1})$ falls close to the convex hull of the set of points $\{(X_{12}, X_{22}, \ldots, X_{k2}), \ldots, (X_{1J}, X_{2J}, \ldots, X_{kJ})\}$. As a result, the synthetic control may not closely resemble the treated region if the latter has an "extreme" value for a specific variable. If the synthetic control closely mirrors the course of the outcome variable for the unit impacted by the intervention during the pre-treatment period, this problem might concern less of a concern[10].

[10] In some situations, converting the outcome variable to time differences or growth rates is a feasible approach to take. Similarly, deviations from pre-intervention means could be used to quantify outcomes (Abadie et al., 2010).

## III. Data discussion and descriptive statistics

The unit of analysis in the present study is the region, and all variables are measured on a sub-regional level. Eurostat, the statistical office of the European Union, began collecting regional statistics in the 1970s, establishing the NUTS classification. With the Commission Regulation EC No 1059/2003, this classification was adopted in May 2003. For statistical purposes, the regulation specified a period of stability of 3 years, during which the NUTS classification should not be altered (Eurostat, 2018). There are three different levels of regional division, 1, 2, and 3, from larger to smaller areas: it subdivides each Member State into a number of regions at a NUTS1 level; each of these are then subdivided into NUTS2 regions and into NUTS3 regions. This division should follow two main principles (Eurostat, 2018). First, the NUTS regulation defines the minimum and maximum population thresholds to ensure a certain degree of comparability; second, it favors administrative units since the different NUTS levels may be conceived according to the local authorities, where possible.

For each treated and untreated country, Table 1 shows the number of NUTS 2016 regions and statistical regions and Figure 1 visualized them.

| EU | NUTS1 | NUTS2 | NUTS3 |
|---|---|---|---|
| Bulgaria | 2 | 6 | 28 |
| Czechia | 1 | 8 | 14 |
| Estonia | 1 | 1 | 5 |
| Croatia | 1 | 2 | 21 |
| Cyprus | 1 | 1 | 1 |
| Latvia | 1 | 1 | 6 |
| Lithuania | 1 | 2 | 10 |
| Hungary | 3 | 8 | 20 |
| Malta | 1 | 1 | 2 |
| Poland | 7 | 17 | 73 |
| Romania | 4 | 8 | 42 |
| Slovenia | 1 | 2 | 12 |
| Slovakia | 1 | 4 | 8 |

**Table 1.** Number of NUTS 2016 regions and statistical regions by country (Eurostat)

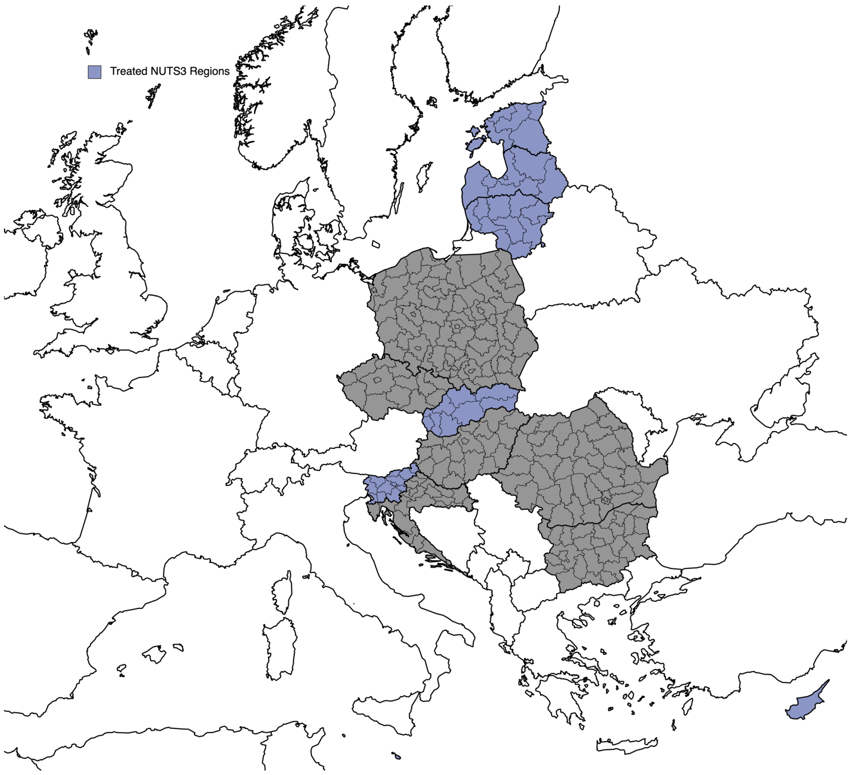


**Figure 1.** The treated NUTS3 regions are colored in blue, the donor pool NUTS3 regions in grey

Data are derived from ARDECO, a regional counterpart of AMECO, the Annual Macro-Economic database, developed by the European Commission's Directorate General for Regional and Urban Policy.

The annual panel dataset begins in 1997 and ends in 2018, with 44 treated NUTS3 regions and 198 untreated NUTS3 regions. To have enough pre-intervention periods, it would have been beneficial to have data going back to the beginning of 1990, when the interested countries began the transition phase towards the market economy and the European integration. Many countries, however, have reliable data available from later years[11]. The outcome variable of interest is the *annual GDP per capita growth rate*, which is determined by taking the annual natural-log change in the GDP per capita. This variable is expressed in consumption units to account for any currency fluctuation of the market exchange rate and it is calculated as the nominal GDP per capita in national currency divided by the Consumer Price Index CPI.

[11] The outcome variable of interest is available from 1991 for Cyprus and Poland, from 1992 for Bulgaria, Hungary, Malta and Romania, from 1993 for Latvia, Lithuania and Slovenia, from 1994 for Czech Republic, Estonia and Slovakia and from 1997 for Croatia.

Normally, only variables that were measured prior to the intervention are allowed in the collection of predictors. However, the researcher can employ post-intervention characteristics as long as they are unaffected by the treatment (Abadie et al., 2011). As previously stated, the predictors may include economic factors that have explanatory power on the outcome of interests, or lags of the outcome variable.

The covariates used in this empirical analysis for the pre-treatment calibration process are standard economic growth predictors. In the baseline setting, the covariates used are the *logarithm of capital stock in 1998,* the *logarithm of capital stock per capita in 1998*, the *share of regional GVA of different NACE sectors*[12] *in total GVA in 1998*, *compensation of employees*[13] *NACE sector G-J in 1998,* which is defined as the total remuneration paid to an employee in return for work performed in the year 1998, the *logarithm of the number of dwellings per square km in year 2000,* which is presumably considered as a proxy for infrastructures per square km, the *share of dwellings with 3 flats per dwelling in total dwellings* as a proxy for urbanization, the *share of dwellings built between 1991 and 2000 in total dwellings existing in 2000* and the *logarithm of the average age of dwellings in 2000.* The last two variables are possibly proxies of modern infrastructure.

As previously stated, the predictors may include economic factors that have explanatory power on the outcome of interests, or lags of the outcome variable. The inclusion of all pre-intervention outcomes as covariates is not recommended. As discussed in Kaul 2015, it can cause overfitting, and the weights for the prediction will be allocated based on the fit to the pre-intervention outcomes over other covariates, which become irrelevant. This could be harmful because neglecting covariates that are truly influential on the outcome may result in misleading policy conclusions (Kaul et al., 2015). Kaul et al. (2015) also demonstrate how model specifications differing by a subset of pre-intervention outcome lags result in significantly different treatment outcomes. Generally, the literature on SCM does not provide a clear guidance on the choice of the covariates and predictor variables that should be used[14] (Ferman et al., 2018), although there is a

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[12] The NACE (Statistical Classification of Economic Activities in the European Community) sectors considered in the baseline setting are the A for Agriculture, Forestry and Fishing; B-E for Industry; F for Construction; K-N for Financial and Business Services and G-J for Wholesale, Retail, Transport, Accommodation and Food Services, Information and Communication.

[13] This variable is at a NUTS2 level.

[14] Some empirical papers use a subset of pre-treatment outcome values as predictors (Abadie et al., 2010), others all pre-intervention outcome lags (Billmeier & Nannicini, 2013) and others use the

consensus that some lagged outcomes must be included as covariates to attain good accuracy, and to address endogeneity concerns as the presence of omitted variable bias (Gilchrist et al., 2022). Regarding this matter, the aspect of the model specification where the researcher has the most flexibility is choosing the set of predictors to include. (Bonander et al. 2021). Therefore, it is crucial to perform sensitivity analyses to prove the robustness of the results to different specifications[15].

In the model, some pre-treatment outcomes are included in the baseline model as predictors: *1998*, *2003* and *2006*. These years were not interested by particular shocks: 1998 is the year prior the introduction of the EMU in 1999; 2003 is the year prior the first enlargement wave in the EU, while the year 2006 is before the outbreak of the Global Financial Crisis. Since Slovenia was the first country in the sample to adopt the euro in 2007, no additional pre-intervention outcome lags have been taken into account. It would also be preferable to have the same set of economic predictors for all NUTS3 treatment units when analyzing the treatment effect.

Table 2 presents the descriptive statistics of each predictor variable for the treated NUTS3 regions and the non-treated NUTS3 regions. It is relevant to explore the descriptive statistics of the covariates for both the treated and untreated NUTS3 regions to assess whether the predictor variables would overlap adequately.

| | Treated Units | | | | Non-Treated Units | | | |
|---|---|---|---|---|---|---|---|---|
| Predictor | Mean | S.D. | Min | Max | Mean | S.D. | Min | Max |
| Ln(Capital Stock) in 1998 | 8,177 | 1,039 | 6,101 | 10,239 | 8,209 | 0,992 | 5,690 | 11,322 |
| Ln(Capital Stock p.c.) in 1998 | -4,325 | 0,658 | -5,711 | -3,130 | -4,707 | 0,640 | -6,246 | -2,665 |
| Share Agricultural, Forestry, Fishing GVA in tot GVA in 1998 | 0,084 | 0,063 | 0,001 | 0,286 | 0,124 | 0,100 | 0,000 | 0,486 |
| Share Industry GVA in tot GVA in 1998 | 0,275 | 0,086 | 0,118 | 0,455 | 0,268 | 0,088 | 0,071 | 0,524 |
| Share Construction GVA in tot GVA in 1998 | 0,067 | 0,020 | 0,022 | 0,114 | 0,068 | 0,026 | 0,007 | 0,150 |
| Share Trade GVA in tot GVA in 1998 | 0,233 | 0,070 | 0,133 | 0,385 | 0,220 | 0,063 | 0,098 | 0,436 |
| Share Financial&Business GVA in tot GVA in 1998 | 0,142 | 0,048 | 0,054 | 0,246 | 0,154 | 0,047 | 0,065 | 0,371 |
| Compensation of employees in Trade sector in 1998 | 1,434 | 0,716 | 0,498 | 2,651 | 1,044 | 0,694 | -0,280 | 2,218 |
| Ln(Number of Dwellings per square-km) in 2000 | 11,475 | 0,814 | 9,236 | 12,631 | 11,827 | 0,544 | 10,303 | 13,591 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0,502 | 0,191 | 0,119 | 0,949 | 0,431 | 0,194 | 0,065 | 0,926 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0,076 | 0,042 | 0,028 | 0,261 | 0,088 | 0,037 | 0,018 | 0,190 |
| Ln(Average Age of Dwellings) in 2000 | 3,560 | 0,133 | 3,088 | 3,818 | 3,568 | 0,129 | 3,292 | 4,028 |
| Ln(GDP p.c.) change in 1998 | 0,028 | 0,037 | -0,073 | 0,151 | 0,022 | 0,092 | -0,239 | 0,352 |
| Ln(GDP p.c.) change in 2003 | 0,057 | 0,052 | -0,047 | 0,149 | 0,058 | 0,052 | -0,058 | 0,232 |
| Ln(GDP p.c.) change in 2006 | 0,081 | 0,059 | -0,018 | 0,214 | 0,064 | 0,055 | -0,060 | 0,214 |

**Table 2.** Summary Statistics

mean of all pre-treatment outcome lags as predictors (Abadie & Gardeazabal, 2003, Abadie et al., 2015)

[15] As robustness check, the study will implement two different model specifications, one of which will change the set of pre-intervention outcome lags, and the other one will rely solely on economic predictors while eliminating pre-intervention outcome lags.

The minimum and maximum values for the untreated units are more extreme than those for the treated units for 9 out of the 15 predictor variables. The variables *Share Financial & Business GVA in tot GVA in 1998*, *Number of dwellings per square km in year 2000* and *Average Age of Dwellings in 2000* presents more extreme values in the untreated units only for the maximum values, whereas for *Compensation of employees in Trade sector in 1998, Share of Dwellings with 3 flats in total Dwellings in 2000* and *Share of Dwellings built between 1991 and 2000 in tot 2000* only for the minimum values.

Since not all of the treated regions had extreme values, specific cases will be addressed during the discussion of the findings.

One of the drawbacks of this case study is that the short time series for some treated units (the range of the pre-treatment period of time goes from 9 years for Slovenia to 19 for Lithuania) might not fully address problems like imbalances, interpolation bias, economic meaninglessness, giving rise to a biased estimator, if it is not possible to achieve the pre-intervention fit (Abadie et al., 2010). Not reaching a good pre-intervention fit may be problematic also because the post-intervention outcome might be driven by biases that makes the identification of the causal effect dubious. This thesis will show if the synthetic control method from Abadie & Gardeazabal (2003) and Abadie et al. (2010) is suitable in exploiting the research question.

# IV. Results

The causal effect of the introduction of the common currency Euro on the GDP per capita growth rate is calculated as the gap in the GDP per capita growth rate between each region and its synthetic counterpart in the post-Euro adoption period.

As reported in the previous section, for the baseline estimate, the donor pool is composed of the NUTS3 regions from Bulgaria, the Czech Republic, Croatia, Hungary, and Poland. The study's treated units include one from Cyprus, five from Estonia, ten from Lithuania, six from Latvia, two from Malta, twelve from Slovenia, and eight from Slovakia.

Figures display the growth trend for each NUTS3 region (the full black line) and its synthetic counterfactual (dashed line) and the aggregate GDP growth rate gap vis-à-vis counterfactual result from the SCM simulation for each Eurozone member country's region[16].

There are a few things that demand analysis before talking about the results. First, given the short data series[17], it is important to use caution when interpreting the results to examine the impact of the adoption of the Euro on the economic growth of the Central and Eastern European countries. Additionally, one must be aware that outcomes may be influenced by idiosyncratic shocks that affect not only the donor pool region but also the treated region in the post-adoption period, and this could be mistakenly perceived as the result of the Euro adoption. In addition to a detailed examination of each country, a general discussion about limitations and common issues will also be covered at the end of this section.

Cyprus had become a member of the European Union on May 1st, 2004. In May 2007, Cyprus met the Maastricht convergence criteria and adopted Euro on January 2008. Figure 2 shows that, up until 2004, when Cyprus joined the EU, the synthetic *ln GDP per capita change* tracked the actual version of the Cypriot ln GDP per capita change. The Cypriot ln GDP per capita change diverges by -3.23 p.p. annually on average in the

[16] For each model specification mentioned in this Section, covariance balance and weight composition can be found at the Appendix section, whereas the table with the ATTs for each country can be found at page 36.

[17] Especially for the Baltic countries. Lithuania joined the Eurozone in 2015 and the time series ends in 2018.

three years following the EU's accession, but this deviation disappears in the year of Cyprus' entry into the Eurozone. After 2008, the difference between the Cypriot NUTS3 region's ln GDP per capita change and its synthetic counterpart widened. It reached its maximum level in 2013 when the Cypriot ln GDP per capita change was 8,34 p.p. less than synthetic Cyprus. In Figure 2 left panel, we can notice a substantial decline in the *ln GDP per capita change*. This result is likely an effect of the banking system collapse that the Cypriot economy experienced after the outbreak of the Global Financial Crisis in 2008, which significantly hurt the well-being of Cyprus. In the years before the crisis, the country was already experiencing economic disequilibria, as evidenced by fiscal deficits, a loss of competitiveness, current account deficits, and an overheated real estate market (Hardouvelis & Gkionis, 2016). The primary deficit caused a sudden stop in the investment activities and the rating agencies began to downgrade CGBs below investment grade. Therefore, it may be inferred that the decline in GDP growth path was caused more by a variety of bad fiscal measures implemented by the government than by the impact of the euro[18]. These idiosyncratic shocks in the post-intervention period result in biased estimated of the average treatment effect of the treated NUTS3 region, thus affecting the interpretation of the euro adoption effect on the Cypriot economic growth. In 2013, the Eurozone countries imposed austerity measures in exchange for a €10bn rescue(Michaelides, 2016). The graph on the left shows that this measure has boosted the economy, but it is risky to attribute this result to the euro effect, since the idiosyncratic shock may have distorted the outcome.

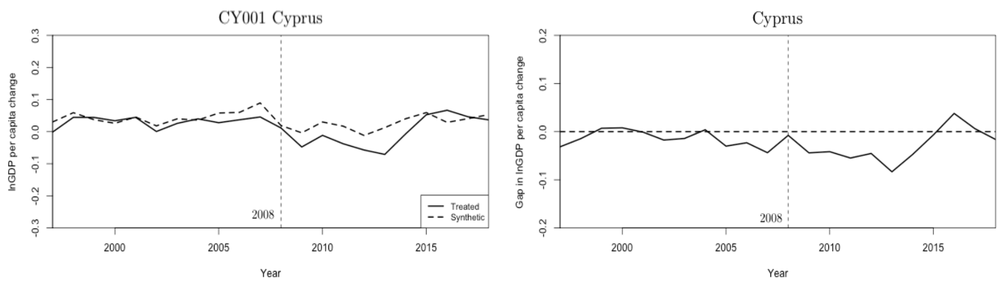


**Figure 2.** Trends in lnGDP per capita change: Cypriot NUTS3 region vs. Synthetic Cypriot NUTS3 region. The figure on the right is the lnGDP per capita change gap between Cypriot NUTS3 region and its Synthetic Cypriot NUTS3 region.

[18] Additionally, on July 11th 2011, there was an explosion that damaged the power plant responsible for supplying more than half of the island’s plant supply. The aftermath of the explosion resulted in a slump for the economy (The Economist, 2013)

The table in the Appendix 1 section reports the NUTS3 regions that are given positive weights which enables the SCM simulation to closely resemble the growth trend of each NUTS3 treated region before the euro adoption. Not all the predictors seem to be perfectly matched, especially the capital stock in 1998. The difficulty in reproducing the synthetic value may likely be because some Cypriot variable values are extreme with respect to the respective values for the untreated units, namely in the *Share of Dwellings built between 1991 and 2000 in tot 2000* and *Average Age of Dwellings in 2000.* Cyprus appears to have made significant investments in the building of new dwellings during the last decade of the 20th century, and this is reflected in the two predictor variables that were employed as proxies for modern infrastructures. This is also reflected in the weight assigned to the variables related to the construction sector: the weight given to the *Average Age of Dwellings in 2000* is the highest value (11,7%), but also the share of GVA values from the construction sector and the number of dwellings per square-km have a similar weight, around 11%. The SCM algorithm gave the financial and business services sector a weight of 0.7%, indicating that it hardly explains the economic growth rate in the Cypriot economy. The combination of donor pool regions in the construction of the synthetic counterpart includes the Bulgarian capital city Sofia, Pest in Hungary, and two Polish regions Bialostocki and Warszawski wschodni, the hinterland area of the Polish capital city Warsaw.

The three Baltic states Lithuania, Latvia and Estonia were all URSS republics until 1991[19] (Grigas et al., 2013). To be eligible for membership in the European Union after the fall of the Soviet Union, these centrally planned economies started a process of internal structural reconstruction. The reform package established all kinds of national institutions and the legislation, stimulating privatization and trade liberalization. From 2001, the Baltic states experienced strong economic growth, and all three countries were part of the first EU enlargement wave in 2004, entered the EU's exchange rate system, and entailed a commitment to adopt the euro.

The economies eventually overheated especially in Estonia and Latvia, reaching double-digit inflation, wage growth faster than productivity growth and significant external

[19] Information regarding the socio-economics regional differences in the Baltic area are from Kebza et al. (2019)

current account (Purfield & Rosenberg, 2010). Growth began to slow down prior to the start of the global financial crisis in 2008, mostly as a result of the Baltic States' real estate bubble and the subsequent credit restrictions (Purfield & Rosenberg, 2010).
The Estonian and Latvian regions presented negative growth trend especially in Kesk-Eesti (Estonia) with a growth rate of -13,2% and -11,7% in the Latvian region of Vidzeme. The collapse of the Lehman Brothers worsened the downturn in 2009 and compromised the financial system stability with a double-digit decline in GDP per capita, The aggregate Estonian, Lithuanian and Latvian GDP growth rates were respectively -20,8%, -22,8% and -25,1%[20].

Estonia prioritized the adoption of the euro after EU membership in 2004 (Lättemäe & Randveer, 2004), and it was the first Baltic nation to join the Eurozone in 2011. The aggregate difference in *ln GDP per capita change* between the Estonian NUTS3 areas and their synthetic counterfactuals is depicted in the graph in Figure 3's lower right corner. Following its entry into the Eurozone, overall Estonia outperformed the non-euro adoption scenario by 3,4 percentage points on average every year until 2014. This initial advantage did not persist, as the growth path in 4 out of 5 Estonian regions began to fall below non-euro synthetic regions in 2015. Kirde-Eesti, the industrial region of Estonia started to outperform the synthetic counterfactual in terms of GDP per capita growth during the last two years of the study. After 2016, the outcomes varied by region, with Põhja-Eesti, Lääne–Eesti and Lõuna-Eesti performing worse. The covariate balancing analysis revealed some noteworthy findings. In all Estonia region, large weights are assigned to the pre-intervention outcome lags used in the specification, with the only exception of the capital region Põhja-Eesti. For the capital region Põhja-Eesti, weights are distributed between the capital stock, the construction industry, the infrastructure per square meter proxy and the financial sector suggesting that those predictors appear to have prediction power on the GDP per capita growth rate. Paradoxically, also the primary economic sector's portion of GVA seems to play a significant role in the prediction of the growth path, even though this region has the lowest agriculture-related GVA share in all Estonia. The composition of its synthetic counterfactual does not appear

[20] Author's calculation from the dataset used in this thesis. Source: ARDECO Dataset

to accurately represent the trajectory of the treated outcome prior to treatment, according to the graph (upper corner left).

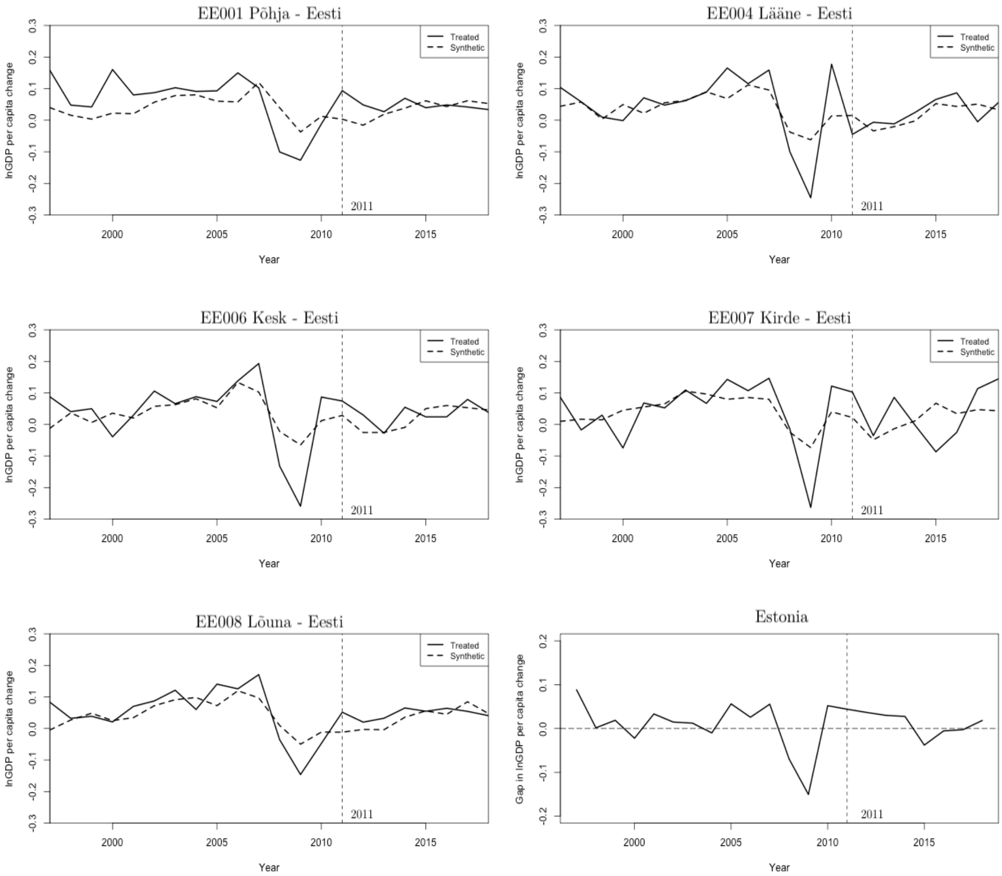


**Figure 3.** Trends in lnGDP per capita change: Estonian NUTS3 region vs. Synthetic Estonian NUTS3 region. The figure on the bottom right is the aggregate lnGDP per capita change gap between Estonian NUTS3 regions and their Synthetic Estonian NUTS3 regions.

The rural Estonian regions with the highest value in the share of agricultural GVA on total GVA are Lääne-Eesti and Kesk-Eesti. It can also be deduced from the urbanization proxy value (*Share of Dwellings with 3 flats in total Dwelling in 2000*) which in both cases was not deemed as the main predictor of economic growth, probably because of the rural characteristic of these regions. But once more, the weight assigned to the *Share Agricultural, Forestry, Fishing GVA in tot GVA in 1998* was zero. It's interesting to note that the SCM algorithm only used the capital stock and the density of housing in 1998 to explain the GDP growth rate for Lääne-Eesti. Except for the *Share Industry GVA in tot GVA in 1998*, which had zero predicting power for the economic growth, weights are dispersed throughout all the variables in the Kirde region, which is instead the industrial region of the country. This finding questions whether the covariance importance is consistent with the economic theory.

Latvia was the last Baltic country to adopt the Euro as its national currency. With the bankruptcy of Lehman Brothers in 2008, Latvia's second largest bank Parex Bank asked for government intervention and in November 2008, the Latvian authorities sought Balance of Payment support from the IMF, EU and the Nordic countries and concluded an agreement with Latvia on a credit of €750 million (Åslund & Dombrovskis, 2011). As a result, there was a rebound impact following the start of the financial crisis that the synthetic counterfactual growth performance did not manage to reproduce. The overall Latvian GDP per capita change consistently underperformed in comparison to the non-adoption scenario, peaking in 2015 with a 2,68 p.p. gap below the counterfactual before being nearly equal in 2016. Then Latvia would have been on average around 3,11 p.p. higher had it not adopted the euro in 2017 and 2018. Since its introduction, only Latgale and Zemgale regions appear to have consistently lost with respect to the non-euro adoption scenario on average. With few exceptions, the covariate balancing fit is mediocre regionally. This was most likely also influenced by the existence of some extreme values that were seen in some cases. With respect to the donor pool regions, Kurzume, the port region, and Zemgale have lower *Share Financial&Business GVA in tot GVA in 1998* values, whilst Riga, the capital region, has an extremely high urbanization proxy value compared to the other regions. Pieriga is the interland area of the capital city Riga, and in both regions, the capital stock in 1998 was significantly weighted while creating the counterfactual. Given that Riga is the most densily inhabited and urbanized region in Latvia, *Share of Dwellings with 3 flats in total Dwelling in 2000* was not considered by the SCM algorithm to be a significant economic driver in predicting the pre-intervention economic growth path.

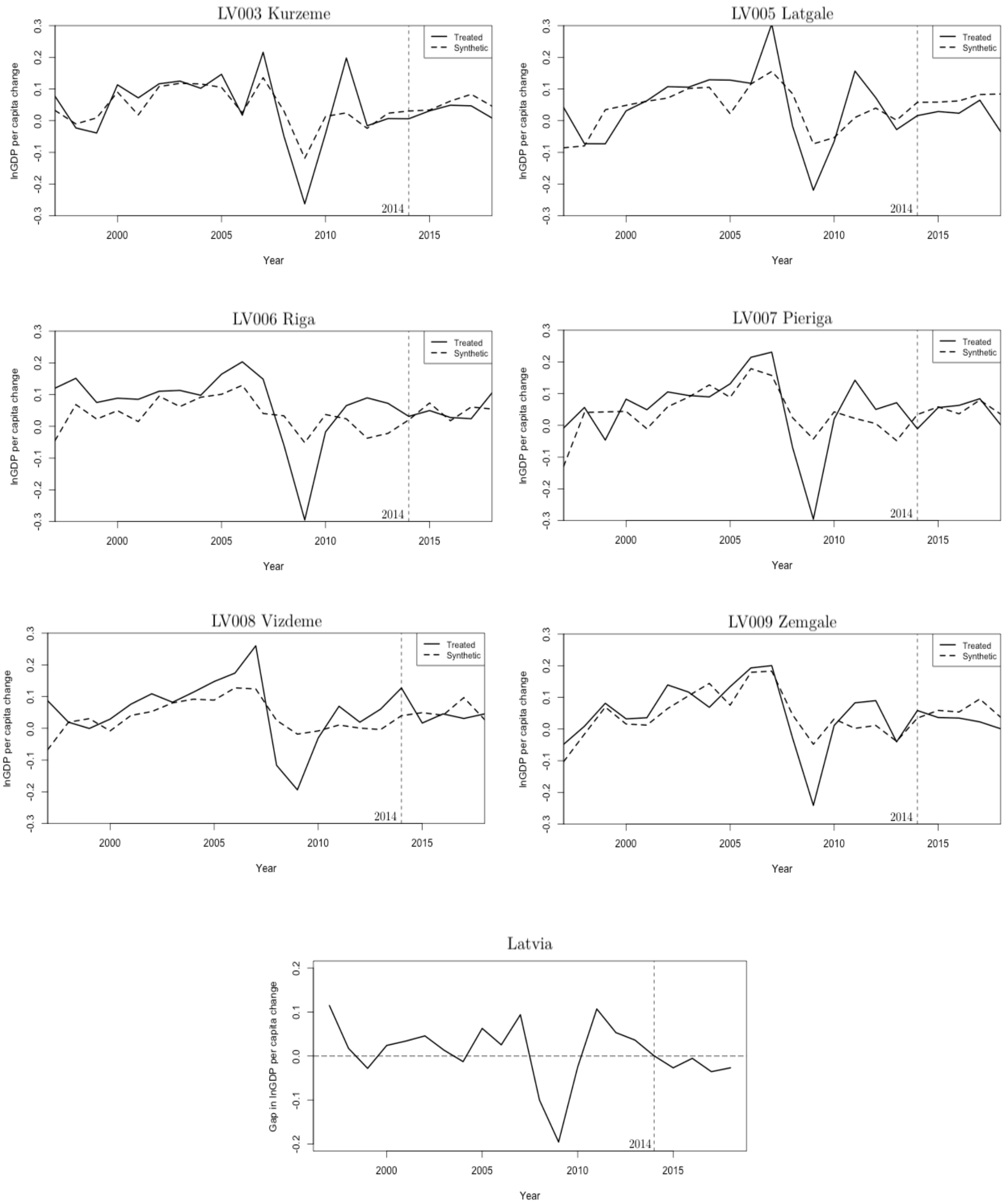


**Figure 4.** Trends in lnGDP per capita change: Latvian NUTS3 region vs. Synthetic Latvian NUTS3 region. The figure at the bottom is the aggregate lnGDP per capita change gap between Latvian NUTS3 regions and their Synthetic Latvian NUTS3 regions.

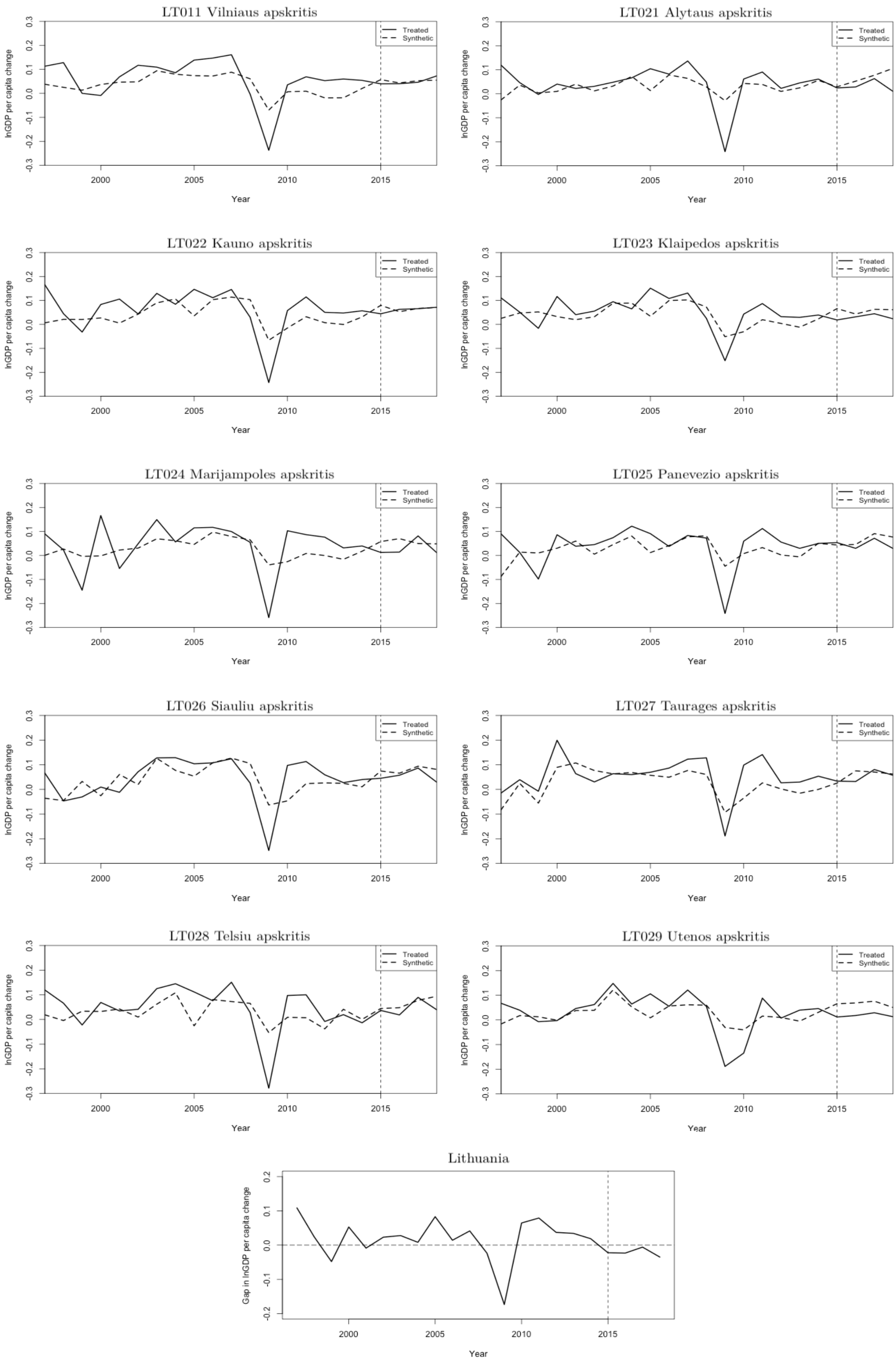


**Figure 5.** Trends in lnGDP per capita change: Lithuanian NUTS3 region vs. Synthetic Lithuanian NUTS3 region. The figure at the bottom is the aggregate lnGDP per capita change gap between Lithuanian NUTS3 regions and their Synthetic Lithuanian NUTS3 regions.

Following the adoption of the euro, Lithuania's GDP per capita growth rate was 2,3 percentage points lower than in the "no-adoption" scenario in the first two years, with essentially no difference in 2017 compared to the counterfactual and a decline of 3,5 percentage points in 2018 (Figure 5). Regionally, neither the region with the capital city Vilnius nor the second core region Kauno exhibit any divergent growth-path from the adoption of the euro. For both regions, a lot of weight was given to the capital stock variable. The Financial and Business sector received more weight among the NACE sectors when estimating the growth tendency of the Vilnius region, which is consistent with the economic characteristics of the area given that Vilnius is also a centre for software development, IT, R&D, and computer game development (Kebza et al., 2019). Whereas for the other core region Kauno, it was given to the trade sector. On the Lithuanian coast, Klaipedos, the country's economic and social hub and one of the most significant trade regions with a strong capital stock, consistently underperformed its synthetic counterpart. The performance of the other regions lagged behind that of their synthetic controls, with favorable differences in 2017 occurring mostly in the rural areas. In 2018, in general the other rural regions and not close to the economic centers performed worse between -3,7 p.p. in Marijampoles and – 9,6 p.p. in Alytaus. The weights assigned to the covariates are distributed generally in a way that is consistent with the economic structure of the regions of interest. Taurages, for example, has the lowest capital stock per capita measured in 1998, making it the poorest region. And this helps to explain why the variable was ignored while building the synthetic counterfactual pre-intervention trajectory.

For all Baltic NUTS3 regions, the pre-intervention path presents high differences between the observed and the synthetic growth path during the years of the financial crisis. Analyzing the GDP per capita growth rate of the donor pool regions used for constructing the counterfactuals outcomes, no control region had a GDP per capita growth rate as high as the Baltic treated regions. As previously mentioned, these areas experienced a generally much more severe economic downturn during the financial crisis than other untreated units considered in this study.

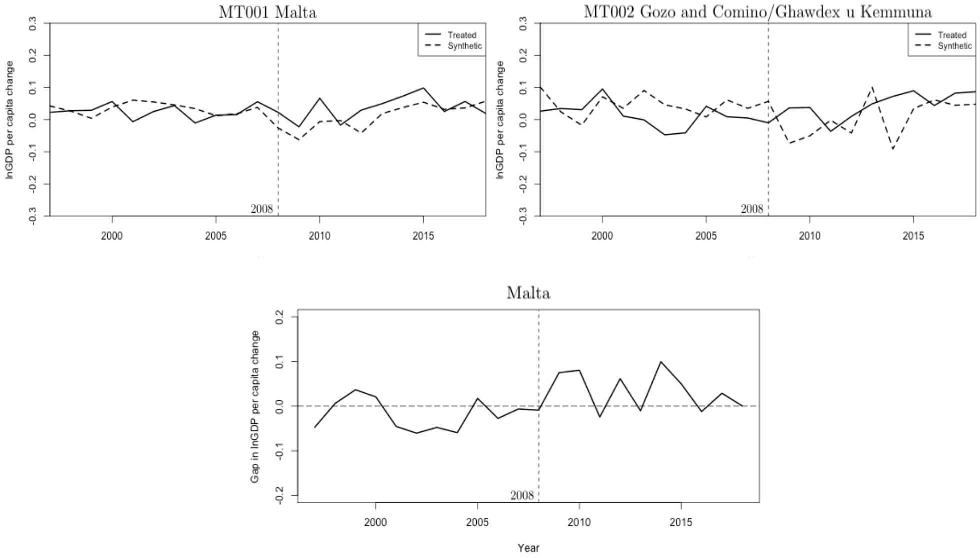


**Figure 6.** Trends in lnGDP per capita change: Maltese NUTS3 region vs. Synthetic Maltese NUTS3 region. The figure at the bottom is the aggregate lnGDP per capita change gap between Maltese NUTS3 regions and their Synthetic Maltese NUTS3 regions.

The socialist Mintoff government, which administrated Malta from 1971 to 1987, enacted severe pricing and import controls, expanded the public sector, and maintained a protectionist economic strategy. In 1987, after the liberal nationalism party won the elections, the government implemented an extensive economic reform which encouraged privatization and the deregulation of the good markets and the financial sector (Caruana Galizia, 2017). The GDP per capita growth trend in regional Malta is not persistently positive. The positive effect of the euro adoption was registered in 2009 and 2010 with +7,76 p.p. annually on average, in 2012 with +6,15 p.p. and in 2014 and 2015 with +9.9 p.p. and + 4,99 p.p. respectively. In the other years, the performance of Malta was marginally lower than the non-adoption case. Malta is made up of two NUTS3 regions: Malta, the main island and Gozo Comino. The main island (MT001) has a decent pre intervention fit. With a slump in 2011 and a positive differential of 4.5 percentage points between 2012 and 2015, the country's growth rate in the first two years after joining the eurozone was on average higher than its synthetic rate by +5,3 percentage points. From 2016 onward, the growth rate was not significantly different from the control scenario. The pre-intervention fit for Gozo and Comino is poor, and in the post-intervention trend it appears to have fared better during the two crises, with notable deviations from the control in 2010 (+8.79 p.p.) and 2015 (+16 p.p.). For both regions, it is clear from the covariance balance table in the Appendix section than the treated units and their counterfactuals do not match exactly. In the MT002 region, *Compensation of employees in Trade sector in 1998* appears to be extreme when compared to the donor pool regions, and the weight assigned to this predictor in explaining the outcome is different from 0. Almost one-third of the total weights are allocated to the outcome lags in both regions. The remaining weights are split between the contribution of the construction and of the financial and business sector to the GVA and the infrastructures proxies for Malta, the total capital stock measure and per capita, the contribution of the agricultural, fishing, industry and trade sectors to the GVA, and the infrastructures per square meter proxy for Gozo and Comino. These combinations reflect the economic structures of the units, as, for instance, Gozo and Comino are mostly agricultural and fishing islands and have a higher concentration of employment in the building and real estate industries.

Beginning of the 1990s, Slovenia attained independence from decades of communist domination. For the whole post-intervention period 2007-2018, the average treatment effect of the treated regions in Slovenia is around 0% (Figure 7). Lorber (2011) divided the Slovenian NUTS3 regions into five categories based on a particular set of development indicators[21]. Analyzing the results for each region, there is an interesting pattern. The three regions Goriska, Osrednjeslovenska and Obalno–kraska, which the author considers to be the economically most developed Slovenian regions with good economic structure, underperformed the non-euro adoption synthetic control on average every year between 2009 and 2013 by -3,5 percentage points for the first region, and from 2009 to 2015 by -3,28 p.p. and -3,4 p.p. for the other two regions respectively. Interesting findings come from the covariance balancing fit: the pre-intervention outcome lags are given a higher weight than the other variables.

Slovakia adopted the common currency in 2009, in the midst of the global financial crisis. Again, to be able to argue that the adoption of the common currency had a consistent effect on economic growth, we would need the post-treatment series to diverge. The rebound effect following the global financial crisis of 2009 was more pronounced in some regions than in others (Nitriansky kraj, Zilinsky kraj, Banskobystricky kraj, and

[21] The economic disparities were analyzed examining the movement of the regional GDP per capita and the structure of the GVA in each statistical region.

Kosicky kraj) even though the effect did not last longer and their GDP per capita underperformed each synthetic control scenario in the year after (Figure 8). Since the outbreak of the Eurozone Crisis, the average annual gap between the Slovakian GDP per capita growth rate and the non-euro path was -1,33 percentage points. The capital region Bratislava has the highest employment rate and the strongest economy. It appears that it did not experience the financial crisis as badly as the other Slovakian regions.

For the entire pre-intervention period, synthetic regions faithfully replicate the per capita GDP growth rate for Slovakia and Slovenia. However, the pre-intervention perfect fit in the economic predictors is not entirely respected. As a result, it cannot be firmly asserted that the synthetic pre-intervention path actually accounts for all unobserved heterogeneity thus producing an unbiased estimator.

Regarding statistical inference, the traditional inferential techniques do not work accurately for the comparative case studies due to the small number of units in the comparison group (Abadie et al., 2010). Therefore, there are few strategies that can be employed to assess the accuracy of our results: in-time placebo tests pretend that the intervention occurred at an earlier point in time, whereas in in-space placebo tests, the intervention occurs at the same time but in a control unit.

In order to perform the in-space placebo analysis, we run the same model again, reassigning the treatment to each of the remaining donor pool regions. Graphically, the placebo will allow us to compare the estimated effect of the treatment to the distribution of placebo effects obtained for the other regions. If the estimated effect for the treated region is “unusually large relative to the distribution of placebo effects” (Abadie et al., 2010), the effect of the euro adoption as common currency is regarded to be significant.

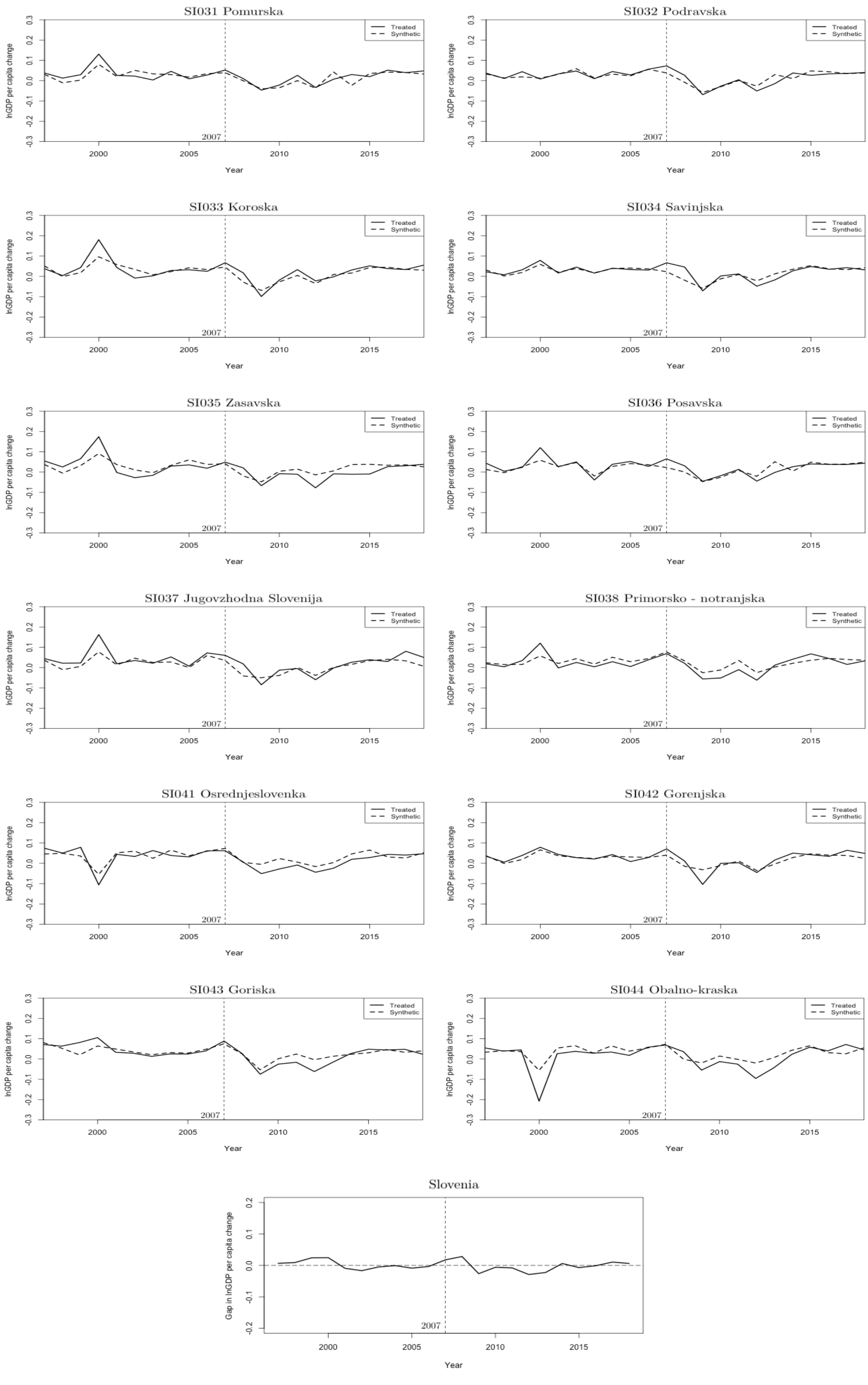


**Figure 7.** Trends in lnGDP per capita change: Slovenian NUTS3 region vs. Synthetic Slovenian NUTS3 region. The figure at the bottom is the aggregate lnGDP per capita change gap between Slovenian NUTS3 regions and their Synthetic Slovenian NUTS3 regions.

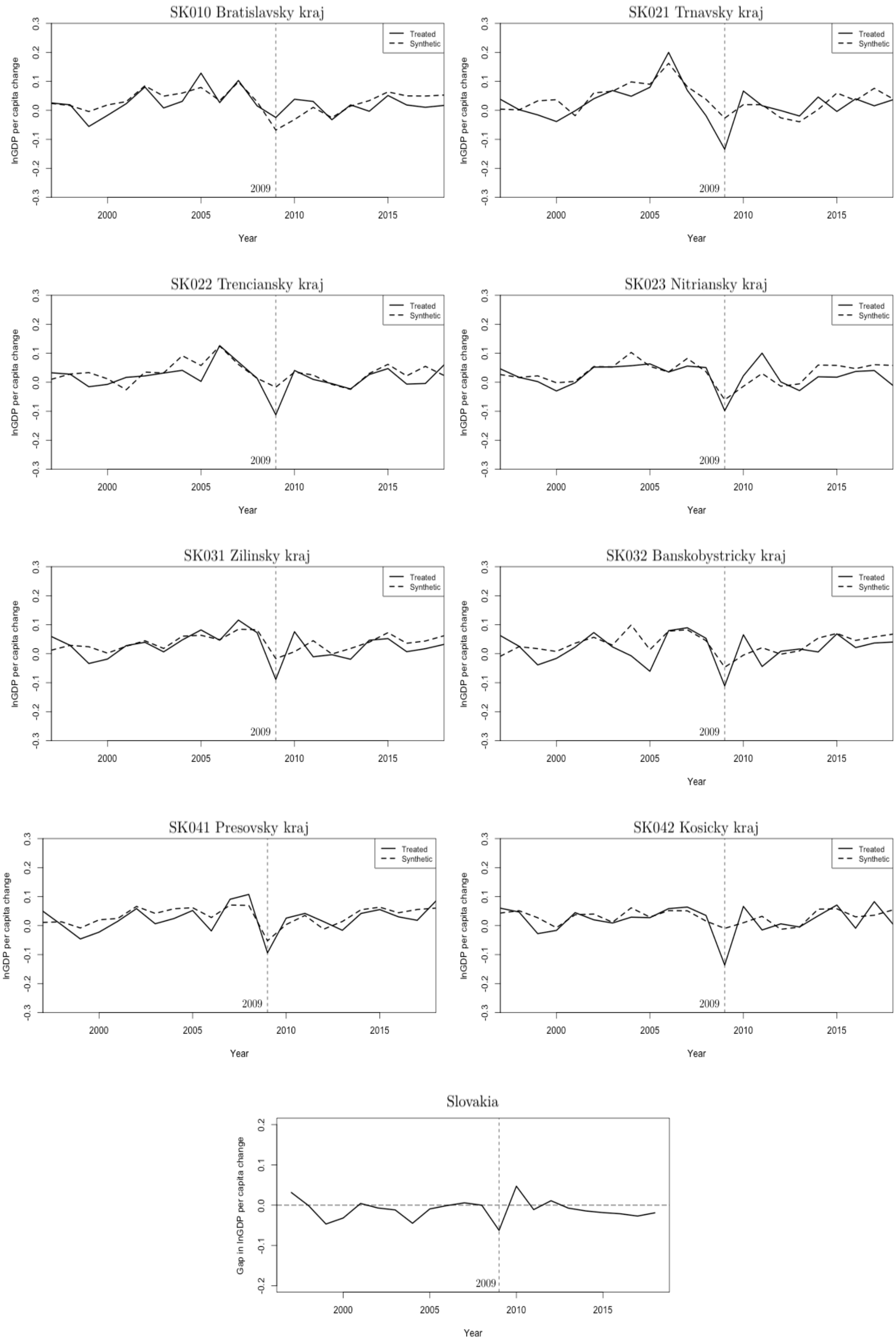


**Figure 8.** Trends in lnGDP per capita change: Slovakian NUTS3 region vs. Synthetic Slovakian NUTS3 region. The figure at the bottom is the aggregate lnGDP per capita change gap between Slovakian NUTS3 regions and their Synthetic Slovakian NUTS3 regions.

Figure 9 provides the results of the placebo in-space test, where the solid black line represents the effect of the euro adoption (i.e. the aggregate difference between the GDP per capita growth rate in the NUTS3 treated regions for each country and their corresponding synthetic estimates) and the solid gray line represents the placebo effect of the other 198 NUTS3 regions (i.e. the gap in the outcome variable for each donor pool region assuming the treatment was implemented there).

The estimated effects for the regions in Lithuania, Latvia, Slovenia and Slovakia are not large when compared to those estimated for the other regions, indicating the negligible impact of the treatment. In Estonia, the aggregate treatment effect seems to be higher in the treated regions than in the donor pool regions, but only until 2014. Malta seems to have significant results only when the aggregate outcome outperformed the control group, whereas Cyprus requires a separate analysis, since, as seen before, inadequate public finance management was a major factor in the country's economic decline, making the result of doubtful interpretation.

The figure also demonstrates that some of the synthetic units created for those donor pool regions do not accurately reproduce the donor outcomes, when the grey line is far from the x-axis. This shows that the model that was used to predict the synthetic counterfactuals of the NUTS3 regions that were treated does not predict other synthetic regions successfully.

When interpreting the placebo test itself, it does not give undoubtable insights on the appropriateness of the methodology in exploiting the research question of interest. Nor it provides suggestions whether the specification model can be improved or not including or excluding economic predictors. Therefore, to help in the discussion of the results alternative specifications that test the same hypothesis are reported as part of the robustness checks.

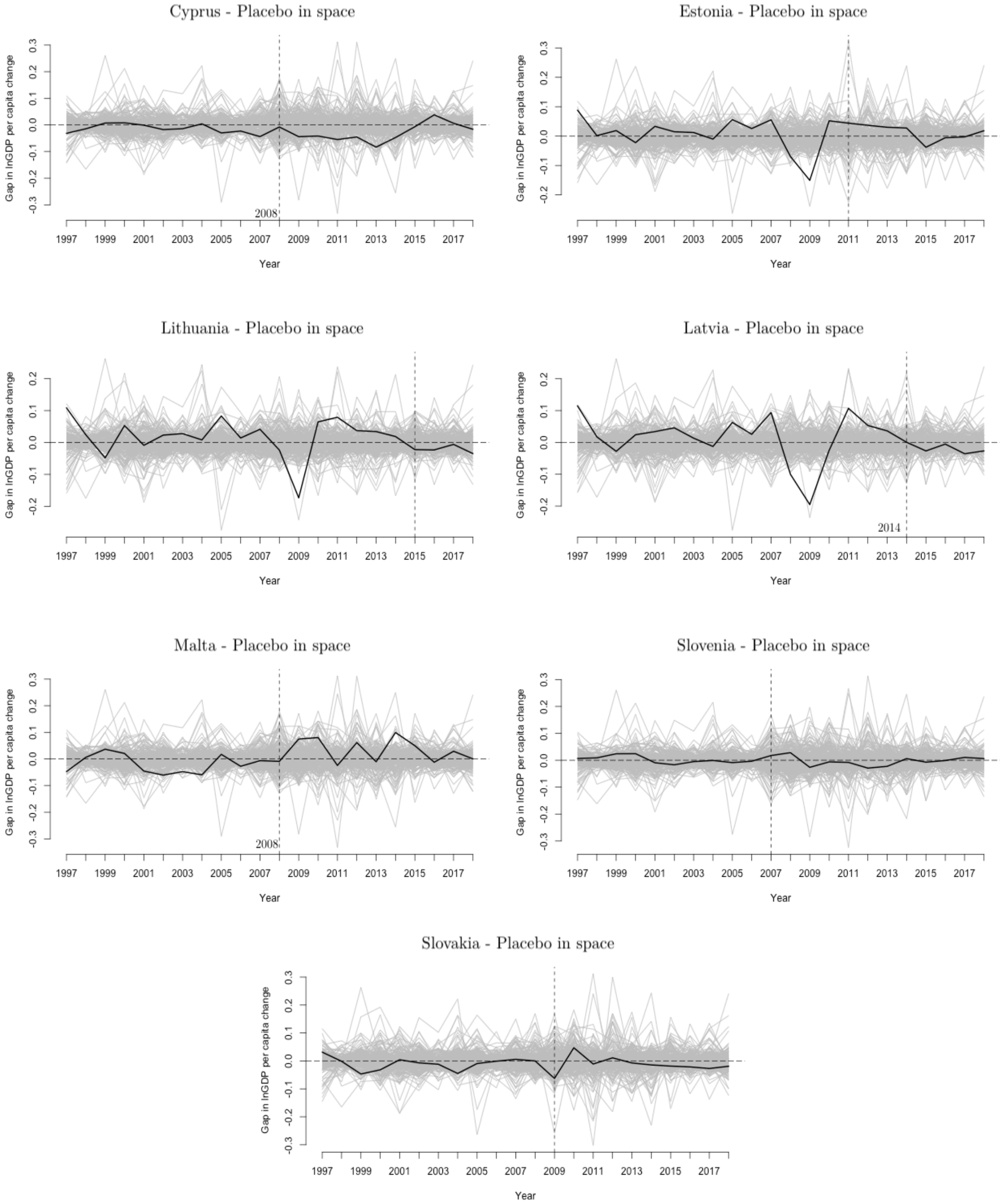


**Figure 9.** Aggregate lnGDP per capita change gap between treated NUTS3 regions and their Synthetic control NUTS3 regions by treated country and placebo gaps in 198 control regions.

As Ferman et al. (2018) recommended, to further probe the robustness of the results, the baseline model was modified first, changing the pre-intervention outcome lags and then excluding them to see how the model would react to the change.

Instead of using the three years of lagged GDP per capita growth rate (1998, 2003 and 2006), the first robustness check uses only the last two pre-treatment outcome values[22]. This was made by arguing that it is especially important to achieve a good fit at the treatment cutoff, because if the period before the time of intervention was somewhat an outlier, it might be more likely that the intervention will happen in period $T_0 + 1$ (Kaul et al., 2015). Some of the countries in this case study adopted the euro shortly after the financial crisis, and it can be claimed that this event ultimately had led to the intervention. This argument can be rejected because there are a few procedures that must be taken before the euro is adopted as a common currency, and the economic integration period typically continues for more than one year[23].

As has been said a few times, it is essential that the values of the observed covariates that have predictive power for the outcome of interest are closely replicated by the synthetic controls. In the discussion of the results, there were some intriguing findings on which observed covariates the synthetic control algorithm deemed to be more relevant than others in predicting the economic growth path. When the weights' distribution was compared to the economic traits of the treated units, some contradictions were revealed.

It is also true that when outcome lags are included, the SCM faces a trade-off: some observable variable would be given up increasing the pre-treatment trajectory's efficiency and hence attempting to enhance the fit of the unobserved confounders (Doudchenko & Imbens, 2016). Therefore, crucial information can be lost if the removed factors are instead economic drivers that would better explain the outcome path (Kaul et al., 2015). The second robustness check will be performed excluding all the outcome lags from the set of predictors.

[22] Kaul et al. (2022) conducted a simulation using different model specifications according to the number of outcome lags used as in the predictor set together with the observed covariates. They discovered that, regardless of the number of $T_0$, using all lags of the outcomes performs worse in terms of bias and RMSPE. Using only the last one or none at all turned out to be slightly better to employing an average of the outcome lags.

[23] According to the Maastricht Treaty, first countries entered the European Exchange Rate Mechanism, a multilateral exchange rate arrangement with a fixed, but adjustable, central rate and a fluctuation band with a width of +/- 15 percent. It was set up on January 1st, 1999 for the EU countries that had not entered the Eurozone yet. The Slovenian Tolar, the Lithuanian litas, and the Estonian kroon were all incorporated into the ERM II shortly after the 2004 EU enlargement. The Cyprus Pound, Latvian Lats, and Maltese Lira joined the ERM II in 2005, while the Slovak Koruna did so at the end of 2005. To be eligible to enter the Eurozone, these countries had to fulfill some convergence criteria established by the Maastricht Treaty (ECB, 2020).

The results of the robustness checks are presented together for each country in order to facilitate the comparison and the discussion[24].

When the covariate set's composition has been altered, the covariance importance in predicting the outcome variable, the distribution of weights among the donor pool regions, and the RMSPE changed. The alternative specifications lead to a gap trajectory that is quite similar to that of the main specification model in the post-treatment period but with different magnitudes. The RMSPE gets worse when the number of predictors is decreased, thus providing justification that adding pre-treatment outcomes actually improve the fit of the synthetic control counterfactual growth path.

Despite the fact that the RMSPE worsened, Cyprus seems to have the same outcome trend as in the baseline model and a more thorough analysis reveals that the synthetic control was constructed using the same untreated NUTS3 regions, with some variations in the weight distribution. The distribution of the weights according to the importance of the covariate in explaining the outcome does not present big differences from the baseline model, but it gives more weight to the *Share Financial & Business GVA in tot GVA in 1998* and *Share of Dwellings with 3 flats in total Dwelling in 2000.* Interestingly, when the model ignores the outcome lags, the predictors weight distribution marginally changes giving again more weight to the variable for the financial sector contribution to the GVA. The synthetic covariate values are the same as those from the second specification model, as well as the donor pool regions combination.

For Estonian regions, as expected, the second specification model's counterfactuals better reproduce the decline in GDP per capita growth during the crisis, especially for Lääne-Eesti and Lõuna-Eesti. While the new covariance setting appears to enhance the pre-intervention fit in the former region, it worsens it in the latter. For Kirde-Eesti, the industrial region, the Share of GVA industry, which seemed to be irrelevant in the baseline model, gets 12,5% weight in the third specification. The same applies to the urbanization proxy variable as in both robustness checks, the weight increases from 1,4% to 17,2% and 24,1%. Changing the model specification, Riga the capital region of Latvia

[24] Graphs for each treated country in the Appendix 2 for the first robustness check specification, Appendix 3 for the second robustness check specification.
The RMSPE measure and the covariance balance table from all specifications are presented for each treated NUTS3 area in Appendix 1.

loses weight in the capital stock. The first specification put a lot of importance on the Financial and Business sector, while trade and the construction sector replace it in the second robustness check. It is interesting to note that in the specification using the last two outcome lags for Kurzume, the Latvian port region, more than half of the weight allocated to the outcome lags in the first specification, has been redistributed across all variables. Contrarily, in the third specification, the algorithm totally ignores the proxy variables for urbanization and modern infrastructure, the capital stock and the contribution of trade and of the financial sector to the economy.

Differently from the baseline model, the importance of the trade sector in Kauno, one of the social and economic Lithuanian hubs, was demonstrated in the robustness checks.

In Slovenia, the covariance balance appears to be more respected when the lags are removed at the expense of a worse pre-intervention outcome lags fit. Malta is the only case where the gap trajectory for the three models during the study period is different. The second specification's RMSPE is the lowest and more accurately mimics the variable's pre-intervention result. Even though the trend is similar for the first 3 years after the adoption at varied magnitudes, the average treatment effect of Malta for the period 2008-2018 is +3,09 p.p. in the first specification, +1,64 p.p. and + 3,77 p.p. in the second and the third respectively.

| | Average Treatment Effect of the Treated Countries post Euro adoption | | | | | |
|---|---|---|---|---|---|---|
| Country | Synth_1 | Post Euro adoption period | Synth_2 | Post Euro adoption period | Synth_3 | Post Euro adoption period |
| Cyprus | - 2.76 | 2008-2018 | - 2.95 | 2008-2018 | - 2.95 | 2008-2018 |
| Estonia | 1.38 | 2011-2018 | 1.06 | 2011-2018 | 1.28 | 2011-2018 |
| Lithuania | - 2.16 | 2015-2018 | - 1.41 | 2015-2018 | - 2.39 | 2015-2018 |
| Latvia | - 1.88 | 2014-2018 | - 1.98 | 2014-2018 | - 1.97 | 2014-2018 |
| Malta | 3.09 | 2008-2018 | 1.64 | 2008-2018 | 3.78 | 2008-2018 |
| Slovenia | - 0.27 | 2007-2018 | - 0.11 | 2007-2018 | - 0.09 | 2007-2018 |
| Slovakia | -1.23 | 2009-2018 | -1.32 | 2009-2018 | - 1.04 | 2009-2018 |

**Table 3.** Average treatment effect of the treated countries for the baseline model (Synth_1) and the robustness checks (Synth_2, Synth_3)

In general, it has been found that several observed covariates neglected in the baseline specification, help to determine the course of economic growth when the outcome lags are excluded. This demonstrates that, when outcome lags are included in the model, the SCM trades off economic significance for greater pre-intervention fit and tend to better match the unobserved variables. Indeed, in the majority of the cases, the RMSPE is lower in the first specification. Not all of the covariate values of the treated units included in the predictor set are accurately reproduced by the SC estimator, in all three model specifications. Theoretically (Botosaru & Ferman, 2019), as long as the study relies on a long pre-intervention period of time, researchers should not be concerned if imbalances in the covariance fit are present i.e. the variable values of the treated units are not in the convex hull of the donor pool regions. However, as previously discussed, this study cannot rely on a long $T_0$. Nevertheless, Abadie et al. (2015) highlighted how important it is for the algorithm to reproduce the variables with greater predictive power, and this was generally done. A source of concern may also be triggered by the choice of the predictors. Most of the observed economic covariates are taken at exactly one point of time (1998). These variables only give us a snapshot of a single year during the pre-treatment period, without taking into account possible dynamics.

In Section II, we have discussed the presence of some threats of validity. Among all, biasness might be prompt by the existence of anticipation effects. The effects of the euro adoption could have started few years before the actual euro-adoption, when the countries joined the ERM-II mechanism. This study could be expanded to rule out this possibility. The year of intervention should be shift to the accession date to the mechanism, and it should be examined whether pegging the national currencies to the euro has affected economic growth.

This thesis uses the traditional linear method presented in Abadie et al 2010, and works with weights driven from the minimization of the MSPE in the pre-intervention period. However, the imperfect pre-treatment fit raised the question of whether the original method was appropriate for this research question, or if some modifications in the approach or in the model would instead be required.

To address the imperfect pre-treatment fit issue, a number of empirical strategies have been proposed in the literature. Abadie & L'Hour (2021) discussed that in circumstances characterized by a large number of treated and untreated units, the best synthetic control may not be unique. For this reason, they proposed a penalized synthetic control estimator to further reduce the discrepancies between the treated units and the donor pool regions. This ensures the existence of a unique and sparse control estimator. Also Doudchenko & Imbens (2016) proposed few adjustments to exclude non-unique control estimator. They showed that if the setting presents a number of potential control units that is much larger than the number of pre-intervention period, the vector of weights could be customized as 1/N. Moreover, Ben-Michael et al. (2021) studied Augmented SCM, an extension of the original SCM to be used in settings faulted by poor pre-intervention fit, whereas Gobillon & Magnac (2016) explored data transformation to improve the performance of the estimator. Therefore, as the original data-driven synthetic control approach does not clearly rule out the potential sources of bias in this setting, the impact of the euro adoption could be assessed by using a wide range of potential SC methodologies which can be used in future research, according to the specific circumstances.

# V. Conclusion

The synthetic control method is one of the identification methods used in comparative economics, capable of revealing the causal effect of shocks or interventions in a particular treated unit. This study uses the synthetic control algorithm to determine the long-term impact of the adoption of the euro as common currency on the growth performances of the European Eastern transition economies.

The results showed that in the three years following the Eurozone entrance, the Cypriot GDP per capita change negatively diverged from the non-euro scenario by 3.23 percentage points yearly on average, with a decline in 2013. However, the impact of the euro is intrinsically linked to the impact of the banking crisis that hit Cyprus during those years, making it hard to interpret the actual impact of the euro. Among the Baltic countries, Lithuania and Latvia almost consistently underperformed when compared to the non-adoption scenario by 2,16 p.p. and 1,88 p.p. respectively on average every year. Estonia outperformed the non-euro adoption scenario by 3,4 percentage points on average every year until 2014, even though this initial advantage did not persist in the years afterwards. For Slovenia and Slovakia, the overall estimated effect of the euro adoption was neutral or marginal negative particularly during the years of the financial crisis; on contrary the Malta seems to have gain benefits from the common currency regime.

As noted in the debate, some factors influence the consistency of the results. First, the countries adopted euro during the financial crisis. If the adoption occurred after this common shock, it is possible to hypothesize that it was taken into account in the pre-treatment outcome fit as an unobserved covariate. However, if the adoption occurred before, it would be difficult to distinguish the effects of the euro from the crisis, as it would be reckless to exclude that the shock has caused structural modification in the economies. The results of the robustness checks indicate that changing the model specification will still produce a similar outcome as the baseline model, with some minor differences in the magnitude of the effect. Besides this, the robustness checks demonstrate that adding pre-intervention outcomes as covariates improves the pre-treatment outcome fit between treated unit and synthetic control although inducing instability in the covariance importance. Speculations have been made about what other concerns might affect the accuracy of the results, namely the selection of predictors, the anticipatory effect of the ERM-II, coupled with deficiency in the time series length.

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# Appendix 1

| CY | Kypros CY000 | | | | | | | Average of donor pool regions |
|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 10.239 | 8.926 | 8.6% | 9.228 | 8.9% | 9.228 | 10% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -3.19 | -4.423 | 1.4% | -4.15 | 5% | -4.15 | 6.5% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.047 | 0.039 | 7% | 0.045 | 7.2% | 0.045 | 8.5% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.118 | 0.217 | 1.5% | 0.24 | 1.3% | 0.24 | 1.7% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.329 | 0.299 | 5.3% | 0.28 | 2.9% | 0.28 | 2.3% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.089 | 0.083 | 11.1% | 0.081 | 9.3% | 0.081 | 14% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.203 | 0.165 | 0.7% | 0.196 | 6.7% | 0.196 | 8.3% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 2.03 | 1.702 | 6.4% | 1.729 | 7.8% | 1.729 | 7.9% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 12.424 | 12.271 | 11.2% | 12.301 | 10.6% | 12.301 | 13.1% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.328 | 0.495 | 5.5% | 0.37 | 11.1% | 0.37 | 14% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.261 | 0.165 | 3.9% | 0.162 | 4.1% | 0.162 | 5.3% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.088 | 3.368 | 11.7% | 3.406 | 9.3% | 3.406 | 8.6% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.044 | 0.059 | 9.5% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.026 | 0.04 | 6.1% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.037 | 0.06 | 10% | 0.055 | 8.1% | - | - | 0.064 |
| Ln(GDP p.c.) change in 2007 | 0.046 | - | - | 0.073 | 7.7% | - | - | 0.08 |
| RMSPE | | 0.0217 | | 0.0240 | | 0.0240 | | |

| MT | Malta MT001 | | | | | | | Gozo and Comino MT002 | | | | | | | Average of donor pool regions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 9.12 | 8.742 | 0.1% | 8.553 | 0% | 9.126 | 28.2% | 6.305 | 7.07 | 31.1% | 8.500 | 1.1% | 7.273 | 18.9% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -3.662 | -4.064 | 2% | -4.228 | 0.1% | -3.693 | 22.3% | -3.98 | -4.535 | 12.2% | -4.705 | 0.5% | -4.365 | 8.6% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.028 | 0.105 | 0.2% | 0.15 | 0% | 0.027 | 26.5% | 0.08 | 0.144 | 7.4% | 0.09 | 10% | 0.141 | 18.4% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.233 | 0.279 | 0.4% | 0.234 | 16.1% | 0.232 | 9.5% | 0.172 | 0.278 | 1.8% | 0.197 | 16.9% | 0.358 | 0.6% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.325 | 0.21 | 0% | 0.232 | 0% | 0.3 | 0% | 0.241 | 0.142 | 3.8% | 0.277 | 8.7% | 0.135 | 0.7% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.054 | 0.056 | 12.4% | 0.055 | 10.3% | 0.078 | 0% | 0.051 | 0.061 | 0.9% | 0.087 | 0.9% | 0.044 | 8.3% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.156 | 0.156 | 11.5% | 0.157 | 10.6% | 0.2 | 0% | 0.092 | 0.188 | 0.9% | 0.115 | 29.1% | 0.146 | 20.4% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 2.287 | 1.58 | 0,0% | 1.358 | 0% | 2.152 | 0.13% | 2.287 | 1.975 | 9.5% | 1.576 | 4.5% | 1.975 | 7.4% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.721 | 11.737 | 13.6% | 11.719 | 12.2% | 11.983 | 0% | 9.236 | 10.42 | 8.5% | 12.09 | 0% | 10.487 | 12% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.274 | 0.28 | 11.4% | 0.277 | 12.7% | 0.568 | 0% | 0.119 | 0.101 | 1.3% | 0.38 | 0% | 0.107 | 2.9% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.173 | 0.111 | 0% | 0.127 | 0.5% | 0.117 | 0% | 0.201 | 0.111 | 0.5% | 0.141 | 6.9% | 0.105 | 1.3% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.552 | 3.551 | 8% | 3.496 | 0.8% | 3.677 | 0.3% | 3.499 | 3.44 | 0.7% | 3.374 | 0.2% | 3.506 | 0.6% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.028 | 0.027 | 10.2% | - | - | - | - | 0.035 | 0.023 | 11.5% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.044 | 0.046 | 10.3% | - | - | - | - | -0.047 | 0.046 | 6.3% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.015 | 0.018 | 20% | 0.017 | 28.8% | - | - | 0.009 | 0.061 | 3.6% | 0.033 | 9.3% | - | - | 0.064 |
| Ln(GDP p.c.) change in 2007 | | - | - | 0.053 | 7.8% | - | - | | - | - | 0.019 | 11.8% | - | - | 0.08 |
| RMSPE | | 0.0286 | | 0.028 | | 0.0348 | | | 0.0576 | | 0.044 | | 0.0578 | | |

| EE | Põhja - Eesti EE001 | | | | | | |
|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 |
| Ln(Capital Stock) in 1998 | 9.19 | 9.188 | 32.5% | 9.216 | 23.4% | 9.207 | 23.9% |
| Ln(Capital Stock p.c.) in 1998 | -4015 | -4.013 | 20% | -4.029 | 16.8% | -4031 | 16.3% |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.015 | 0.019 | 10.2% | 0.02 | 21% | 0.021 | 24.6% |
| Share Industry GVA in tot GVA in 1998 | 0.178 | 0.19 | 1.2% | 0.184 | 8.3% | 0.181 | 12.7% |
| Share Trade GVA in tot GVA in 1998 | 0.378 | 0.318 | 0% | 0.329 | 0.1% | 0.314 | 0% |
| Share Construction GVA in tot GVA in 1998 | 0.08 | 0.08 | 10.9% | 0.089 | 0.8% | 0.082 | 4.8% |
| Share Financial&Business GVA in tot GVA in 1998 | 0.2 | 0.199 | 7.1% | 0.199 | 3.1% | 0.214 | 0% |
| Compensation of employees in Trade sector in 1998 | 1.441 | 1.583 | 0.1% | 1.624 | 0.1% | 1.826 | 0% |
| Ln(Number of Dwellings per square-km) in 2000 | 12.297 | 12.302 | 17.1% | 12.308 | 16.9% | 12.305 | 14.7% |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.86 | 0.741 | 0.2% | 0.745 | 1.6% | 0.724 | 0.4% |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.048 | 0.065 | 0.4% | 0.059 | 2.2% | 0.059 | 2.5% |
| Ln(Average Age of Dwellings) in 2000 | 3.493 | 3.674 | 0% | 3.672 | 0% | 3.754 | 0% |
| Ln(GDP p.c.) change in 1998 | 0.048 | 0.016 | 0% | - | - | - | - |
| Ln(GDP p.c.) change in 2003 | 0.103 | 0.078 | 0.3% | - | - | - | - |
| Ln(GDP p.c.) change in 2006 | 0.15 | 0.058 | 0% | - | - | - | - |
| Ln(GDP p.c.) change in 2009 | -0.127 | - | - | -0.03 | 0.1% | - | - |
| Ln(GDP p.c.) change in 2010 | -0.012 | - | - | -0.012 | 5.6% | - | - |
| RMSPE | | 0.0749 | | 0.0771 | | 0.0686 | |

| EE | Lääne - Eesti EE004 | | | | | | |
|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight | Synth_2 | Weight_2 | Synth_3 | Weight_3 |
| Ln(Capital Stock) in 1998 | 7.557 | 7.609 | 28.8% | 7.687 | 3.5% | 7.585 | 18% |
| Ln(Capital Stock p.c.) in 1998 | -4.457 | -4.485 | 28.2% | -4.464 | 19.7% | -4.515 | 11.3% |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.152 | 0.102 | 0% | 0.049 | 0% | 0.083 | 0.6% |
| Share Industry GVA in tot GVA in 1998 | 0.21 | 0.215 | 4.1% | 0.225 | 26.9% | 0.169 | 0.2% |
| Share Trade GVA in tot GVA in 1998 | 0.2 | 0.233 | 0.1% | 0.213 | 5.9% | 0.286 | 0% |
| Share Construction GVA in tot GVA in 1998 | 0.079 | 0.075 | 0.4% | 0.075 | 13.1% | 0.067 | 0.5% |
| Share Financial&Business GVA in tot GVA in 1998 | 0.159 | 0.175 | 0.1% | 0.24 | 0% | 0.182 | 0% |
| Compensation of employees in Trade sector in 1998 | 1.441 | 1.654 | 0.1% | 1.837 | 0% | 1.776 | 0.4% |
| Ln(Number of Dwellings per square-km) in 2000 | 11.133 | 11.11 | 10.5% | 11.439 | 11.1% | 11.177 | 28% |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.537 | 0.387 | 0.2% | 0.478 | 7.5% | 0.468 | 2% |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.053 | 0.078 | 0.2% | 0.094 | 0% | 0.067 | 3.5% |
| Ln(Average Age of Dwellings) in 2000 | 3.713 | 3.623 | 0% | 3.58 | 4.2% | 3.709 | 35.5% |
| Ln(GDP p.c.) change in 1998 | 0.058 | 0.058 | 11.3% | - | - | - | - |
| Ln(GDP p.c.) change in 2003 | 0.062 | 0.062 | 7.5% | - | - | - | - |
| Ln(GDP p.c.) change in 2006 | 0.116 | 0.112 | 8.7% | - | - | - | - |
| Ln(GDP p.c.) change in 2009 | -0.245 | - | - | -0.104 | 1.1% | - | - |
| Ln(GDP p.c.) change in 2010 | 0.177 | - | - | 0.092 | 7% | - | - |
| RMSPE | | 0.0786 | | 0.0657 | | 0.0866 | |

| EE | Kesk - Eesti EE006 | | | | | | |
|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight | Synth_2 | Weight_2 | Synth_3 | Weight_3 |
| Ln(Capital Stock) in 1998 | 7.32 | 7.592 | 2.8% | 7.45 | 15.7% | 7.458 | 11.6% |
| Ln(Capital Stock p.c.) in 1998 | -4.568 | -4.608 | 16.4% | -4.72 | 13.5% | -4.656 | 15.8% |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.189 | 0.149 | 0.2% | 0.138 | 5.1% | 0.171 | 3.7% |
| Share Industry GVA in tot GVA in 1998 | 0.276 | 0.277 | 6.8% | 0.25 | 0.7% | 0.256 | 2.5% |
| Share Trade GVA in tot GVA in 1998 | 0.173 | 0.185 | 3.3% | 0.171 | 12.8% | 0.204 | 0.0% |
| Share Construction GVA in tot GVA in 1998 | 0.052 | 0.062 | 5.2% | 0.069 | 0.6% | 0.055 | 0.1% |
| Share Financial&Business GVA in tot GVA in 1998 | 0.157 | 0.156 | 0.06% | 0.196 | 0.1% | 0.156 | 18.1% |
| Compensation of employees in Trade sector in 1998 | 1.441 | 1.41 | 13.8% | 1.393 | 27.3% | 1.445 | 16.6% |
| Ln(Number of Dwellings per square-km) in 2000 | 11.01 | 11.121 | 11.8% | 11.237 | 8.7% | 11.061 | 19.6% |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.567 | 0.355 | 2.2% | 0.4 | 0.9% | 0.363 | 0.5% |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.042 | 0.067 | 2.2% | 0.076 | 1.4% | 0.063 | 3% |
| Ln(Average Age of Dwellings) in 2000 | 3.659 | 3.602 | 1.9% | 3.569 | 2.9% | 3.635 | 8.3% |
| Ln(GDP p.c.) change in 1998 | 0.041 | 0.037 | 6.5% | - | - | - | - |
| Ln(GDP p.c.) change in 2003 | 0.066 | 0.063 | 7.1% | - | - | - | - |
| Ln(GDP p.c.) change in 2006 | 0.138 | 0.133 | 13.8% | - | - | - | - |
| Ln(GDP p.c.) change in 2009 | -0.259 | - | - | -0.106 | 0.7% | - | - |
| Ln(GDP p.c.) change in 2010 | 0.087 | - | - | 0.064 | 9.7% | - | - |
| RMSPE | | 0.0775 | | 0.0773 | | 0.0882 | |

| EE | Kirde - Eesti EE007 | | | | | | |
|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight | Synth_2 | Weight_2 | Synth_3 | Weight_3 |
| Ln(Capital Stock) in 1998 | 7.586 | 8.171 | 0.4% | 8.844 | 0.8% | 8.575 | 12.8% |
| Ln(Capital Stock p.c.) in 1998 | -4.519 | -4.415 | 6% | -4.162 | 4.4% | -4.385 | 10.4% |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.045 | 0.1 | 10.7% | 0.051 | 6.8% | 0.038 | 17.6% |
| Share Industry GVA in tot GVA in 1998 | 0.455 | 0.361 | 0.4% | 0.395 | 19.1% | 0.432 | 12.5% |
| Share Trade GVA in tot GVA in 1998 | 0.134 | 0.167 | 6.7% | 0.18 | 6% | 0.191 | 5.8% |
| Share Construction GVA in tot GVA in 1998 | 0.048 | 0.065 | 3.3% | 0.072 | 5.4% | 0.091 | 0.7% |
| Share Financial&Business GVA in tot GVA in 1998 | 0.174 | 0.15 | 3.7% | 0.165 | 9.3% | 0.13 | 0.1% |
| Compensation of employees in Trade sector in 1998 | 1.441 | 1.424 | 13.7% | 1.257 | 7.9% | 1.308 | 12.3% |
| Ln(Number of Dwellings per square-km) in 2000 | 11.252 | 11.475 | 12.9% | 11.998 | 2% | 11.759 | 0% |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.891 | 0.455 | 1.4% | 0.568 | 17.2% | 0.697 | 24.1% |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.036 | 0.057 | 10.9% | 0.059 | 6.1% | 0.06 | 0.2% |
| Ln(Average Age of Dwellings) in 2000 | 3.409 | 3.601 | 1.1% | 3.588 | 1% | 3.632 | 3.5% |
| Ln(GDP p.c.) change in 1998 | -0.017 | 0.017 | 8.5% | - | - | - | - |
| Ln(GDP p.c.) change in 2003 | 0.109 | 0.106 | 14.3% | - | - | - | - |
| Ln(GDP p.c.) change in 2006 | 0.107 | 0.086 | 5.9% | - | - | - | - |
| Ln(GDP p.c.) change in 2009 | -0.263 | - | - | -0.118 | 6.3% | - | - |
| Ln(GDP p.c.) change in 2010 | 0.122 | - | - | 0.071 | 7.9% | - | - |
| RMSPE | | 0.0728 | | 0.0817 | | 0.0950 | |

| EE | Lõuna - Eesti EE008 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Average of donor pool regions |
| Ln(Capital Stock) in 1998 | 8.166 | 8.177 | 27.4% | 8.146 | 22.4% | 8.185 | 23.1% | 8209 |
| Ln(Capital Stock p.c.) in 1998 | -4.624 | -4.598 | 14.2% | -4.59 | 9.8% | -4.582 | 12.2% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.104 | 0.107 | 0.7% | 0.104 | 20% | 0.105 | 22.4% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.191 | 0.207 | 2.6% | 0.318 | 0% | 0.262 | 0% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.164 | 0.249 | 0% | 0.169 | 11.9% | 0.182 | 6.2% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.051 | 0.052 | 5% | 0.06 | 0.4% | 0.053 | 8% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.246 | 0.188 | 0.4% | 0.167 | 0% | 0.216 | 0.1% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 1.441 | 1.347 | 13.1% | 1.39 | 15.6% | 1.381 | 23.5% | 1044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.843 | 11.836 | 6.8% | 11.709 | 0% | 11.745 | 0.3% | 11827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.6 | 0.481 | 0.8% | 0.31 | 0.1% | 0.463 | 1.7% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.044 | 0.067 | 0.4% | 0.06 | 2.6% | 0.056 | 2.5% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.685 | 3.67 | 2% | 3.553 | 0% | 3.639 | 0% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.032 | 0.027 | 7.9% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.121 | 0.091 | 1% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.126 | 0.119 | 17.7% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2009 | -0.146 | - | - | -0.115 | 1.2% | - | - | -0.032 |
| Ln(GDP p.c.) change in 2010 | -0.047 | - | - | -0.045 | 16% | - | - | -0.013 |
| RMSPE | | 0.0496 | | 0.0591 | | 0.0619 | | |

| LT | Vilniaus apskritis LT011 | | | | | | | Alytaus apskritis LT021 | | | | | | | Kauno apskritis LT022 | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 9.698 | 9.623 | 26.3% | 9.59 | 14.8% | 9.652 | 19.6% | 7.014 | 7.228 | 1.3% | 7.172 | 17.4% | 7.231 | 9.7% | 7.014 | 7.228 | 1.3% | 9.11 | 0.4% | 8.858 | 0% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -3.982 | -4.079 | 13.7% | -4.161 | 9.9% | -4.163 | 2.9% | -5.159 | -5.072 | 13.8% | -4.887 | 0,0% | -5.039 | 10.1% | -5.159 | -5.072 | 13.8% | -4.381 | 0% | -4.656 | 0.8% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.037 | 0.033 | 7.1% | 0.024 | 6.3% | 0.034 | 11.2% | 0.144 | 0.158 | 6.5% | 0.147 | 17.8% | 0.15 | 19.4% | 0.144 | 0.158 | 6.5% | 0.041 | 31.3% | 0.044 | 28.8% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.17 | 0.268 | 1.2% | 0.253 | 3.5% | 0.257 | 2,0% | 0.293 | 0.29 | 4.9% | 0.296 | 9.3% | 0.315 | 0,0% | 0.293 | 0.29 | 4.9% | 0.265 | 2.2% | 0.268 | 7.8% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.361 | 0.279 | 1.2% | 0.304 | 0.6% | 0.289 | 0.1% | 0.203 | 0.202 | 9.4% | 0.199 | 13.1% | 0.198 | 18.4% | 0.203 | 0.202 | 9.4% | 0.248 | 15.5% | 0.249 | 26.5% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.086 | 0.082 | 5.2% | 0.086 | 7.4% | 0.087 | 5.1% | 0.062 | 0.063 | 9.4% | 0.062 | 1,0% | 0.062 | 11.4% | 0.062 | 0.063 | 9.4% | 0.105 | 7.3% | 0.106 | 3.8% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.115 | 0.141 | 9% | 0.141 | 9.7% | 0.14 | 6.7% | 0.113 | 0.127 | 5.9% | 0.13 | 4.4% | 0.12 | 19.1% | 0.113 | 0.127 | 5.9% | 0.161 | 0% | 0.144 | 1.7% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 1.426 | 1.484 | 9.1% | 1.399 | 22.9% | 1.404 | 28.1% | 0.695 | 0.923 | 0% | 1.119 | 0,0% | 0.913 | 0.3% | 0.695 | 0.923 | 0% | 1.404 | 0% | 1.311 | 0.1% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 12.631 | 12.672 | 6.9% | 12.69 | 4.3% | 12.742 | 1.8% | 11.186 | 11.339 | 7.5% | 11.22 | 17.7% | 11.371 | 5.8% | 11.186 | 11.339 | 7.5% | 12.431 | 21.6% | 12.429 | 24.4% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.728 | 0.627 | 4.3% | 0.652 | 4.4% | 0.645 | 4.4% | 0.51 | 0.496 | 15.8% | 0.455 | 0,0% | 0.458 | 1.4% | 0.51 | 0.496 | 15.8% | 0.506 | 0,0% | 0.473 | 0.2% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.089 | 0.095 | 4.1% | 0.095 | 6,0% | 0.092 | 11.2% | 0.086 | 0.086 | 12.4% | 0.084 | 4.5% | 0.086 | 4.4% | 0.086 | 0.086 | 12.4% | 0.071 | 7,0% | 0.078 | 2.5% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.446 | 3.496 | 0.5% | 3.464 | 9.6% | 3.467 | 7.1% | 3.468 | 3.639 | 0.2% | 3.646 | 0.2% | 3.629 | 0,0% | 3.468 | 3.639 | 0.2% | 3.491 | 1.8% | 3.484 | 3.5% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.128 | 0.025 | 1.2% | - | - | - | - | 0.046 | 0.036 | 4.8% | - | - | - | - | 0.046 | 0.036 | 4.8% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.109 | 0.094 | 9.8% | - | - | - | - | 0.048 | 0.032 | 1% | - | - | - | - | 0.048 | 0.032 | 1% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.147 | 0.072 | 0.5% | - | - | - | - | 0.082 | 0.078 | 7.2% | - | - | - | - | 0.082 | 0.078 | 7.2% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2013 | 0.06 | - | - | -0.003 | 0.3% | - | - | 0.045 | - | - | 0.042 | 8.4% | - | - | 0.048 | - | - | 0.032 | 0.9% | - | - | 0.01 |
| Ln(GDP p.c.) change in 2014 | 0.054 | - | - | 0.035 | 0.1% | - | - | 0.061 | - | - | 0.059 | 6.3% | - | - | 0.057 | - | - | 0.056 | 12% | - | - | 0.038 |
| RMSPE | | 0.0699 | | 0.0717 | | 0.0713 | | | 0.0690 | | 0.0682 | | 0.0701 | | | 0.0785 | | 0.0697 | | 0.0761 | | |

| LT | Klaipedos apskritis LT023 | | | | | | | Marijampoles apskritis LT024 | | | | | | | Panevezio apskritis LT025 | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 7.933 | 8.121 | 19.4% | 8.118 | 17.9% | 8.264 | 5.3% | 6.861 | 7.277 | 1.1% | 7.085 | 1.8% | 6.872 | 11.9% | 7.585 | 7.603 | 30.9% | 7.857 | 4.6% | 7.612 | 15.2% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -4.932 | -4.936 | 11.2% | -4.836 | 6.2% | -4.9 | 10.6% | -5.299 | -5.051 | 2.8% | -5.279 | 10.9% | -5.299 | 10.2% | -5.047 | -5.036 | 14.8% | -5.007 | 4.9% | -5.028 | 12.7% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.055 | 0.077 | 10.2% | 0.063 | 19.2% | 0.067 | 14.8% | 0.286 | 0.236 | 1.8% | 0.231 | 1.6% | 0.208 | 0.2% | 0.136 | 0.142 | 9.9% | 0.139 | 28.3% | 0.141 | 20.7% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.219 | 0.218 | 6% | 0.217 | 11% | 0.228 | 8.1% | 0.177 | 0.179 | 10.4% | 0.204 | 0.2% | 0.176 | 6.1% | 0.299 | 0.305 | 4% | 0.301 | 17.9% | 0.302 | 12.2% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.298 | 0.289 | 12.3% | 0.29 | 16% | 0.295 | 14.4% | 0.183 | 0.182 | 16% | 0.179 | 11.7% | 0.182 | 7.8% | 0.186 | 0.189 | 4% | 0.208 | 1.2% | 0.19 | 5.1% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.112 | 0.107 | 4.9% | 0.106 | 4.4% | 0.11 | 7.7% | 0.068 | 0.065 | 11.4% | 0.066 | 11.5% | 0.068 | 10.7% | 0.062 | 0.063 | 2.1% | 0.091 | 0% | 0.067 | 1.5% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.103 | 0.125 | 2% | 0.135 | 1.3% | 0.113 | 18.1% | 0.083 | 0.155 | 0.5% | 0.149 | 0.7% | 0.165 | 0,0% | 0.099 | 0.127 | 1.3% | 0.108 | 10.3% | 0.123 | 2.4% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 0.695 | 1.199 | 1.4% | 1.352 | 0.1% | 1.282 | 0% | 0.695 | 1.092 | 0.2% | 0.678 | 26.3% | 0.695 | 32.9% | 0.695 | 0.694 | 7.9% | 0.843 | 0.2% | 0.694 | 18.3% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.809 | 11.922 | 7% | 11.841 | 13% | 11.931 | 11% | 11.081 | 11.152 | 17.8% | 11.257 | 5.7% | 11.091 | 9.5% | 11.648 | 11.64 | 8.9% | 11.856 | 0.7% | 11.649 | 5.2% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.739 | 0.439 | 0.7% | 0.449 | 0% | 0.44 | 0% | 0.434 | 0.403 | 9.4% | 0.418 | 11% | 0.433 | 10.2% | 0.539 | 0.488 | 1.2% | 0.49 | 6.2% | 0.487 | 1.5% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.089 | 0.098 | 2.5% | 0.095 | 1.2% | 0.111 | 0% | 0.064 | 0.096 | 0% | 0.068 | 11.6% | 0.07 | 0.4% | 0.069 | 0.07 | 1.6% | 0.083 | 1.3% | 0.071 | 4.8% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.429 | 3.485 | 1.5% | 3.472 | 0.6% | 3.432 | 10% | 3.528 | 3.536 | 19% | 3.597 | 0.6% | 3.607 | 0% | 3.506 | 3.603 | 0% | 3.526 | 5.7% | 3.58 | 0.3% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.051 | 0.048 | 8.2% | - | - | - | - | 0.023 | 0.027 | 7.9% | - | - | - | - | 0.013 | 0.014 | 10% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.095 | 0.088 | 5.8% | - | - | - | - | 0.149 | 0.07 | 0.1% | - | - | - | - | 0.074 | 0.045 | 0.1% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.108 | 0.1 | 7% | - | - | - | - | 0.117 | 0.098 | 1.7% | - | - | - | - | 0.038 | 0.041 | 3.4% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2013 | 0.029 | - | - | 0.023 | 9% | - | - | 0.031 | - | - | 0.027 | 5.7% | - | - | 0.03 | - | - | 0.029 | 11.4% | - | - | 0.01 |
| Ln(GDP p.c.) change in 2014 | 0.039 | - | - | 0.032 | 0.1% | - | - | 0.04 | - | - | 0.022 | 0.7% | - | - | 0.05 | - | - | 0.051 | 7.4% | - | - | 0.038 |
| RMSPE | | 0.0578 | | 0.0567 | | 0.0594 | | | 0.0924 | | 0.0918 | | 0.0946 | | | 0.0779 | | 0.0785 | | 0.0791 | | |

| LT | Siauliu apskritis LT026 | | | | | | | Taurages apskritis LT027 | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 7.671 | 7.713 | 1.4% | 7.696 | 21.5% | 7.736 | 15,0% | 6.101 | 6.913 | 0.3% | 6.779 | 6.2% | 6.823 | 0.1% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -5.165 | -5.173 | 12.1% | -5.17 | 10.1% | -5.168 | 8.2% | -5.711 | -5.112 | 0.1% | -5.316 | 0.2% | -5.21 | 0.3% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.199 | 0.2 | 7.5% | 0.199 | 20.2% | 0.199 | 20.4% | 0.253 | 0.233 | 4% | 0.26 | 13.3% | 0.251 | 15.4% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.2 | 0.206 | 17,0% | 0.2 | 8.9% | 0.201 | 6.3% | 0.137 | 0.242 | 0.2% | 0.156 | 6.9% | 0.228 | 0.2% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.244 | 0.24 | 8.9% | 0.242 | 9% | 0.242 | 6.8% | 0.183 | 0.172 | 13.4% | 0.177 | 11.7% | 0.169 | 9.6% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.066 | 0.082 | 0% | 0.066 | 1.4% | 0.065 | 3.8% | 0.022 | 0.035 | 4.5% | 0.049 | 0% | 0.034 | 3.8% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.109 | 0.115 | 9.5% | 0.134 | 0.2% | 0.112 | 19.3% | 0.142 | 0.147 | 21.4% | 0.15 | 28.2% | 0.149 | 15.3% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 0.695 | 0.766 | 0.1% | 0.685 | 10.4% | 0.943 | 1% | 0.695 | 0.897 | 4.3% | 0.679 | 14.2% | 0.757 | 16.7% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.807 | 11.834 | 10.4% | 11.797 | 7.3% | 11.824 | 3.1% | 10.73 | 10.893 | 25.3% | 11.122 | 3.6% | 10.933 | 19.2% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.565 | 0.335 | 0.1% | 0.452 | 0.2% | 0.506 | 3% | 0.423 | 0.225 | 0.1% | 0.305 | 0.3% | 0.248 | 0.1% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.065 | 0.089 | 1.1% | 0.07 | 1.7% | 0.119 | 0% | 0.069 | 0.079 | 0% | 0.069 | 2% | 0.069 | 9.4% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.467 | 3.504 | 2.8% | 3.506 | 0.7% | 3.47 | 13% | 3.574 | 3.537 | 5.1% | 3.586 | 3.6% | 3.557 | 10% | 3.568 |
| Ln(GDP p.c.) change in 1998 | -0.047 | -0.045 | 9.5% | - | - | - | - | 0.039 | 0.025 | 1.7% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.128 | 0.126 | 9.6% | - | - | - | - | 0.064 | 0.063 | 19.9% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.108 | 0.108 | 10% | - | - | - | - | 0.087 | 0.049 | 0% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2013 | 0.028 | - | - | 0.027 | 4.3% | - | - | 0.03 | - | - | 0.028 | 9.4% | - | - | 0.01 |
| Ln(GDP p.c.) change in 2014 | 0.04 | - | - | 0.041 | 4.1% | - | - | 0.054 | - | - | 0.017 | 0.4% | - | - | 0.038 |
| RMSPE | | 0.0744 | | 0.0789 | | 0.0839 | | | 0.0655 | | 0.0695 | | 0.0678 | | |

| LT | Telsiu apskritis LT028 | | | | | | | Utenos apskritis LT029 | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 7 | 7.442 | 8.1% | 7.233 | 21.9% | 7.426 | 3.6% | 7.143 | 7.812 | 0% | 8.136 | 0% | 7.901 | 0.3% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -5.098 | -4.714 | 1.9% | -4.928 | 0% | -4.686 | 0.4% | -5.026 | -4.715 | 0% | -4.455 | 0% | -4.518 | 0.2% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.146 | 0.163 | 11.3% | 0.165 | 9.7% | 0.161 | 16.5% | 0.124 | 0.159 | 0.9% | 0.126 | 14.8% | 0.134 | 8% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.339 | 0.338 | 8% | 0.216 | 0% | 0.354 | 6.1% | 0.394 | 0.386 | 9.5% | 0.392 | 13.2% | 0.395 | 8.6% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.18 | 0.18 | 8.1% | 0.187 | 2.1% | 0.182 | 11% | 0.147 | 0.153 | 18.5% | 0.184 | 0% | 0.183 | 0.2% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.068 | 0.055 | 0% | 0.064 | 1.1% | 0.052 | 0% | 0.049 | 0.049 | 17.6% | 0.049 | 15.7% | 0.05 | 13.5% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.096 | 0.118 | 18% | 0.155 | 1.5% | 0.114 | 21.5% | 0.105 | 0.124 | 6.3% | 0.123 | 1.9% | 0.107 | 28% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 0.695 | 1.308 | 0.4% | 1.278 | 0% | 1.107 | 2.1% | 0.695 | 0.92 | 5.2% | 1.205 | 0% | 1.215 | 0.2% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.035 | 11.139 | 29.5% | 11.047 | 38.8% | 11.124 | 35.5% | 11.254 | 11.422 | 13.5% | 11.506 | 3.4% | 11.263 | 29.5% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.551 | 0.351 | 1.5% | 0.414 | 3.8% | 0.348 | 1.7% | 0.464 | 0.383 | 3.6% | 0.4 | 2.4% | 0.311 | 0.2% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.079 | 0.098 | 0% | 0.11 | 0% | 0.082 | 0.2% | 0.057 | 0.064 | 0% | 0.06 | 15.6% | 0.072 | 0.9% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.467 | 3.571 | 0.4% | 3.568 | 0.3% | 3.59 | 1.4% | 3.561 | 3.557 | 13.5% | 3.566 | 13.7% | 3.563 | 10.5% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.066 | -0.004 | 0.8% | - | - | - | - | 0.039 | 0.017 | 0% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.125 | 0.062 | 1.4% | - | - | - | - | 0.148 | 0.121 | 2.4% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.076 | 0.081 | 10.7% | - | - | - | - | 0.055 | 0.056 | 9% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2013 | 0.02 | - | - | 0.021 | 0.8% | - | - | 0.04 | - | - | 0.038 | 18% | - | - | 0.01 |
| Ln(GDP p.c.) change in 2014 | -0.013 | - | - | -0.009 | 20.1% | - | - | 0.046 | - | - | 0.035 | 1.3% | - | - | 0.038 |
| RMSPE | | 0.0820 | | 0.0774 | | 0.0856 | | | 0.0596 | | 0.0569 | | 0.0629 | | |

| LV | Kurzume LV003 | | | | | | | Latgale LV005 | | | | | | | Riga LV006 | | | | | | | Average of donor pool regions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth 1 | Weight 1 | Synth 2 | Weight 2 | Synth 3 | Weight 3 | Treated | Synth 1 | Weight 1 | Synth 2 | Weight 2 | Synth 3 | Weight 3 | Treated | Synth 1 | Weight 1 | Synth 2 | Weight 2 | Synth 3 | Weight 3 | |
| Ln(Capital Stock) in 1998 | 7.831 | 8.721 | 0.4% | 8.638 | 2.1% | 8.272 | 22,3% | 7.624 | 8.43 | 1% | 8.011 | 20% | 8.099 | 0.4% | 9.22 | 9.226 | 12.8% | 9.782 | 0.6% | 10.451 | 0% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -4.857 | -4.062 | 0% | -4.818 | 5.5% | -4.847 | 11,1% | -5.242 | -4.833 | 6.8% | -5.094 | 9.5% | -4.903 | 10.7% | -4.351 | -4.45 | 14.1% | -4.161 | 5.4% | -3.719 | 0% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.062 | 0.043 | 5.6% | 0.062 | 7.8% | 0.068 | 23,8% | 0.073 | 0.121 | 9.6% | 0.104 | 24.5% | 0.161 | 7% | 0.001 | 0.059 | 7.3% | 0.014 | 11.4% | 0.003 | 20.6% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.187 | 0.206 | 10.6% | 0.263 | 1% | 0.247 | 7,6% | 0.21 | 0.35 | 0.1% | 0.271 | 2,0% | 0.339 | 0.3% | 0.217 | 0.266 | 2.9% | 0.266 | 3.5% | 0.202 | 6.1% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.385 | 0.295 | 5.6% | 0.312 | 9.9% | 0.319 | 13,3% | 0.295 | 0.258 | 2.4% | 0.267 | 10.3% | 0.238 | 1.7% | 0.325 | 0.232 | 0% | 0.28 | 0,0% | 0.313 | 12.2% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.114 | 0.057 | 0% | 0.11 | 16% | 0.073 | 0,1% | 0.032 | 0.057 | 5.1% | 0.081 | 0.4% | 0.046 | 12.8% | 0.07 | 0.057 | 0% | 0.071 | 19.4% | 0.071 | 31.7% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.059 | 0.194 | 0.5% | 0.105 | 17.1% | 0.121 | 9,3% | 0.069 | 0.109 | 12.9% | 0.125 | 7.8% | 0.109 | 13.4% | 0.217 | 0.211 | 19.4% | 0.216 | 19.2% | 0.24 | 0% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 0.498 | 1.672 | 1.1% | 1.098 | 4.8% | 1.177 | 5,3% | 0.498 | 0.83 | 4.8% | 0.676 | 7.7% | 0.743 | 8.7% | 0.498 | 1084 | 0.5% | 1.425 | 0% | 1.542 | 0% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.788 | 11.885 | 8.1% | 12.233 | 3.3% | 11.805 | 6,5% | 11.939 | 12.153 | 0% | 11.992 | 5.7% | 11.915 | 10.6% | 12.626 | 12.686 | 8.8% | 12.922 | 0% | 13.227 | 0% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.705 | 0.541 | 3.8% | 0.491 | 1.5% | 0.407 | 0% | 0.566 | 0.457 | 11.8% | 0.493 | 1.1% | 0.441 | 10.7% | 0.949 | 0.657 | 0.2% | 0.828 | 7.2% | 0.87 | 8.6% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.042 | 0.061 | 8.9% | 0.093 | 5.2% | 0.101 | 0,7% | 0.055 | 0.057 | 28.1% | 0.07 | 7.5% | 0.058 | 18.2% | 0.028 | 0.051 | 7.2% | 0.035 | 20.1% | 0.051 | 2.5% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.699 | 3.585 | 0% | 3.441 | 0.7% | 3.481 | 0% | 3.574 | 3.566 | 1% | 3.51 | 0% | 3.577 | 5.5% | 3.705 | 3.7 | 20.1% | 3.706 | 10.6% | 3.697 | 18.1% | 3.568 |
| Ln(GDP p.c.) change in 1998 | -0.023 | 0.003 | 5.4% | - | - | | | -0.073 | -0.08 | 4.8% | - | - | - | - | 0.151 | 0.068 | 0.7% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.125 | 0.119 | 29.2% | - | - | - | - | 0.106 | 0.102 | 6.3% | - | - | - | - | 0.113 | 0.062 | 1.1% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.017 | 0.037 | 20.8% | - | - | - | - | 0.118 | 0.116 | 5.3% | - | - | - | - | 0.203 | 0.129 | 4.7% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2012 | -0.016 | - | - | -0.005 | 16.2% | - | - | 0.072 | - | - | 0.057 | 3.5% | - | - | 0.09 | - | - | 0.004 | 1.9% | - | - | -0.002 |
| Ln(GDP p.c.) change in 2013 | 0.007 | - | - | 0.018 | 9% | - | - | -0.028 | - | - | 0.001 | 0% | - | - | 0.072 | - | - | 0.011 | 0.6% | - | - | 0.01 |
| RMSPE | | 0.0736 | | 0.0976 | | 0.0968 | | | 0.0837 | | 0.0905 | | 0.0836 | | | 0.0986 | | 0.1034 | | 0.1025 | | |

| LV | Pieriga LV007 | | | | | | | Vidzeme LV008 | | | | | | | Zemgale LV009 | | | | | | | Average of donor pool regions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth 1 | Weight 1 | Synth 2 | Weight 2 | Synth 3 | Weight 3 | Treated | Synth 1 | Weight 1 | Synth 2 | Weight 2 | Synth 3 | Weight 3 | Treated | Synth 1 | Weight 1 | Synth 2 | Weight 2 | Synth 3 | Weight 3 | |
| Ln(Capital Stock) in 1998 | 7.921 | 8.198 | 8.5% | 8.017 | 25.5% | 8.046 | 24.2% | 7.396 | 7.435 | 31.1% | 7.797 | 4.9% | 7.627 | 20.2% | 7.454 | 8.167 | 3.6% | 7.491 | 23.3% | 7.85 | 12.6% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -4.884 | -4.765 | 7.7% | -4.92 | 12.4% | -4.901 | 10.1% | -5.065 | -5.064 | 15.4% | -5.049 | 9.6% | -4.928 | 10.8% | -5.136 | -4.79 | 4.5% | -5.164 | 10.6% | -5.036 | 14.4% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.071 | 0.124 | 5.5% | 0.085 | 24.6% | 0.076 | 24.6% | 0.142 | 0.149 | 13.5% | 0.156 | 31.9% | 0.167 | 16.4% | 0.141 | 0.143 | 11.4% | 0.15 | 21.4% | 0.161 | 19.9% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.31 | 0.363 | 1.6% | 0.292 | 8.3% | 0.308 | 9.5% | 0.248 | 0.252 | 3.5% | 0.261 | 8.7% | 0.32 | 0.2% | 0.252 | 0.368 | 0% | 0.261 | 6.9% | 0.297 | 2.7% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.287 | 0.179 | 0.3% | 0.274 | 8.7% | 0.281 | 10.9% | 0.206 | 0.211 | 2.5% | 0.237 | 0.2% | 0.198 | 5% | 0.225 | 0.191 | 3.8% | 0.225 | 8.9% | 0.217 | 7.9% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.043 | 0.065 | 1.7% | 0.058 | 1.8% | 0.055 | 2.2% | 0.042 | 0.053 | 0.5% | 0.047 | 18.9% | 0.05 | 8.7% | 0.038 | 0.06 | 4.6% | 0.049 | 4.1% | 0.086 | 0% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.069 | 0.125 | 6.7% | 0.143 | 0% | 0.136 | 1.4% | 0.055 | 0.177 | 0% | 0.132 | 2.3% | 0.12 | 4.2% | 0.054 | 0.113 | 9.1% | 0.153 | 0.5% | 0.104 | 10.6% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 0.498 | 0.773 | 6.9% | 0.66 | 6.4% | 0.975 | 0.1% | 0.498 | 0.792 | 0.1% | 0.755 | 5.5% | 0.909 | 1.3% | 0.498 | 0.944 | 0.6% | 0.535 | 6% | 0.835 | 1.2% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.93 | 11.895 | 7% | 11.863 | 6% | 11.855 | 9.4% | 11.463 | 11.486 | 14.7% | 11.772 | 1.3% | 11.604 | 1.6% | 11.631 | 11825 | 6.2% | 11.667 | 7% | 11.904 | 0.1% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.581 | 0.529 | 17.8% | 0.498 | 0% | 0.529 | 5.1% | 0.566 | 0.46 | 1% | 0.463 | 1.8% | 0.527 | 14.1% | 0.638 | 0.487 | 14% | 0.427 | 0.5% | 0.52 | 5.1% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.092 | 0.072 | 0.8% | 0.086 | 1.3% | 0.091 | 2.3% | 0.047 | 0.058 | 0.6% | 0.062 | 0% | 0.066 | 1.4% | 0.053 | 0.056 | 10.6% | 0.061 | 2.8% | 0.066 | 5.4% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.516 | 3.589 | 0.7% | 3.5 | 3.4% | 3.491 | 0.2% | 3.762 | 3.657 | 0.8% | 3.726 | 8% | 3.748 | 16.1% | 3.584 | 3.622 | 4% | 3.578 | 1.6% | 3.579 | 20.1% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.056 | 0.041 | 17.4% | - | - | - | - | 0.019 | 0.019 | 10.1% | - | - | - | - | 0.009 | -0.016 | 8.6% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.094 | 0.089 | 5.7% | - | - | - | - | 0.082 | 0.08 | 5.1% | - | - | - | - | 0.117 | 0.105 | 7.8% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.214 | 0.179 | 11.6% | - | - | - | - | 0.174 | 0.127 | 1% | - | - | - | - | 0.193 | 0.179 | 11.3% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2012 | 0.05 | - | - | 0.01 | 0.9% | - | - | 0.019 | - | - | 0.008 | 4.3% | - | - | 0.09 | - | - | 0.082 | 6.3% | - | - | -0.002 |
| Ln(GDP p.c.) change in 2013 | 0.071 | - | - | 0.025 | 0.7% | - | - | 0.06 | - | - | 0.028 | 2.7% | - | - | -0.04 | - | - | -0.014 | 0.1% | - | - | 0.01 |
| RMSPE | | 0.0919 | | 0.0968 | | 0.0971 | | | 0.0821 | | 0.0837 | | 0.0907 | | | 0.0666 | | 0.0794 | | 0.0785 | | |

| SI | Pomurska | | | | | | | Podravska | | | | | | | Koroska | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SI031 | | | | | | | SI032 | | | | | | | SI033 | | | | | | | |
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 7.739 | 8.069 | 1.7% | 7.816 | 8.8% | 7.726 | 27.4% | 8.995 | 9.023 | 7.6% | 9.056 | 3.5% | 9.028 | 14.7% | 7.336 | 8.156 | 4.3% | 8.207 | 0.7% | 7.629 | 2.7% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -3.987 | -4.118 | 25.3% | -4.188 | 7.2% | -4.303 | 0% | -3.68 | -3.766 | 11.4% | -3.904 | 8.5% | -3.745 | 20.8% | -3.862 | -4.139 | 13.7% | -4.064 | 14.3% | -4.264 | 5.8% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.096 | 0.087 | 6.9% | 0.101 | 5.5% | 0.098 | 25.5% | 0.048 | 0.076 | 8.9% | 0.084 | 1% | 0.072 | 1.5% | 0.053 | 0.072 | 17.5% | 0.08 | 5.3% | 0.111 | 18% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.306 | 0.305 | 5.3% | 0.299 | 4.3% | 0.307 | 12.6% | 0.284 | 0.322 | 2.3% | 0.255 | 0.3% | 0.278 | 7.4% | 0.423 | 0.28 | 0% | 0.329 | 0.6% | 0.266 | 0% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.186 | 0.19 | 5.3% | 0.173 | 0.2% | 0.187 | 10.5% | 0.189 | 0.211 | 5% | 0.217 | 5.4% | 0.227 | 0.9% | 0.142 | 0.197 | 1.2% | 0.189 | 1.4% | 0.162 | 17.4% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.065 | 0.066 | 10.2% | 0.064 | 16.1% | 0.065 | 6.7% | 0.064 | 0.067 | 5.8% | 0.063 | 8% | 0.063 | 12.1% | 0.043 | 0.096 | 0% | 0.07 | 0% | 0.059 | 0.2% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.158 | 0.155 | 9.7% | 0.158 | 13.1% | 0.163 | 1.3% | 0.217 | 0.169 | 0.3% | 0.209 | 14% | 0.202 | 3.4% | 0.16 | 0.161 | 2.1% | 0.148 | 2.4% | 0.154 | 6.1% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 2.115 | 1.604 | 0.4% | 1.638 | 0.7% | 1.804 | 0.1% | 2.115 | 1.638 | 0% | 1.65 | 0.8% | 1.756 | 0.3% | 2.115 | 1.611 | 0.4% | 1.584 | 0.9% | 1.658 | 0.8% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 10.631 | 11.06 | 2.6% | 10.878 | 2.8% | 10.93 | 0.6% | 11.688 | 11.731 | 5.3% | 12.001 | 0% | 11.684 | 9.1% | 10.098 | 11.272 | 0.3% | 11.191 | 1.2% | 10.812 | 6.8% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.155 | 0.402 | 0% | 0.35 | 0% | 0.158 | 13.4% | 0.347 | 0.399 | 1.9% | 0.369 | 22.1% | 0.358 | 22.5% | 0.38 | 0.393 | 12.6% | 0.383 | 13.2% | 0.316 | 14.5% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.1 | 0.102 | 0% | 0.1 | 4.9% | 0.078 | 0% | 0.091 | 0.091 | 7.8% | 0.091 | 11% | 0.094 | 6.8% | 0.095 | 0.094 | 9.5% | 0.095 | 17.6% | 0.108 | 3.1% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.554 | 3.576 | 5.5% | 3.555 | 10.8% | 3.545 | 1.9% | 3.632 | 3.62 | 6.6% | 3.611 | 15.1% | 3.57 | 0.5% | 3.609 | 3.609 | 0% | 3.607 | 18.3% | 3.588 | 24.6% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.012 | -0.011 | 0.1% | - | - | - | - | 0.011 | 0.013 | 12.6% | - | - | - | - | 0.004 | -0.001 | 14.5% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.003 | 0.033 | 3.8% | - | - | - | - | 0.01 | 0.013 | 11.9% | - | - | - | - | 0.003 | 0.008 | 12.6% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2005 | 0.009 | - | - | 0.008 | 22.2% | - | - | 0.028 | - | - | 0.02 | 4.4% | - | - | 0.032 | - | - | 0.027 | 14.6% | - | - | 0.035 |
| Ln(GDP p.c.) change in 2006 | 0.028 | 0.034 | 23.4% | 0.037 | 3.5% | - | - | 0.056 | 0.056 | 12.5% | 0.049 | 5.7% | - | - | 0.025 | 0.034 | 11.2% | 0.031 | 9.4% | - | - | 0.064 |
| RMSPE | | 0.0244 | | 0.0278 | | 0.0345 | | | 0.0101 | | 0.0151 | | 0.0177 | | | 0.0319 | | 0.0382 | | 0.0478 | | |

| SI | Savinjska | | | | | | | Zasavska | | | | | | | Posavska | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SI034 | | | | | | | SI035 | | | | | | | SI036 | | | | | | | |
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 8.743 | 8.757 | 23.4% | 8.629 | 7.3% | 8.887 | 4.1% | 7.019 | 8.706 | 0% | 8.016 | 2.2% | 8.451 | 0% | 7.437 | 8.428 | 1.8% | 8.507 | 0% | 7.647 | 4.7% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -3.681 | -3.91 | 9.8% | -3.951 | 9.2% | -3.82 | 14.9% | -4.019 | -4.059 | 9.2% | -4.318 | 11.6% | -4.036 | 25% | -3.8 | -4.059 | 17.3% | -4.024 | 20.3% | -4.339 | 0% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.043 | 0.066 | 5.9% | 0.07 | 1.1% | 0.09 | 0.1% | 0.031 | 0.043 | 16.4% | 0.089 | 5.2% | 0.059 | 11.4% | 0.079 | 0.082 | 17.4% | 0.072 | 10% | 0.102 | 5.6% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.38 | 0.363 | 2.6% | 0.362 | 2.3% | 0.35 | 1.4% | 0.411 | 0.305 | 0.7% | 0.307 | 0% | 0.379 | 6.2% | 0.414 | 0.345 | 0.5% | 0.347 | 1.1% | 0.27 | 0% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.183 | 0.199 | 3.7% | 0.195 | 11% | 0.185 | 44.5% | 0.133 | 0.218 | 3% | 0.172 | 15.8% | 0.202 | 0.8% | 0.157 | 0.188 | 0% | 0.199 | 0% | 0.213 | 0.1% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.081 | 0.079 | 10.7% | 0.079 | 12.6% | 0.08 | 19.1% | 0.066 | 0.101 | 0% | 0.067 | 4.6% | 0.066 | 15% | 0.059 | 0.081 | 0% | 0.078 | 0% | 0.06 | 42.5% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.153 | 0.136 | 0.7% | 0.137 | 0.7% | 0.14 | 0.1% | 0.179 | 0.161 | 4.2% | 0.147 | 2.9% | 0.128 | 0% | 0.14 | 0.137 | 15.2% | 0.141 | 9.3% | 0.152 | 1.8% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 2.115 | 1.499 | 1.3% | 1.517 | 2.4% | 1.565 | 1.6% | 2.115 | 1.482 | 5.2% | 1.43 | 0.9% | 1.508 | 0% | 2.115 | 1.446 | 1.1% | 1.529 | 0.2% | 1.853 | 2.3% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.448 | 11.652 | 2.5% | 11.571 | 6.1% | 11.617 | 0.1% | 9.747 | 11.742 | 0.5% | 11.234 | 1.8% | 11.367 | 2.2% | 10.223 | 11.425 | 1.4% | 11.476 | 1.1% | 10.991 | 0.1% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.324 | 0.399 | 1.8% | 0.401 | 1.4% | 0.328 | 13.8% | 0.568 | 0.543 | 26.5% | 0.485 | 6.5% | 0.556 | 23.3% | 0.179 | 0.384 | 0% | 0.345 | 2.3% | 0.197 | 20.9% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.083 | 0.088 | 5.4% | 0.087 | 8.3% | 0.111 | 0.1% | 0.05 | 0.092 | 0% | 0.09 | 2.3% | 0.07 | 3.2% | 0.079 | 0.083 | 5.8% | 0.084 | 8.9% | 0.071 | 0.3% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.641 | 3.637 | 3% | 3.638 | 13.7% | 3.527 | 0.1% | 3.715 | 3.709 | 16% | 3.67 | 16.2% | 3.677 | 12.9% | 3.633 | 3.632 | 5% | 3.624 | 15% | 3.622 | 21.6% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.008 | 0.002 | 7.6% | - | - | - | - | 0.025 | -0.005 | 1.9% | - | - | - | - | 0.004 | -0.003 | 10.4% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.016 | 0.017 | 8.8% | - | - | - | - | -0.016 | -0.003 | 9.3% | - | - | - | - | -0.039 | -0.019 | 6.5% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2005 | 0.034 | - | - | 0.032 | 5% | - | - | 0.035 | - | - | 0.029 | 11.2% | - | - | 0.052 | - | - | 0.046 | 18% | - | - | 0.035 |
| Ln(GDP p.c.) change in 2006 | 0.031 | 0.037 | 13% | 0.035 | 19% | - | - | 0.019 | 0.038 | 7% | 0.025 | 18.9% | - | - | 0.028 | 0.036 | 17.6% | 0.034 | 13.7% | - | - | 0.064 |
| RMSPE | | 0.0091 | | 0.0082 | | 0.0179 | | | 0.0365 | | 0.0496 | | 0.0554 | | | 0.0235 | | 0.0235 | | 0.0389 | | |

| SI | Jugovzhodna Slovenija SI037 | | | | | | | Primorsko-notranjska SI038 | | | | | | | Osrednjeslovenska SI041 | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 8.125 | 8.271 | 22.7% | 8.202 | 25.5% | 8.8 | 0% | 6.989 | 7.498 | 14.7% | 8.137 | 0% | 8.119 | 3.9% | 9.911 | 10.426 | 0.2% | 10.416 | 0,0% | 9.981 | 17.8% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -3.703 | -3.988 | 15.8% | -4.03 | 9% | -3.722 | 38.1% | -3.827 | -4.963 | 0% | -4.351 | 0.2% | -4.455 | 2.8% | -3.16 | -3.256 | 36.3% | -3.26 | 32,0% | -3.407 | 16.7% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.075 | 0.076 | 9.1% | 0.075 | 9.7% | 0.072 | 12.5% | 0.1 | 0.135 | 6.3% | 0.086 | 6.5% | 0.094 | 11.5% | 0.018 | 0.011 | 7.9% | 0.011 | 12.8% | 0.022 | 19,0% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.419 | 0.36 | 0% | 0.356 | 0% | 0.331 | 0.3% | 0.312 | 0.195 | 0,0% | 0.306 | 21.3% | 0.297 | 10.1% | 0.232 | 0.18 | 0.1% | 0.185 | 0.1% | 0.218 | 5.6% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.14 | 0.187 | 3.3% | 0.184 | 2.3% | 0.223 | 0.8% | 0.192 | 0.234 | 3.4% | 0.192 | 10.8% | 0.195 | 11.4% | 0.232 | 0.362 | 0,0% | 0.364 | 0,0% | 0.342 | 0.1% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.075 | 0.074 | 25.2% | 0.074 | 20.8% | 0.073 | 24.8% | 0.082 | 0.076 | 9% | 0.081 | 27.4% | 0.073 | 1.7% | 0.055 | 0.063 | 8.5% | 0.062 | 5.6% | 0.06 | 4.5% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.133 | 0.138 | 0.3% | 0.135 | 1.7% | 0.138 | 14.4% | 0.162 | 0.168 | 8.8% | 0.149 | 3.4% | 0.153 | 7.8% | 0.231 | 0.248 | 0,0% | 0.244 | 0.4% | 0.223 | 3.7% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 2.115 | 1.612 | 0.5% | 1.624 | 0.3% | 1.782 | 3.1% | 2.115 | 1.4 | 2.7% | 1.728 | 3.9% | 1.689 | 8.1% | 2.651 | 1.994 | 15.6% | 1.992 | 14.3% | 2.006 | 15.3% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 10.854 | 11.205 | 0% | 11.164 | 1.4% | 11.607 | 0.8% | 9.901 | 11.352 | 0.8% | 11.455 | 0% | 11.465 | 0% | 12.144 | 12.546 | 0,0% | 12.511 | 0,0% | 12.202 | 5.7% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.194 | 0.413 | 0% | 0.45 | 0% | 0.407 | 0.3% | 0.287 | 0.464 | 0% | 0.38 | 1.9% | 0.385 | 4.5% | 0.51 | 0.726 | 0,0% | 0.718 | 0,0% | 0.625 | 0.3% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.093 | 0.09 | 6.5% | 0.085 | 1.5% | 0.107 | 0.2% | 0.065 | 0.072 | 2.9% | 0.076 | 3.4% | 0.072 | 15.2% | 0.083 | 0.125 | 0.7% | 0.126 | 1.1% | 0.127 | 0.3% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.648 | 3.614 | 7.1% | 3.622 | 6.7% | 3.626 | 4.6% | 3.789 | 3.756 | 22.9% | 3.734 | 2.7% | 3.762 | 22.8% | 3.574 | 3.606 | 12.3% | 3.605 | 12,0% | 3.594 | 11.1% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.022 | -0.01 | 0.3% | - | - | - | - | 0.004 | 0.015 | 12.7% | - | - | - | - | 0.05 | 0.049 | 6.5% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.022 | 0.025 | 6.8% | - | - | - | - | 0.004 | 0.017 | 5.1% | - | - | - | - | 0.063 | 0.025 | 0.9% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2005 | 0.007 | - | - | 0.005 | 9.6% | - | - | 0.005 | - | - | 0.006 | 15.6% | - | - | 0.031 | - | - | 0.034 | 13.3% | - | - | 0.035 |
| Ln(GDP p.c.) change in 2006 | 0.072 | 0.06 | 2.5% | 0.071 | 11.5% | - | - | 0.038 | 0.044 | 10.7% | 0.046 | 2.8% | - | - | 0.062 | 0.06 | 10.8% | 0.061 | 8.3% | - | - | 0.064 |
| RMSPE | | 0.0309 | | 0.0312 | | 0.0339 | | | 0.0255 | | 0.0338 | | 0.0346 | | | 0.0287 | | 0.0288 | | 0.0310 | | |

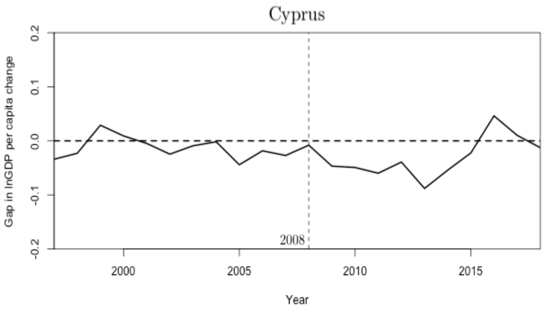
| SI | Gorenjska SI042 | | | | | | | Goriska SI043 | | | | | | | Obalno-kraska SI044 | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 8.414 | 8.712 | 6.1% | 8.448 | 6.4% | 8.385 | 6.9% | 7.867 | 7.991 | 22.4% | 7.963 | 9.8% | 7.991 | 7.4% | 8.322 | 10.35 | 0% | 10.548 | 0% | 10.468 | 0% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -3.768 | -3.923 | 8.7% | -4.28 | 0% | -4.149 | 1.6% | -3.819 | -4.468 | 0% | -4.398 | 1.5% | -4.432 | 1.6% | -3.224 | -3.228 | 37.8% | -3.24 | 21.8% | -3.232 | 34% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.034 | 0.045 | 13.3% | 0.059 | 13.6% | 0.058 | 27.7% | 0.051 | 0.074 | 10.8% | 0.089 | 8.4% | 0.091 | 4.2% | 0.027 | 0.021 | 0.5% | 0.009 | 7.2% | 0.011 | 11.8% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.377 | 0.372 | 8.3% | 0.327 | 0.6% | 0.363 | 7.3% | 0.305 | 0.251 | 0% | 0.287 | 0% | 0.299 | 8% | 0.182 | 0.183 | 0% | 0.182 | 9.2% | 0.176 | 9.1% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.22 | 0.216 | 10% | 0.22 | 10.5% | 0.212 | 1.2% | 0.175 | 0.199 | 10.4% | 0.19 | 10.8% | 0.187 | 10.2% | 0.35 | 0.346 | 6% | 0.345 | 19.5% | 0.345 | 20.4% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.051 | 0.083 | 0% | 0.057 | 4.3% | 0.054 | 14.4% | 0.085 | 0.1 | 0% | 0.084 | 23.1% | 0.083 | 19.2% | 0.08 | 0.063 | 0% | 0.078 | 9.5% | 0.079 | 9.8% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.166 | 0.135 | 0% | 0.168 | 7.9% | 0.162 | 10.4% | 0.155 | 0.178 | 0% | 0.157 | 10.1% | 0.153 | 7.4% | 0.168 | 0.237 | 0% | 0.241 | 0% | 0.239 | 0.1% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 2.651 | 1.533 | 0% | 1.823 | 2.4% | 1.92 | 3.4% | 2.651 | 1.75 | 9.3% | 1.762 | 3.6% | 1.707 | 4.3% | 2.651 | 1.908 | 0% | 1.808 | 0.6% | 1.838 | 0.9% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 11.164 | 11.612 | 0.1% | 11.693 | 0% | 11.526 | 1.9% | 10.738 | 11.476 | 0% | 11.315 | 2.3% | 11.339 | 2% | 10.771 | 12.485 | 0% | 12.759 | 0% | 12.688 | 0% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.389 | 0.511 | 0% | 0.413 | 6.2% | 0.395 | 21.7% | 0.277 | 0.419 | 0% | 0.321 | 3.1% | 0.333 | 6.1% | 0.439 | 0.709 | 0.2% | 0.825 | 0% | 0.808 | 0% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.069 | 0.09 | 1.2% | 0.071 | 24.8% | 0.089 | 2.1% | 0.069 | 0.084 | 5.4% | 0.077 | 8.1% | 0.074 | 24.8% | 0.086 | 0.109 | 0.4% | 0.087 | 13.7% | 0.087 | 13.9% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.647 | 3.649 | 7.8% | 3.642 | 14.3% | 3.603 | 1.4% | 3.818 | 3.718 | 4.6% | 3.686 | 3.1% | 3.706 | 4.8% | 3.781 | 3.662 | 0.1% | 3.696 | 0.7% | 3.709 | 0% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.006 | -0.001 | 9.1% | - | - | - | - | 0.063 | 0.054 | 14.1% | - | - | - | - | 0.039 | 0.04 | 12.2% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.021 | 0.023 | 13.8% | - | - | - | - | 0.013 | 0.021 | 10% | - | - | - | - | 0.029 | 0.029 | 42.3% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2005 | 0.008 | - | - | 0.01 | 8.1% | - | - | 0.025 | - | - | 0.023 | 6.6% | - | - | 0.018 | - | - | - | - | - | - | 0.035 |
| Ln(GDP p.c.) change in 2006 | 0.029 | 0.029 | 21.5% | 0.049 | 0.9% | - | - | 0.04 | 0.048 | 12.9% | 0.044 | 9.4% | - | - | 0.058 | 0.054 | 0.4% | 0.054 | 16.7% | - | - | 0.064 |
| RMSPE | | 0.0113 | | 0.0260 | | 0.0307 | | | 0.0247 | | 0.0306 | | 0.0313 | | | 0.0514 | | 0.0545 | | 0.0570 | | |

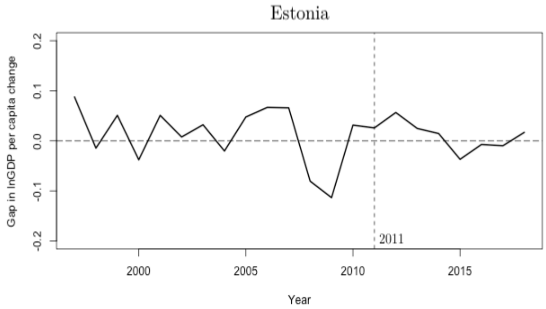
| SK | Bratislavsky kraj | | | | | | | Trnavsky kraj | | | | | | | Trenciansky kraj | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SK010 | | | | | | | SK021 | | | | | | | SK022 | | | | | | | |
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | pool |
| Ln(Capital Stock) in 1998 | 10.154 | 9.622 | 0.1% | 10.127 | 8.2% | 10.186 | 8.5% | 9.125 | 8.436 | 0.1% | 9.02 | 5.6% | 9.091 | 18.9% | 9.154 | 9.096 | 10.4% | 9.139 | 33.2% | 9.109 | 20.9% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -3.13 | -3.68 | 1.8% | -3.507 | 8.7% | -3.349 | 13.4% | -4.094 | -4.521 | 1.5% | -4.096 | 9.2% | -4.074 | 7.5% | -4.171 | -4.128 | 0.4% | -4.162 | 15% | -4.134 | 9% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.02 | 0.045 | 3.2% | 0.03 | 7.4% | 0.032 | 10.1% | 0.078 | 0.102 | 0.5% | 0.075 | 18.8% | 0.077 | 24.2% | 0.042 | 0.098 | 0% | 0.048 | 6.7% | 0.046 | 23.2% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.194 | 0.216 | 5.7% | 0.223 | 3% | 0.243 | 0% | 0.348 | 0.349 | 3.5% | 0.346 | 11.2% | 0.346 | 8.7% | 0.367 | 0.338 | 0.5% | 0.37 | 3.1% | 0.37 | 8.5% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.308 | 0.291 | 1.7% | 0.313 | 8.6% | 0.305 | 7.6% | 0.236 | 0.208 | 0.2% | 0.235 | 12.9% | 0.235 | 10.7% | 0.186 | 0.188 | 20.3% | 0.194 | 3.5% | 0.196 | 9.4% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.05 | 0.068 | 2.5% | 0.064 | 2.8% | 0.059 | 10.2% | 0.075 | 0.074 | 25.7% | 0.074 | 1.9% | 0.074 | 5.1% | 0.068 | 0.069 | 5.5% | 0.069 | 0.5% | 0.069 | 2.3% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.222 | 0.225 | 10% | 0.225 | 9.2% | 0.221 | 9.2% | 0.146 | 0.131 | 0.5% | 0.147 | 1.4% | 0.136 | 0,0% | 0.165 | 0.161 | 5.7% | 0.156 | 0.4% | 0.163 | 8.3% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 1.973 | 1.788 | 14.1% | 1.759 | 13.8% | 1.751 | 13.4% | 1.3 | 1.193 | 8.8% | 1.309 | 3.1% | 1.293 | 7.1% | 1.3 | 0.984 | 0.1% | 1.294 | 9.4% | 1.269 | 6.5% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 12.288 | 12.27 | 15.2% | 12.572 | 6.6% | 12.475 | 10.8% | 11.99 | 11.886 | 8.1% | 12.008 | 11.4% | 12.01 | 8.3% | 12.12 | 12.061 | 0.2% | 12.131 | 9.7% | 12.145 | 7% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.793 | 0.538 | 0.1% | 0.718 | 10.3% | 0.666 | 6.2% | 0.433 | 0.447 | 24% | 0.575 | 0% | 0.435 | 9.2% | 0.544 | 0.472 | 0.1% | 0.549 | 1.4% | 0.502 | 2.1% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.072 | 0.084 | 9.2% | 0.093 | 3.4% | 0.085 | 6.6% | 0.068 | 0.076 | 2.6% | 0.07 | 14.7% | 0.083 | 0.4% | 0.058 | 0.097 | 0% | 0.074 | 0.1% | 0.082 | 0.3% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.437 | 3.556 | 2.7% | 3.557 | 6.5% | 3.587 | 3.9% | 3.473 | 3.582 | 0.6% | 3.587 | 0.1% | 3.525 | 0% | 3.479 | 3.557 | 0.4% | 3.589 | 0% | 3.505 | 2.6% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.019 | 0.017 | 7.5% | - | - | - | - | 0.002 | 0.002 | 18.7% | - | - | - | - | 0.028 | 0.028 | 4.4% | | | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.008 | 0.049 | 4.1% | - | - | - | - | 0.068 | 0.066 | 1% | - | - | - | - | 0.032 | 0.032 | 25.5% | | | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.027 | 0.034 | 22.2% | - | - | - | - | 0.2 | 0.162 | 4.2% | - | - | - | - | 0.126 | 0.125 | 26.5% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2007 | 0.103 | - | - | 0.104 | 8.6% | - | - | 0.069 | - | - | 0.07 | 8.9% | - | - | 0.07 | | | 0.069 | 6.8% | | | 0.08 |
| Ln(GDP p.c.) change in 2008 | 0.016 | - | - | 0.035 | 2.9% | - | - | -0.018 | - | - | -0.001 | 0.7% | - | - | 0.014 | - | - | 0.013 | 10.1% | - | - | 0.051 |
| RMSPE | | 0.0277 | | 0.0327 | | 0.0336 | | | 0.0378 | | 0.0364 | | 0.0480 | | | 0.0301 | | 0.0312 | | 0.0360 | | |

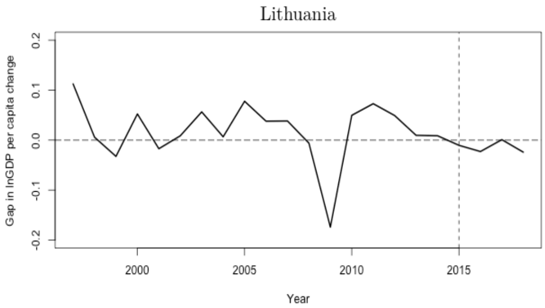
| SK | Nitriansky kraj | | | | | | | Zilinsky kraj | | | | | | | Banskobystricky kraj | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SK023 | | | | | | | SK031 | | | | | | | SK032 | | | | | | | |
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | pool |
| Ln(Capital Stock) in 1998 | 9.164 | 9.098 | 3.8% | 9.11 | 31.4% | 9.096 | 18,0% | 9.229 | 9.198 | 17.8% | 9.043 | 2.8% | 9.04 | 0.7% | 9.19 | 8.601 | 0% | 9.062 | 11.1% | 8.584 | 0% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -4.321 | -4.3 | 3.4% | -4.289 | 14.1% | -4.251 | 4% | -4.221 | -4.214 | 6.4% | -4.24 | 5% | -4.23 | 8.3% | -4.223 | -4.66 | 0% | -4.207 | 8.2% | -4.596 | 0% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.091 | 0.089 | 7.2% | 0.082 | 6.4% | 0.088 | 23.5% | 0.045 | 0.046 | 12.7% | 0.048 | 20.2% | 0.047 | 12.5% | 0.072 | 0.077 | 7.7% | 0.101 | 0.2% | 0.074 | 9.8% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.332 | 0.331 | 11.1% | 0.324 | 3.1% | 0.326 | 8.9% | 0.306 | 0.284 | 0% | 0.288 | 0.1% | 0.303 | 3.7% | 0.258 | 0.278 | 0.2% | 0.261 | 6.8% | 0.265 | 0% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.228 | 0.211 | 0.1% | 0.222 | 3.1% | 0.224 | 8.9% | 0.263 | 0.263 | 4.6% | 0.251 | 0.1% | 0.251 | 0.8% | 0.286 | 0.272 | 6.7% | 0.245 | 0.5% | 0.281 | 8.8% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.081 | 0.081 | 10.4% | 0.078 | 3% | 0.075 | 12% | 0.087 | 0.082 | 0.7% | 0.086 | 12.1% | 0.086 | 15% | 0.068 | 0.068 | 7.4% | 0.069 | 12.8% | 0.068 | 9.1% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.139 | 0.139 | 7% | 0.134 | 0.7% | 0.13 | 0.3% | 0.149 | 0.15 | 5.9% | 0.15 | 9.9% | 0.149 | 14.8% | 0.15 | 0.151 | 9.7% | 0.153 | 8% | 0.151 | 19.9% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 1.3 | 1.3 | 10.1% | 1.289 | 9% | 1.28 | 16.6% | 1296 | 1307 | 5.6% | 1.453 | 0% | 1.477 | 0.2% | 1296 | 1292 | 14.2% | 1.312 | 3.8% | 1.294 | 33.5% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 12.28 | 12.297 | 3.3% | 12.327 | 9.1% | 12.31 | 6.9% | 12.17 | 12.19 | 9.5% | 12.186 | 9.9% | 12.173 | 17.9% | 12.247 | 12.208 | 3.1% | 12.277 | 14.4% | 12.11 | 0.3% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.431 | 0.431 | 13.2% | 0.469 | 1.6% | 0.44 | 8.4% | 0.466 | 0.468 | 14.4% | 0.476 | 11.5% | 0.47 | 19.2% | 0.528 | 0.547 | 13.5% | 0.538 | 4.9% | 0.575 | 2.1% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.05 | 0.081 | 0.1% | 0.061 | 2% | 0.058 | 3.2% | 0.067 | 0.105 | 0.2% | 0.068 | 19.1% | 0.069 | 6.7% | 0.042 | 0.049 | 10.8% | 0.047 | 8.9% | 0.044 | 16.6% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.505 | 3.508 | 2.2% | 3.583 | 0.2% | 3.659 | 0% | 3.471 | 3.476 | 9.2% | 3.499 | 0.9% | 3.526 | 0.2% | 3.533 | 3.613 | 0.4% | 3.669 | 0.1% | 3.647 | 0% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.017 | 0.017 | 13.8% | | | - | - | 0.029 | 0.029 | 7% | - | - | - | - | 0.026 | 0.024 | 11% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.053 | 0.053 | 6.7% | | | - | - | 0.006 | 0.018 | 1.3% | - | - | - | - | 0.023 | 0.029 | 6.5% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | 0.035 | 0.035 | 7.7% | - | - | - | - | 0.046 | 0.048 | 4.6% | - | - | - | - | 0.079 | 0.078 | 8.9% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2007 | 0.056 | | | 0.057 | 6.6% | | | 0.116 | - | - | 0.106 | 0.2% | - | - | 0.089 | - | - | 0.057 | 0% | - | - | 0.08 |
| Ln(GDP p.c.) change in 2008 | 0.051 | - | - | 0.051 | 9.7% | - | - | 0.072 | - | - | 0.072 | 8.1% | - | - | 0.053 | - | - | 0.054 | 20.3% | - | - | 0.051 |
| RMSPE | | 0.0198 | | 0.0713 | | 0.0233 | | | 0,0254 | | 0,0272 | | 0,0284 | | | 0,0468 | | 0,0440 | | 0,0487 | | |

| SK | Presovsky kraj SK032 | | | | | | | Kosicky kraj SK042 | | | | | | | Average of donor pool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | Treated | Synth_1 | Weight_1 | Synth_2 | Weight_2 | Synth_3 | Weight_3 | |
| Ln(Capital Stock) in 1998 | 9.093 | 9.052 | 25.8% | 9.055 | 33.1% | 9.059 | 22.3% | 9447 | 9.356 | 12.3% | 9.43 | 31.9% | 9.433 | 17.8% | 8.209 |
| Ln(Capital Stock p.c.) in 1998 | -4.482 | -4.392 | 2.5% | -4.447 | 14.8% | -4.45 | 9.6% | -4.11 | -4.126 | 8.7% | -4.103 | 14.9% | -4.097 | 3.1% | -4.07 |
| Share Agricultural. Forestry. Fishing GVA in tot GVA in 1998 | 0.074 | 0.075 | 8.3% | 0.075 | 6.6% | 0.074 | 26.7% | 0.045 | 0.046 | 5.4% | 0.045 | 6.4% | 0.043 | 3.8% | 0.124 |
| Share Industry GVA in tot GVA in 1998 | 0.244 | 0.249 | 2.6% | 0.253 | 3.1% | 0.245 | 10.2% | 0.272 | 0.28 | 10.9% | 0.276 | 2.1% | 0.275 | 1.2% | 0.268 |
| Share Trade GVA in tot GVA in 1998 | 0.266 | 0.262 | 2.4% | 0.267 | 3.1% | 0.266 | 11.2% | 0.29 | 0.285 | 0.7% | 0.288 | 2.2% | 0.29 | 18.8% | 0.22 |
| Share Construction GVA in tot GVA in 1998 | 0.083 | 0.086 | 0% | 0.083 | 0.7% | 0.083 | 2.8% | 0.086 | 0.086 | 5.4% | 0.083 | 0.1% | 0.086 | 9.1% | 0.068 |
| Share Financial&Business GVA in tot GVA in 1998 | 0.138 | 0.145 | 1.2% | 0.145 | 1.2% | 0.14 | 2.4% | 0.129 | 0.136 | 9.4% | 0.141 | 0.7% | 0.138 | 0.5% | 0.154 |
| Compensation of employees in Trade sector in 1998 | 1319 | 1337 | 6.9% | 1.305 | 9.2% | 1.312 | 6.5% | 1319 | 1.561 | 0% | 1.321 | 8.9% | 1.318 | 10.1% | 1.044 |
| Ln(Number of Dwellings per square-km) in 2000 | 12206 | 12.212 | 40.2% | 12.237 | 9.8% | 12.231 | 6.4% | 12.3 | 12.266 | 3.8% | 12.313 | 10.9% | 12.303 | 20.6% | 11.827 |
| Share of Dwellings with 3 flats in total Dwelling in 2000 | 0.49 | 0.484 | 5.9% | 0.538 | 0.2% | 0.496 | 1.7% | 0.575 | 0.504 | 0% | 0.567 | 3.1% | 0.574 | 6.4% | 0.431 |
| Share of Dwellings built between 1991 and 2000 in tot 2000 | 0.068 | 0.099 | 0% | 0.075 | 1.8% | 0.089 | 0.2% | 0.053 | 0.116 | 0.1% | 0.124 | 0% | 0.12 | 0% | 0.088 |
| Ln(Average Age of Dwellings) in 2000 | 3.419 | 3.468 | 1.2% | 3.573 | 0% | 3.53 | 0% | 3.471 | 3.486 | 4.4% | 3.481 | 1.8% | 3.471 | 8.8% | 3.568 |
| Ln(GDP p.c.) change in 1998 | 0.002 | 0.013 | 1.6% | - | - | - | - | 0.047 | 0.051 | 5.4% | - | - | - | - | 0.022 |
| Ln(GDP p.c.) change in 2003 | 0.006 | 0.042 | 0.4% | - | - | - | - | 0.009 | 0.011 | 33.5% | - | - | - | - | 0.058 |
| Ln(GDP p.c.) change in 2006 | -0.018 | 0.028 | 1.1% | - | - | - | - | 0.059 | 0.052 | 0% | - | - | - | - | 0.064 |
| Ln(GDP p.c.) change in 2007 | 0.091 | - | - | 0.092 | 6.7% | - | - | 0.064 | - | - | 0.066 | 7.5% | - | - | 0.08 |
| Ln(GDP p.c.) change in 2008 | 0.107 | - | - | 0.107 | 9.9% | - | - | 0.035 | - | - | 0.034 | 9.5% | - | - | 0.051 |
| RMSPE | | 0,0309 | | 0,0361 | | 0,0324 | | | 0,0214 | | 0,0210 | | 0,0277 | | |

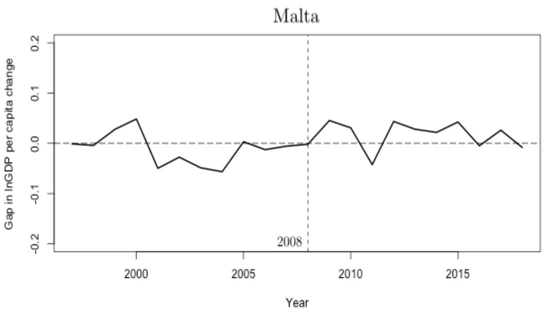
# Appendix 2

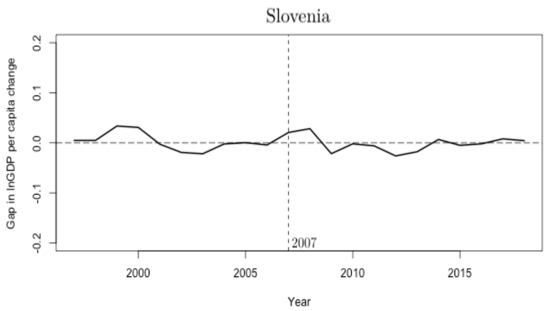

Cyprus
Gap in lnGDP per capita change
Year
2008
-0.2 -0.1 0.0 0.1 0.2
2000 2005 2010 2015

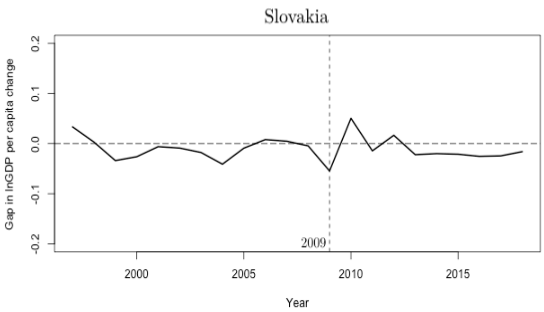

Estonia
Gap in lnGDP per capita change
Year
2011
-0.2 -0.1 0.0 0.1 0.2
2000 2005 2010 2015


Lithuania
Gap in lnGDP per capita change
Year
-0.2 -0.1 0.0 0.1 0.2
2000 2005 2010 2015

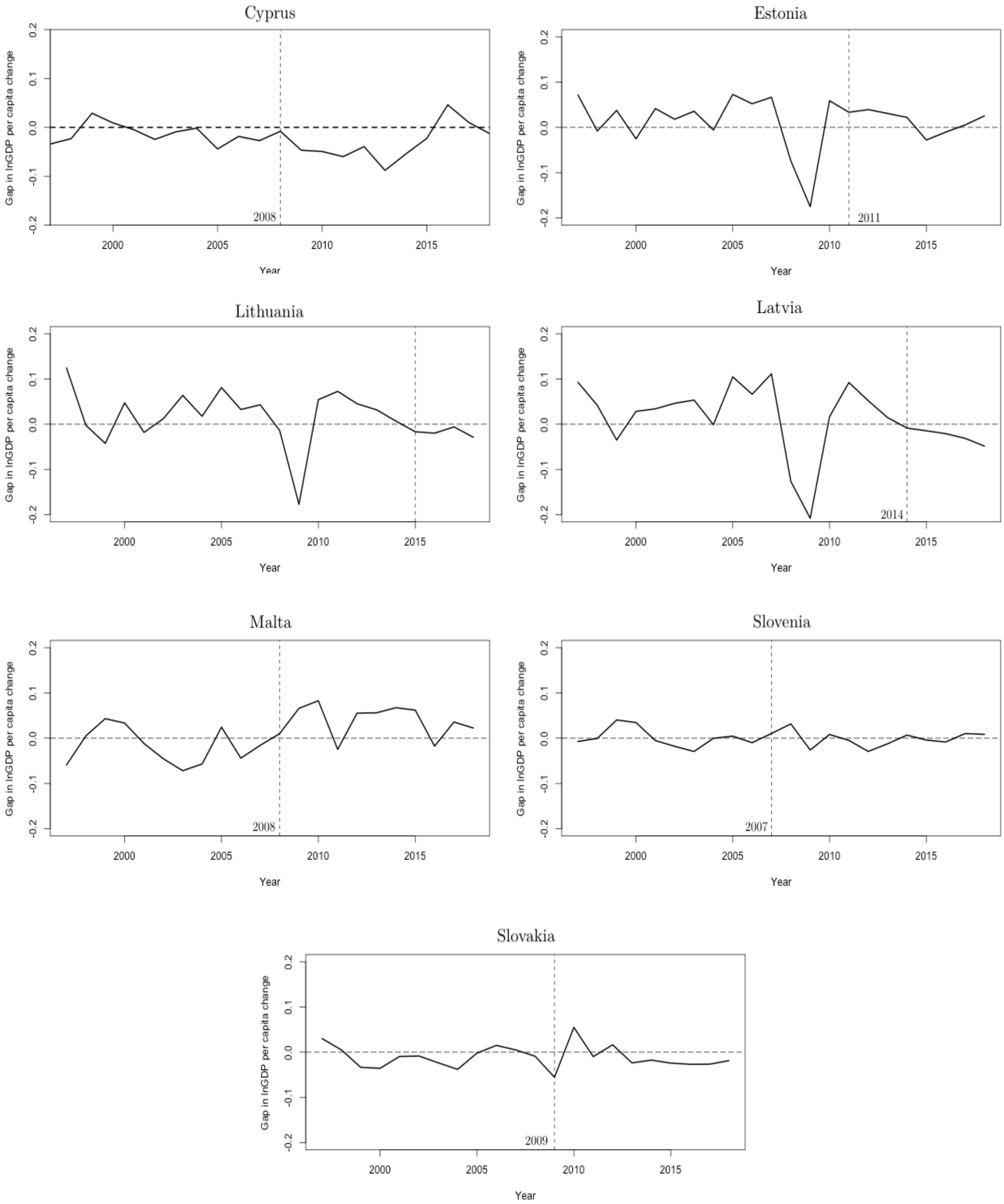

Latvia
Gap in lnGDP per capita change
Year
2014
-0.2 -0.1 0.0 0.1 0.2
2000 2005 2010 2015


Malta
Gap in lnGDP per capita change
Year
2008
-0.2 -0.1 0.0 0.1 0.2
2000 2005 2010 2015


Slovenia
Gap in lnGDP per capita change
Year
2007
-0.2 -0.1 0.0 0.1 0.2
2000 2005 2010 2015


Slovakia
Gap in lnGDP per capita change
Year
2009
-0.2 -0.1 0.0 0.1 0.2
2000 2005 2010 2015

# Appendix 3


Cyprus
Estonia
Lithuania
Latvia
Malta
Slovenia
Slovakia
Gap in lnGDP per capita change
Year
0.2
0.1
0.0
-0.1
-0.2
2000
2005
2010
2015
2008
2011
2014
2007
2009

Herewith, I confirm that I have written the thesis to be found above independently and without help from another party. I have not used any material or sources apart from those which have been indicated on the list of references- All internet sources are enclosed in digital form on the data storage medium. Furthermore, I confirm that I have not submitted this thesis to any previous examination procedure and that the submitted printed version is identical to the electronic version submitted.

Lisa Fadelli