**Integration induced economic growth: The case of North Macedonia's integration in the European Union**


## Abstract

This paper examines the integration induced economic impacts to North Macedonia had it been accessed to the European Union in 2004. Through the application of the Synthetic Control Method, I find that the North Macedonia would have experienced an average of 6.85% higher YOY growth over a period of 20 years. In achieving a more holistic overview of the economy and associated industry trends the same methodology is applied at NUTS0 sectoral levels. Overall, I find a positive trend from EU integration on labour productivity except for 'Industry', and a high likelihood of North Macedonia having a comparative advantage and specialising in labour intensive industries



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## Introduction

The past few decades have observed a world that is continuously becoming more integrated. Until recently empirics on the extent to which economic integration impacts countries have been largely indecisive – countries have nevertheless always striven to cooperate internationally in generating better living conditions. While international trade theory suggests that countries generally seem to benefit from free trade, in some outlier instances this appears to not be the case. As such many small preferential trade agreements and customs unions are appearing in Eastern Europe, albeit, the European Union has long established its role as the most stable and efficient union. One's prospects to its accession provide free trade, foreign investment (FDI), financial flows, as well as the adoption of common policies and regulations in facilitating the movement of goods, capital, and labour. Recent estimates indicate that EU accession strongly benefited most EU countries, however, heterogeneity is present from country to country, with some countries experiencing negative effects (Campos et al., 2019).

The aim of this paper is to estimate the potential economic impacts in the accession of North Macedonia to the EU in terms of per capita GDP and Labour Productivity. Furthermore, investigation is conducted on the sector level, using NUTS0 data - in an attempt to analyse the increases in productivity across sectors. The estimation's viability is with the help of the synthetic control method (or 'synthetic control method for causal inference in comparative case studies') formerly pioneered by Abadie and Gardeazabal (2003) and subsequently refined by Abadie et al. (2010, 2015). Moreover, this paper follows the methodological approach used by Campos et al. (2019). Generally, the synthetic control method (SCM) is used to estimate the impact of a treatment (policy) observed on a single observational unit, by using a control donor pool. This study for the first time reverses the roles of this method, where the units that have experienced the treatment (EU accession) are used in the donor pool (in estimating the synthetic observation), whereas the unit of actual observation has received no treatment.

In the estimation of dividends from EU membership, this paper aims to address the two following questions. What would have the per capita income and labour productivity been, had North Macedonia joined the EU in 2004? Are the potential impacts on the sector level productivity negative or positive?

To estimate the synthetic counterfactual of North Macedonia, data from countries of the 2004 and 2007 accessions are used. The timing of the 2007 accession is normalised to the time of the 2004 accession. This is done due to the 2004 donor pool limitation for the purposes of estimating a synthetic observation for a small economy such as North Macedonia. Furthermore, in regard to geographic proximity (which impacts trade flows), as well as other economic indicators, Bulgaria (2007 accession) seems to be the closest economy to North Macedonia.

The issues of timing should be addressed in estimating treatment period (Campos et al., 2019, p. 89). The former refers to the fact that economic agents have expected the entry of the candidate countries and potentially used it as an arbitrage opportunity. This is likely the case for the 2004 and 2007 accessions due to the increased complexity of institutional alignments and prerequisites, compared to previous accessions, which increased the window of anticipation. This suggests that the effects would have taken before the accession. The latter has to do with EU as a dummy variable which does not fully represent the different levels of integration that a country can take. In the EU pre-accession period, countries undergo systematic institutional change, in many it is a gradual process of integration, where trade agreement are made before the actual accession. Nevertheless, through placebo tests, the best fitting model is estimated to support this framework. Penultimately, it should be noted that the series used steps over the 2008 Financial Crisis period where a significant economic slowdown is observed. While one could think this obstructs the significance the to the results; it does not present a significant problem to this study as its goal is not to analyse the general dividends from EU membership, but to see what trajectory North Macedonia's economy would have followed had it been accessed to the union. One could argue that contrary to the aim of this paper, a crisis of such magnitude is problematic in approximating what the potential

benefits of EU membership would be if North Macedonia achieves accession in the future. But then again, if we have concluded anything about certainty from the heterogenous economic environment in the past century it is that: 'certainty is an uncertain concept'.

Without further ado this paper is structured as follows. Section 2 explains the historical origin of integration and why it is important for developing countries. In section 3 the literature on EU benefits as well as relevant intergration studies for North Macedonia is presented. Sections 3 and 4 include methodology, data and sample, while 5-6 present the relevant results for per capita GDP and Labour Productivity. In section 6 sectoral level data is applied to analyse the potential benefits of EU integration in industries. Finally, sections 7 and 8 are discussion and conclusion.

**Integration induced economic growth: brief theoretical background**

The idea of integration induced economic growth has been uncontested in the literature of economic thought. Building on Jan Tinbergen's (1954) ideas on the importance of both political and economic institutions, Balassa (1961) conceptualises the idea of "depth" in the integration literature. Thus, in this paper depth refers to the various degrees of integration spanning from preferential trade arrangements to full-fledged economic unions, while widening concerns the expansions that involve the inclusion of additional countries (Lawrence, 1996).

The channels through which integration impacts growth are proportionate to the degree of depth. Campos et al. identify three main explanations through which integration could impact productivity and growth: trade, institutions and technology; while noting that these can intersect (2019, p. 2). Moreover, the literature is split on whether institutions, or trade, act as the primary mechanism through which integration impacts growth with scholars finding robust estimates on both sides. It should be noted that integration can be discriminatory and therefore, there is likely to be heterogeneity across countries in terms of these mechanisms. This is the case for both members and non-members, with the latter facing possible trade

hindrances due to trade diversion, while smaller countries within the EU can experience restrictions on aid (Campos et al., 2022, p. 3). As such, the impact that integration has on growth is associated with the size of the joining country. Small countries tend to achieve greater relative growth from EU membership (Comerford et al., 2019), partly explained by factor price equalisation in the process of convergence when an autarky opens up to trade. Some studies indicate that trade liberalisation promotes growth through investment in fixed capital (Levine and Renelt (1992); Baldwin and Seghezza (1996)). Yet it is difficult to distinguish whether this is enabled through trade liberalisation, or the improvement in institutional quality.

The institutional argument is among other factors grounded on the improvement in rule of law, more specifically property rights, implemented through a fair and unbiased judiciary. Douglass North (1990) argues that institutions quality limits uncertainty, thus lowering transaction costs, contributing to better economic performance. Others argue that institutions trump everything else in explaining economic growth (Rodrik et al., 2004). They also limit rent-seeking by delegating to the supranational institutions in the decision-making of economic activity. Schöndelder and Helmut (2019) find that institutional convergence occurs in the pre-accession period, with no further improvements after the country becomes a member. Although one would think that these channels' returns would tend to diminish, there is no certainty that this is the case.

The argument on technology stems from labour productivity improvements associated with the diffusion of knowledge, and investments in R&D. Technology has an important role in labour productivity, often times being a decisive factor in obtaining a comparative advantage. This is, however, subject to the assumption that the two countries have similar fixed factors of production and produce the same goods. Another argument is that integration generates technological pressures through competition by revealing performance on the different sectors across countries at any given time (Campos et al., 2022, p.3).

Ultimately, the link between growth and integration is, and likely will remain a controversy. While the literature produces diverging results, this is a direct consequence of the nature of

links that these studies aim to estimate. In other words, the drawbacks of cross-country analysis is the difficulty of control for varying effects, and the fact that some of the proposed channels are intricate to gauge and interpret makes this even more difficult.

**EU integration and the North Macedonian economy: An empirical review**

Starting as an effort to integrate the coal and steel industries, the European Economic Community has evolved into a highly prosperous integration alliance, widely recognised for its expansion across Europe and the promotion of trade openness, alignment of policies and financial security. The deepening of EU integration meant that technologies and human capital could more easily spread across the continent, generating substantial increases in productivity and economic growth. Although academics have long attached conclusive arguments on the positive impact of EU integration, it was not until recently that this assertion was supported by empiric evidence. An in-depth review table can be found after the conclusion - before the Appendix, empirically summarising the major findings in the literature this paper focuses on.

Henrekson et al. (1997) find a 0.6 to 0.8 percent yearly benefit from EU integration and no difference caused between the depth of integration (EU or EFTA). Besides the results being statistically insignificant, Campos et al. (2022) estimate opposing results about the depth of integration associated with full-fledged and EFTA membership. This is also in line with the literature on the channels through which EU integration affects growth, most but not all the benefits of EU membership come from trade liberalisation (Baldwin and Seghezza, 1996; Slaughter, 2001; Billmeier and Nannicini, 2013).

Lejour et al. (2009)[a] estimate a 27% increase in trade between two EU countries, and a 23 percent added increase in trade, under the condition that institutions improve, in line with the literature on institutional channels being central to economic growth (Acemoglu et al., 2001). An issue that could potentially hinder their results is that the measure of EU integration cannot captured by a dummy variable in such short sample timeframe (1996-2000). This could mean that the results are potentially deflated by the countries that recently joined the EU.

Badinger's (2005) analysis indicates a 20% difference in per capita GDP caused by EU integration, while Crespo et al. (2008) suggest that the average dividends stemming from membership are irrelevant as cross-country heterogeneity is large, with smaller countries experiencing larger benefits. Among others in the literature, the two papers rely on statistically insignificant results, stemming from the inappropriate methodology.

Until recently the ability to attach significance to results has been constrained by such methodological difficulties. Campos et al. (2019) overcome this challenge, by utilising the synthetic control method**,** producing robust results on the implications of EU membership. This in not only due the SCM's ability to construct a synthetic country through assigning weights to a number of different countries, but also because it allows for satisfactory sensitivity analysis to be carried out by researcher. Results suggest an estimated average gap of 12% increase in per capita GDP with high heterogeneity between countries, especially between the Eastern and Northern/Southern enlargements.

Last but not least, on the labour productivity side, Campos et al. (2022) find significant EU induced dividends on the sectoral level using regional data for Norway implementing synthetic-difference-in-differences method. They find that the industry and construction sectors lag behind compared to the synthetic observation, yet these results appear to be significant for 10 out of the 19 regions.

Finally, the literature on North Macedonia regarding the impact of EU integration is severely lacking, to say the least. There are no direct studies available on this matter. Disoska et al. (2018, 2022) conduct an analysis of Foreign Direct Investment (FDI) in North Macedonia and the factors that influence it. Similar to Simionescu's(2018) findings on Romania, they discovered that FDI is greatly affected by the trade-to-economy ratio and the GDP of North Macedonia. As such there is a significant dearth of research on this topic beyond papers focused on international trade utilizing gravity models – thus the objective of this paper is to address this research gap.

**Methodology**

To answer the questions proposed in this paper the synthetic control for causal inference in comparative studies is used. Campos et al. (2019) build on the framework developed by Abadie and Gardeazabal (2003), which this paper makes use of it.

The synthetic control method builds upon the methodological framework of difference-in-differences (DID). Difference-in-differences methods compare changes in an outcome variable over two periods of time: pre-intervention and post-intervention, and two groups: treatment and control. In the post-treatment period, the treatment group experiences the intervention, while the control group does not, which allows the researcher to estimate the effects of the treatment on the treated unit (O'Neil et al., 2016). The difference in the outcome variable in the pre-intervention period is used as a baseline in comparing the differences observed in the post-intervention period. The main idea behind the DID is that the outcome variable would have evolved similarly in both groups in the absence of intervention. The SCM applies the same reasoning, with the main advantage over DID laying in the goodness of fit of the control unit used for comparison between the two units (countries). It conceptualises a weighted combination of countries chosen to resemble the characteristics of the treated country (in this case the control country). For this purpose, predictor variables are used in the pre-accession period to estimate a vector of non-negative weights summing up to one, making up the treated unit (artificial observation). In other words, in the construction of the artificial observation (i.e., country), instead of assigning full weight to one country closesy resembling North Macedonia, SCM uses the predictors of economic growth in the pre-intervention to assign positive weights to multiple countries (Athey and Imbens, 2017, p. 9).

Let J be number of available control units (the 13 other countries except for North Macedonia ($J_1$)), and vector $\boldsymbol{W} = \omega_2 + \omega_3 + \omega_4 \ldots \omega_J = 1$, making sure that $\omega_j \geq 0$ . The integer $\varpi_J$ represents the weight of country J in the artificial observation. As previously said, various values of country weights $\varpi_J$ are chosen with the goal of the artificial country $\boldsymbol{W}$ obtaining close resemblance to North Macedonia, that is before $\boldsymbol{W}$ receives the treatment of EU accession.

Let $\mathbf{X_1}$ be a (K x 1) vector of pre-EU accession values of I economic growth predictors for North Macedonia, and $\mathbf{X_0}$ a (K x J) matrix with the same predictors for J donor pool of countries. It is important that the predictors are themselves not affected by the intervention. The synth control in Stata chooses the vector of weights **W*** to minimise some distance $(\boldsymbol{X_1} - \boldsymbol{X_0}\,\boldsymbol{W})'\boldsymbol{V}(\boldsymbol{X_1} - \boldsymbol{X_0}\mathbf{W})$, between $\mathbf{X_1}$ and $\mathbf{X_0}$ in some pre-intervention period $T_0$, where $\boldsymbol{V}$ is a diagonal matrix whose elements are weights that reflect the importance of the different predictor variables in $\mathbf{X_1}$ and $\mathbf{X_0}$. The unit $J_{2\ldots14}$ (donor pool) is exposed to the treatment in the post-intervention period $T_1$. Furthermore, the set of predictors used in vectors $\mathbf{X_0}$ and $\mathbf{X_1}$ are used to predict outcome (Z) in the preintervention period so that:

$$\sum_{n=2}^{J+1} w_n^* Z_i = Z_1 \qquad \text{and} \qquad \sum_{n=2}^{J+1} w_n^* Y_{it} = Y_{1T} \qquad \text{for t} < \text{T}_0$$

Therefore, in the postintervention period t (where $t \geq T_0$) the effect of EU intervention is:

$$\alpha_{it} = Y_{it}^N - \sum_{n=2}^{J+1} w_n^* Y_{it}^C \qquad \text{for all t} \geq \text{T}_0$$

Where $Y_{it}^N$ is North Macedonia's outcome *i* at time *t*, and $Y_{it}^C$ is the synthetic observation of North Macedonia's outcome *i*, assigning combination of optimal weights ($w_n^*$) from donor pool $J_{2\ldots14}$ at time *t*, that has been treated for the EU integration. The estimated induced gap caused by EU integration is $\alpha_{it}$.

In the application of the SCM it is important to restrict the donor pool to units with outcomes that are determined by the same structural process as the unit of interest (Abadie et al., 2015, p. 497). If structural shocks are present in the outcome variable, or potential effects of the treatment are present in the control unit ($Y_{it}^N$) the estimates could be biased. In the case of North Macedonia, there is a potential concern about a treatment taking effect in the country that needs further investigation. This stems from the fact that North Macedonia became an EU membership candidate in 2005. There could be potential idiosyncratic shocks in the outcome variables used for North Macedonia, however, it is highly unlikely that any effects would have taken place. Another concern and challenge when applying this method

has to do with the timing of the EU intervention. Although the countries in the donor pool technically joined the EU in 2004, most of the effects had taken place in the led up to the accession. Such effects include the change in institutional framework that countries undergo under the Copenhagen criteria, coupled with early free trade agreements. Nevertheless, such concerns will be addressed, and tested where possible, in the subsequent sections.

**Data**

The SCM model is estimated for two outcome variables ($Z_{it}$): per capita GDP and per person employed PPP (constant 2017 international $). In line with Abadie's (2021) suggestions, the choice of economic growth predictors (K) used is: gross fixed capital formation (% of GDP), population growth (%), the share of agriculture, forestry and fishing in value added, share of industry (including construction) in value-added, and finally gross secondary and tertiary school enrolment. All of the variables come from the World Bank – World Development indicators. As the SCM is reliant on the pre-intervention period to estimate the synthetic observation, the series is maximised to the earliest data available (1992). Some countries had missing observations for the outcome variables, which is mandatory for estimating the SCM in Stata. Thus, these missing observations, some of which required further computing, were extracted from IMF and PWT 10.0. Moreover, the donor pool comprising the accession countries of 2004 would not be sufficient in estimating a good fit for North Macedonia, thus the time for the 2007 and 2013 accession of Croatia is normalised to produce a better a better synthetic observation. Insufficiencies could be present in the estimated gap of the intervention because the convex combination of donor countries is not suitable to approximate a synthetic outcome for North Macedonia. It being a small country can be argued that the economic indexes are insignificant compared to other countries. While this can be said for the outcome variables (particularly relevant with per capita GDP), it is not the case with the predictor variables. The nature of the predictors (K) chosen, in vectors $\mathbf{X_1}$ and $\mathbf{X_0}$, is accordance with the literature, so that the exponential growth of larger economies is not encapsulated in the estimation of the synthetic control. Although it can be the case that

emerging economies achieve larger relative growth (%) rates than large ones, in absolute terms growth is exponential in large countries. overfitting of the outcome variable also be a problem

**Results for GDP per capita**

Figure 1 reports the baseline results for North Macedonia joining the EU in 2004 in terms of per capita GDP. As expected, for the synthetic observation appropriate weights for multiple countries are presented so as to closely replicate North Macedonia in terms of the per capita GDP in the pre-accession period. The weight of countries includes Bulgaria (0.692) and Romania (0.308). Meaning that artificial observation is composed of 60.5% Bulgaria and 39.5% Romania. In accordance with these weights, Figure 1 presents the results of the synthetic and actual observations visually, where the dashed line represents the synthetic, whereas the continuous line represents the observed per capita GDP for North Macedonia.

It is evident that certain factors influencing growth cannot be replicated with absolute precision in the pre-accession period. Specifically, during the pre-intervention period in the 1990's North Macedonia is a small country with a presenting the smallest outcome variable values compared to the donor pool countries. As such, a convex combination of countries

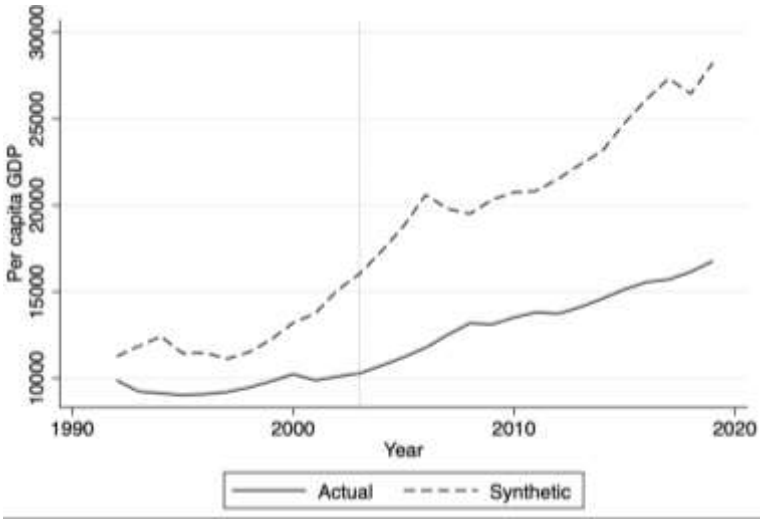



**Figure 1.** Actual vs synthetic observation – per capita GDP (PPP 2017 international dollar)
Note: The dashed line presents the synthetic country, while the straight is the actual observation (i.e., North Macedonia) trends in terms of GDP per capita. Results of the composition of donors and predictors in the synthetic is reported in the Appendix.

that joined the EU in 2007 and 2004 does not perfectly reproduce North Macedonia's economic outcome (per capita GDP) before the accession. It is evident that the SCM could have used a higher ratio of Latvia to make a better fitting observation in terms of the outcome variable (per capita GDP), in return sacrificing the goodness of fit in terms of economic predictors used in matrices $\mathbf{X_1}$ and $\mathbf{X_0}$. In economic terms this will mean that visually and numerically the synthetic observation will match North Macedonia better in the pre-accession period in terms of per capita GDP, however, this will cause spurious results in the post-accession period due the mismatch of economic predictors between the synthetic and actual. With that said, North Macedonia is likely to closely match the economies in terms of geographic proximity, as well as size (population and geographical borders). Therefore, the estimation of Bulgaria and Romania are reasonable.

With that said, the benefits from EU membership observed in the Figure 1 seem to be large. The actual and synthetic series indicate similar trends of relative growth in the pre-accession period, with significant disparities appearing in the beginning of first few years in the century. As previously mentioned findings indicate, it is not strange a disparity can be seen in the pre intervention. In other words, the institutional channel of EU membership seems to

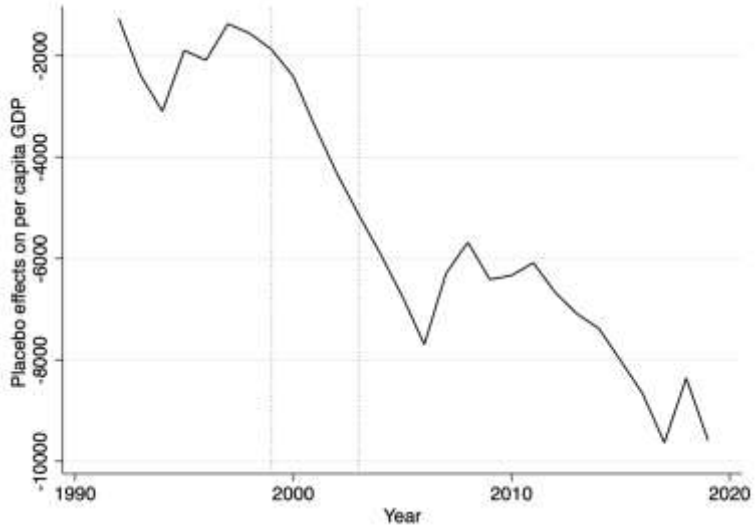



**Figure 2.** Treatment effects anticipated accession of 2000 (left horizontal dotted line) vs actual accession of 2004 (right dotted line)
Note: Differently to the previous graph, this one indicates the difference between the actual and synthetic observation (i.e. effect) induced by EU integration. Further tests are done for the anticipation in year 1999 and 1998, all of which are included in the Appendix.

work in the few years before the country gets accessed for Eastern European countries, in order to meet the Copenhagen criteria. Additionally, it is possible that economic agents have also anticipated this entry, following the signal for the enlargement by the EU To counter this, Campos et al. (2019) use 1998 to re-estimate their results, albeit, as in this case estimates are only done for North Macedonia, adjustments need to be made accordingly.

To do so, a placebo test is conducted in analysing the optimal year that can comprehensively encapsulate the full effects, including those that take place in the pre-accession period. Figure 2 indicates that the expected impact of the treatment begins to manifest during the pre-accession time frame, more specifically starting in 1998. Nevertheless, significant impacts start to kick in after year 2000. It should be noted that the two countries used in the synthetic observation are Bulgaria and Romania, for which the time has been normalised from 2007 to 2004. The European Council in Copenhagen in 2002(1999 normalised time) gave a signal that 2007(2004 normalised) could be a potential year when these two countries could be accessed to the EU (Hubbard and Hubbard, 2008, p. 9). As the placebo tests indicate, this signal had a substantial impact on per capita GDP, possibly

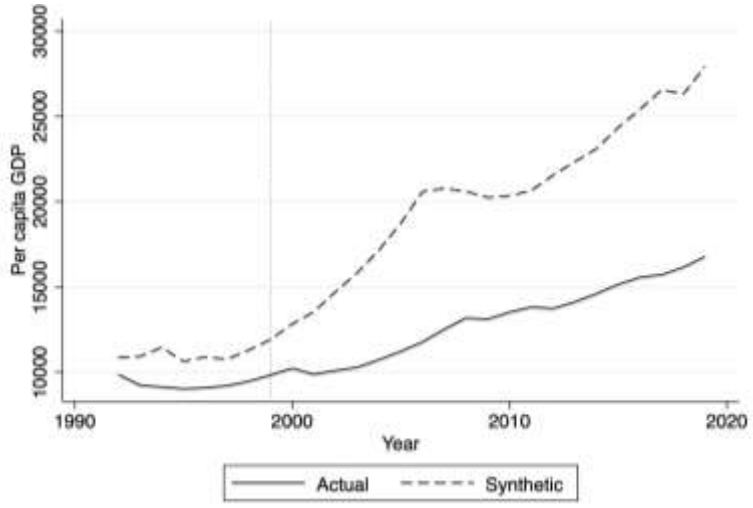
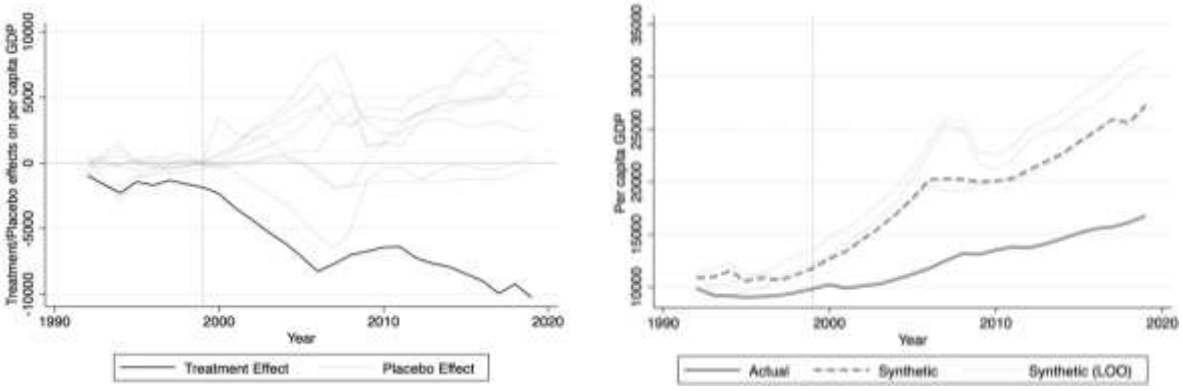



**Figure 3.** Re-estimation of results – GDP per capita, using 2000 as the year of accession
Note: The dashed line presents the synthetic country, while the straight is the actual observation (i.e., North Macedonia) trends in terms of GDP per capita (constant 2017 dollars). Results of the composition of donors and predictors in the synthetic is reported in the Appendix.

through FDI, as economic actors may have foreseen the accession of these countries to the EU. Figure 3 re-estimates the results using the newly proposed date of treatment. As the years over which the predictors are averaged change, different weights of countries are obtained.[1] The newly established estimates include a positive weight for Latvia. Moreover, the corresponding weights for each country are: 55.2% Bulgaria, 20.8% Romania, and 24% Latvia. The trends in Figure 3 seem to correspond to the ones in Figure 2, though there seems to be an improvement in the goodness of fit in the pre-accession period. Again, a substantial increase in per capita GDP can be seen over the years. The percentage difference between the average synthetic and the actual observation in the post-accession period is 54.2%. Applying a deflation term to account for the inefficiency of data in obtaining a perfect fit for the synthetic observation, a gap of 30.65% is obtained.[2] This is in line with the results obtained by Campos et al. (2019), who estimate a gap of around 30% for the Baltic countries, whose




(a) In-space placebo test (b) Loo Robustness Test

**Figure 4.** Robustness tests for main estimates (2000 anticipation).
Note: Graph (a) estimates fake non-treatment effect to different units of the donor pool presented by the grey lines, while the black line the actual estimated treatment. The test in graph (b) iteratively leaves each country out of the estimation, each time presented by the grey lines, while the estimated synthetic with every country is the striped line; the continuous line is the actual observation for North Macedonia.

[1] The weights used in matrixes $\boldsymbol{X_0}$ *(*countries) and $\boldsymbol{V}$ *(predictors)* are presented in the Appendix
[2] The deflation term is calculated using the average difference between the synthetic and the actual observation in the pre-accession period, further details can be found in the Appendix

economies are somewhat similar to North Macedonia in terms of per capita GDP. Furthermore, over the post-accession period, an average of 7.09% difference in growth is observed between the synthetic and actual observations in relative terms.

Ultimately, sensitivity analysis is conducted to probe the robustness of the results obtained. In-space placebo and leave-one-out tests are carried out for the year 2000 anticipation estimates. Figure 4a presents the estimations for the in-space placebo test. The test applies fake (non)treatment to the units in the donor pool that have already undergone EU membership treatment.[3] The test applies the SCM to countries in the donor pool instead of North Macedonia. As such the test establishes whether the donor countries' SCM estimations (grey lines) are able to produce as large of a magnitude in the gap between the synthetic and actual of North Macedonia (Abadie et al., 2010). As seen in Figure 4a the treatment effect for North Macedonia deviates from the donor samples, suggesting that the results are relatively robust. Furthermore, it should be noted that one would want to use a larger and random sample of donor countries to attach absolute robustness to the results. However, in the case of this study it is not possible as the number of countries joining the EU at the same period that are relatively similar in GDP per capita to North Macedonia is limited.

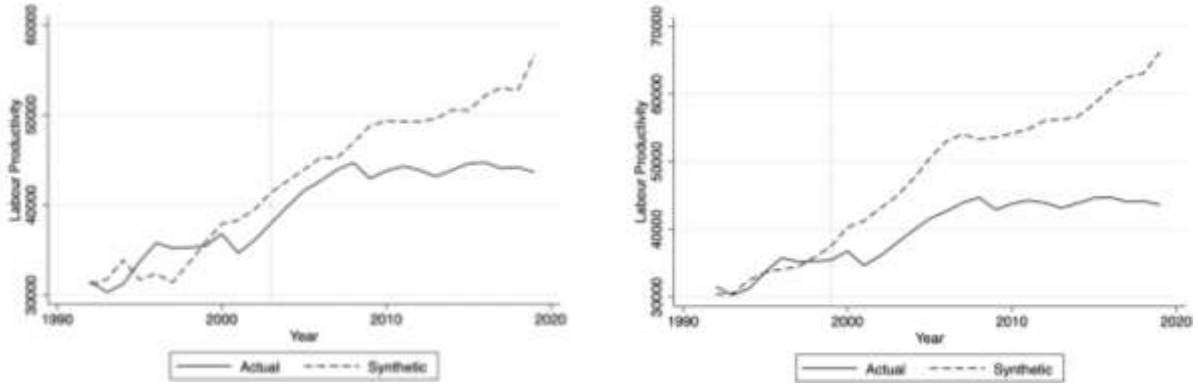
On the other hand, the leave-one-out robustness test re-estimates the synthetic observation, while leaving each county out in each iteration. This allows to establish whether the weight of a certain country in the synthetic observation could have potentially undergone an idiosyncratic shock, thus biased the estimated synthetic observation upwards or downwards. Figure 4b presents the results from the test, where in each of the grey lines a weight of the non-zero countries comprising the artificial country is subtracted. The striped line is the synthetic observation including all weights of the countries, while the continuous is the actual. The premise of the test is that if one of the grey lines presents abnormally in relation to the others it is suggested that idiosyncratic shocks have occurred in it. Given the results, it can be said that for none of the donor countries abnormality is observed. Furthermore, it is

[3] Non – treatment refers to the fact that the treatment and control groups are switched in this study, thus the placebo considers the donor countries as if they had not received any treatment from EU membership.

apparent that the synthetic observation is driven by one of the countries more than the others, namely Bulgaria. Yet this is no bias to the synthetic estimate, as Bulgaria is given the largest proportion of weight in its composition.

**Results for Labour Productivity**

On the labour productivity side, the results are identical, with difference in the composition of the synthetic country. Intuitively this does not come as surprise as the (un)employment rate in the countries of the donor pool will naturally be heterogenous. Contrary to GDP per capita, the measurement of labour productivity permits the SCM to obtain a better fit in terms of the outcome variable, as a convex combination of weighted countries is satisfactory in reproducing an artificial country that will match the actual in the pre-accession period. By the same token, the composition of countries in the artificial observation includes positive weights for different countries, namely Latvia, Cyprus, Romania and




(a) 2004 Estimates (b) 2000 Anticipation Estimates

**Figure 5.** Labour productivity actual vs synthetic series (PPP 2017 international dollar)
Note: The dashed line presents the synthetic country, while the straight is the actual observation (i.e., North Macedonia) trends in terms of labour productivity (constant 2017 dollars). Results of the composition of donors and predictors in the synthetic is reported in the Appendix.

Hungary.[4] Given the countries' weights, the synthetic versus actual series are presented in Figure 5. As observed, the anticipation year (2000) makes a significant difference when it comes to labour productivity. Yet comparing to per capita GDP, the average induced gap of EU integration is lower in terms of labour productivity. An observed 26.83% effect on labour productivity from integration is obtained by computing the percentage difference between the average synthetic and average actual observations over the period. Unlike the need to use a deflation term for GDP per capita, a good pre-accession fit allows for uninflated measurements. In relative terms, the average yearly growth of labour productivity over the post-accession period seems to be lower than per capita GDP by 5.17% (with 1.72%).

An in-space placebo test seems to be ineffective in terms of labour productivity.[5] This is the case because most of the countries in the donor pool exhibit an MSPE (mean square prediction error) larger than 2 times of North Macedonia in the pre-accession period. This is the chosen cut-off point in making sure that the results are robust. As such it allows the placebo test to neglect the units that could present a bad fit in the pre-accession period, thus making

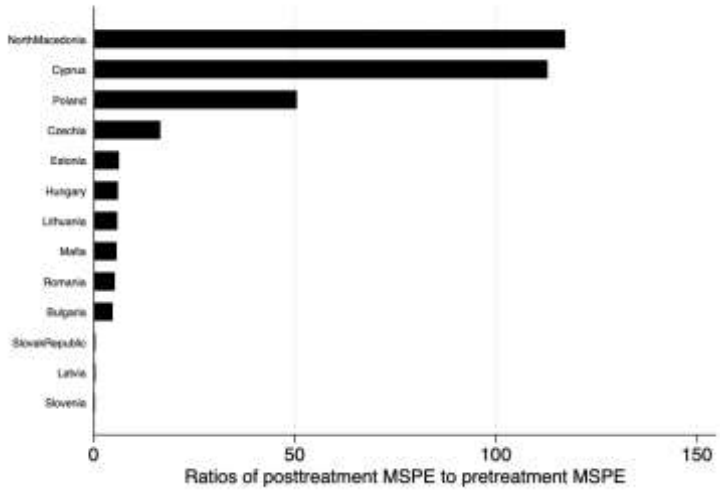



**Figure 6.** Labour productivity ratios of pre/post treatment MSPE for all countries

the test unreliable. However, as this case study does not allow an extension of the sample with random donors, as previously stated, one can examine the post/pre MSPE ratios to

[4] Weights from here on can be found in the Appendix
[5] Figure provided in Appendix.

establish the significance of the treatment effects. If the post/pre MSPE ratio for the unit undergoing treatment is unusually large relative to the placebo distribution of this ratio, then one can be more confident that the average effects of the treatment are significant (Abadie et al., 2010, p, 503). Figure 6 displays the values of pre/post MSPE ratios from the in-space placebo test. The reported estimates suggest that the probability (p-value) of obtaining a post/pre MSPE ratio as large as North Macedonia is the largest out of all of the countries in the sample. More specifically, North Macedonia exhibits a ratio of 172.2. As this measure allows the maximisation of donor in the pool to establish significance, the p-value obtained from this measure is 1/13 = 0.0769. Although this value is above the desirable level of 5% commonly used in statistical analysis, it is statistically significant at the 10% significance level. While it falls short of the accepted level in statistical inference studies, given the difficulties posed by the sample and the nature of this study it is acceptable. Finally, the concern that the estimates are driven by the specific composition of the synthetic control is addressed in Figure 7. As no unusual trend is observed between the estimated synthetic control and the 3 grey series where the SCM reiteratively assigns a zero weight for one of the units comprising the

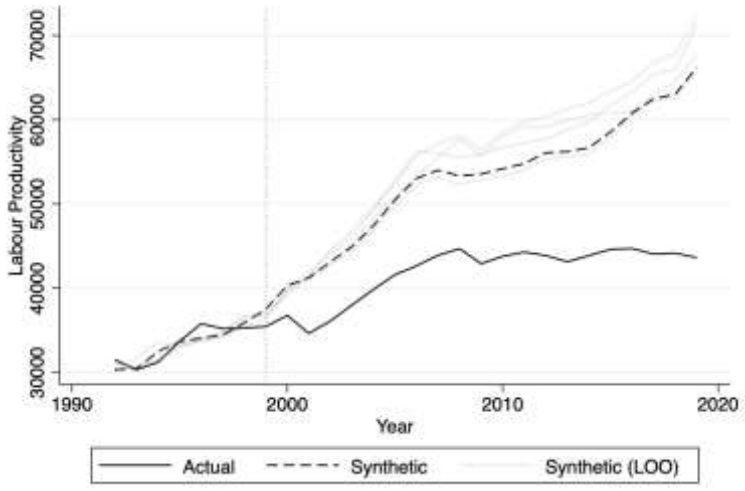



**Figure 7.** Leave-one-out robustness test for Labour Productivity
Note: The test iteratively leaves each country out of the estimation, each time presented by the grey lines, while the estimated synthetic with every country is the striped line; the continuous line is the actual observation for North Macedonia.

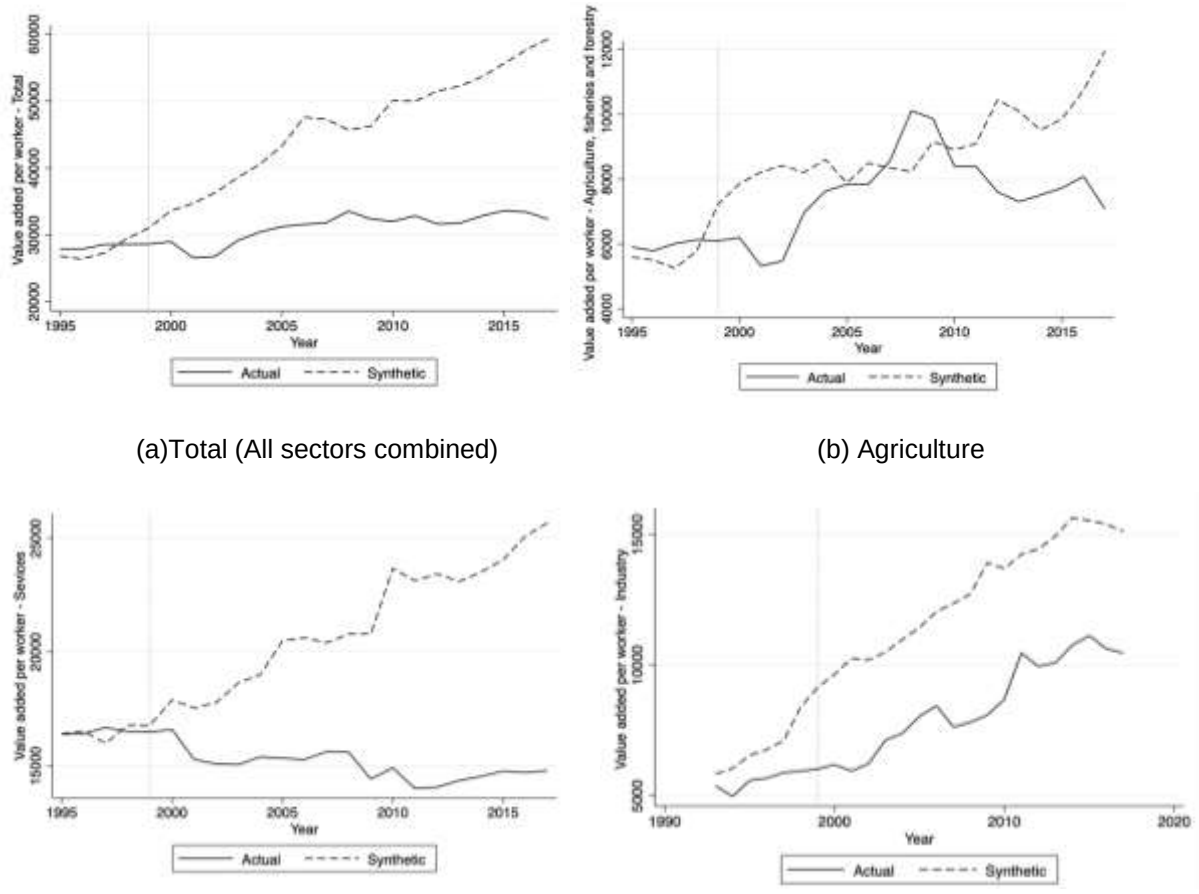
synthetic observation, it can be concluded that the estimation for labour productivity is robust vis-a-vis potential idiosyncratic shocks in the donor units.

**Sectoral level analysis**

This section is an attempt to dissect the EU induced integration gap on sectoral levels. The methodology and data sources in analysing sectoral level remains the same, however, additional outcome (Value added, VA per worker) and predictor variables (gross fixed capital formation over gross value added) are deployed in the anlysis. Again, data exclusively from World Bank Development Indicators is used. For the outcome variable net value added per worker is used, while predictors are gross fixed capital formation over value added, population growth and density, secondary and tertiary education. Furthermore, the sectors (ISIC revision 4) analysed are: A (1-3): Agriculture, forestry and fishing; B-F (5-43): Industry including construction; G-U(45-99): Services. Estimations are also done for all of the sectors combined (Total (A-U), (1-99)).

All estimations are done on NUTS0 (i.e., country) level due to the limitations of data and the scope of this study permit. For outcome variables, where available, value added per worker is used, although in an attempt to further understand the mechanisms through which EU integration impacts economic activity, the manufacturing sector is dissected into several industries, using net value added (due to the lack of data). The industries that are individually analysed in the manufacturing sector (ISIC sub-divisions rev. 4) are: (10-12) Food, Beverages and Tobacco; (28-30): Machinery and transport equipment; (13-15): Textiles and clothing. Manufacturing sub-sector of 'industry' is chosen to be analysed more in-depth because a high share of the countries' exports stem from manufacturing goods. For instance, the textile industry's share in GDP in 2019 was 13%, as well as it represented 10% of total exports in the country (Zezova et al., 2020). Another significant contributor to the North Macedonian economy is food, drinks and tobacco as well as pharmaceuticals all of which can be found under the manufacturing sub-sector within 'industry' (Srbinoski et al., 2022, p. 7158). In the case of the former three, data allows to further explore these as outcome variables, however,

this is not the case for pharmaceuticals. A key assumption here is that the North Macedonia continues to export the same goods after accession. Yet, a small country such as North Macedonia is likely to specialise in the production of the good in which it has comparative advantage in. Therefore, it is not likely that it will have a comparative advantage in an industry that it lags in compared to other countries. This is explained by factors such as dynamic increasing returns to scale which is directly correlated to the skill capacity of the labour force. As such it is likely that its production of goods remains within the boundaries of its current production, at least in the short term. Finally, it should be noted that since no sufficient data is available to control for the variance between industries, the results are reliant on the indices that measure the sectors as a whole. This is a severe limitation to this exercise, as the synthetic control is not able to accurately assign weights to countries in the donor pool.




(a)Total (All sectors combined)

(b) Agriculture

(c) Services

(d) Industry

**Figure 8.** Sectoral level estimations: value added per worker (2015 constant $)

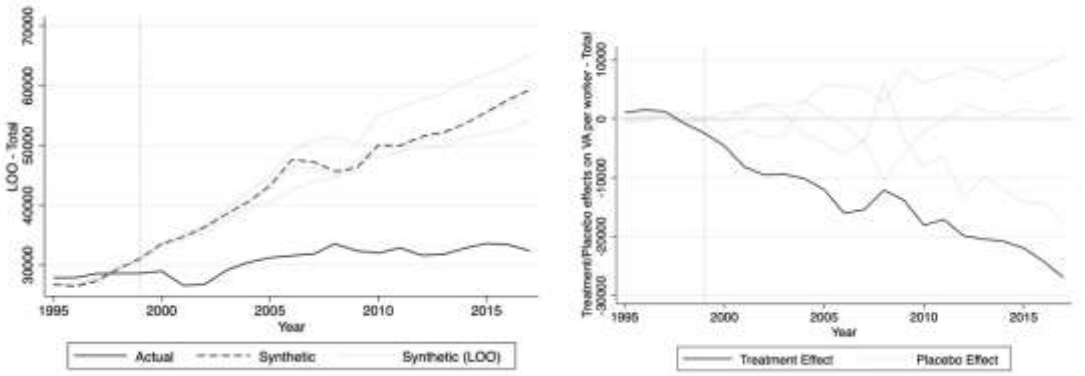
Note: The dashed line presents the synthetic country, while the straight is the actual observation (i.e., North Macedonia) trends in terms of labour productivity (constant 2015 dollars) for each respective sector. Results of the composition of donors and predictors in the synthetic is reported in the Appendix.

When it comes to time, unlike the previous estimations where the series begin in 1992, here the data is more limited, thus where subject to limitations 1995 is used as the starting year in the pre-intervention period. Notably, this will have an impact on the goodness of fit of the synthetic control, but this is taken as is because extrapolating data from other databases could cause inconsistencies in measures and could cause further biases.

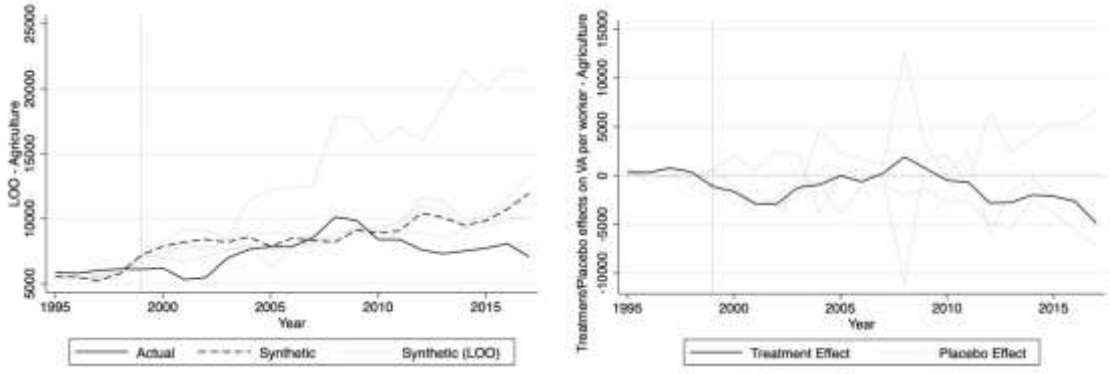
Without further ado, starting with estimations from on sectors, Figure 8 presents the actual and synthetic series for the sectors. At first glance the figure for Services seems the most significant and perfectly fitted (at least visually) in this exercise. On the other hand, as it was the case for per capita GDP, there is a mismatch between the synthetic and actual countries in the results for “Industry including construction”. As previously mentioned, this is the case because a convex combination of countries in the sample is not sufficient in producing a synthetic for North Macedonia. Overall, the trend suggests an inflated estimated average effect over the post-accession period of 51.7% for Industry. However, looking at the relative average difference of growth over the 17-year post-accession period between the artificial and actual country, the trend suggests higher growth for North Macedonia by 0.66% in terms of value added per worker. Thus this leads one to believe that in the case that the synthetic control for North Macedonia produced a good fit, the estimated average induced gap effect of integration would have likely been negative. In other words, North Macedonia would have been worse off by joining the EU in terms of labour productivity in industry including construction as a whole. However, because the sector ‘industry including construction’ is broad, it is further dissected into manufacturing, and subsequently three industries.

On the other hand, in terms of Agriculture it seems as though there are no significant benefits in labour productivity coming from EU integration, however, this is not the case. The average induced gap effect between the synthetic and the actual observation over the post-accession period is 21.83%. Here the impact of the Great Recession of 2007 can be seen to have significant implications. Therefore, it presents a good case of analysis in regard to integration. It can be seen that over the 3 years that it took for European donor countries to recover, North Macedonia outperformed the synthetic country by 9.46%, which points toward

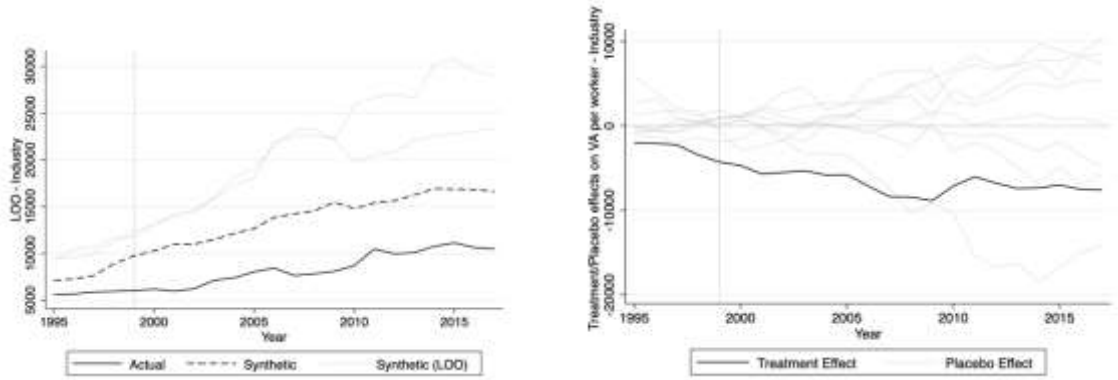
effects of trade diversion - economic agents' anticipations could have taken place due the potential entry of North Macedonia to the EU. It is viable, however, that North Macedonia had reserves of wheat or other agricultural products of the likes with a long shelf life. Penultimately, EU accession has the largest positive effect on labour productivity in terms of 'Services' on the sectoral levels. An astounding average gap of 43.6% can be seen between the synthetic and actual outcome in post-accession timeline, with a good pre-accession fit. Finally, the estimations for all the sectors combined (total) are robust and significant. It can be found that the on average the induced gap over the post-accession period is 49.21%, with one of the best goodness of fits in the pre-accession period from all of the estimations done on a sectoral level.



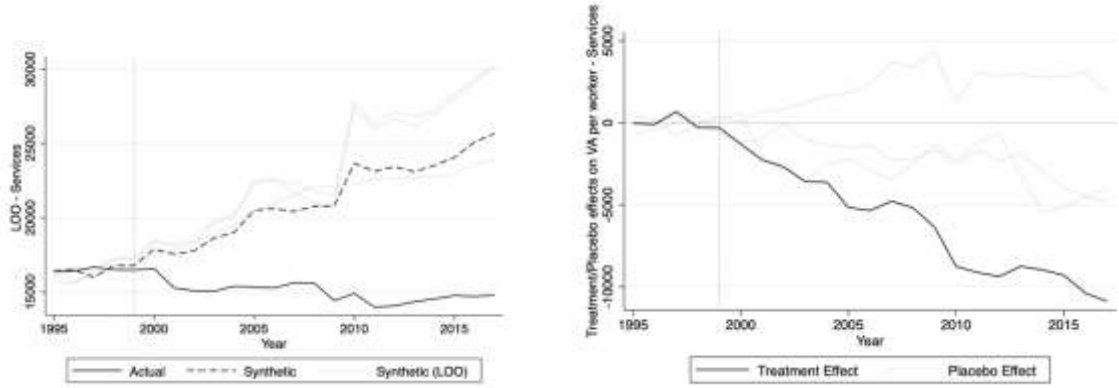

Panel A (Total)




Panel B (Agriculture, fishing, forestry)




Panel C (Industry, including construction)




Panel D (Services)

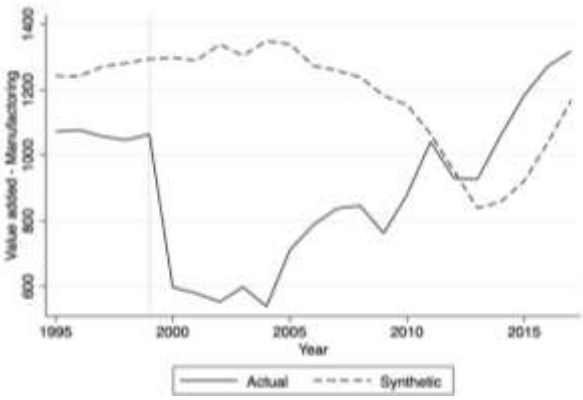
**Figure 9.** In-space placebo and LOO tests - value added per worker in sectors (constant 2015 dollar)
Note: The LOO test (on the left side for each) iteratively leaves each country out of the estimation, each time presented by the grey lines. Graphs on the right side estimate fake non-treatment effect to different units of the donor pool presented by the grey lines, while the black line the actual estimated treatment.

Turning the attention to the in-space placebo test for the estimates, the evidence that is obtained in Panel A is for total labour productivity across all sectors. The test reports suggest that the estimated results for total labour productivity is large and robust. Namely, no other country in the (right-hand figures) test presents similar trends. By the same token, the leave one out test is also in line with the hypothesis that the estimated results are robust.

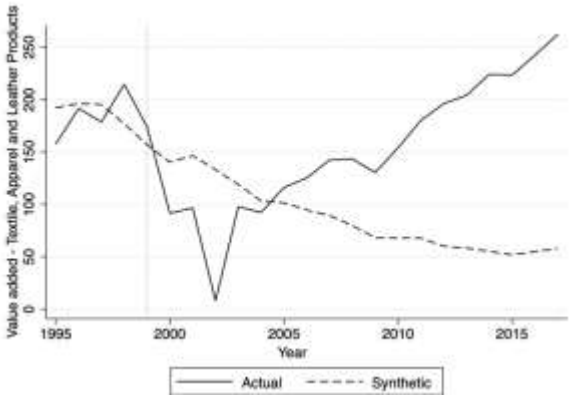
Panel B representing 'Agriculture, fishing and forestry' suggests that the SCM does produce significant estimates. There are three countries in the donor pool that have an MSPE more than 2 times that of North Macedonia in the pre-accession period. Thus, according to the fake treatment to these three countries similar results can be obtained. Effectively, the treatment outcome of the EU accession is not evident in the application of SCM to North Macedonia in terms of 'Agriculture'. The leave one out test provides further evidence to the poor robustness of these estimates. Namely, as Campos et al. (2019, p. 97) warn, the results

could potentially be driven by spillover effects from trade diversion in a certain country (in this case Romania), which biases the artificial observation upwards. In terms of 'agriculture, fishing and forestry' findings are mixed. As with the estimated synthetic versus actual series, the poor fit can be observed again in both graphs of Panel C. The series for North Macedonia (black line) follows a somewhat similar trend. The disparity between North Macedonia and the other countries can be analysed in the pre-accession period. Finally, in Panel D the tests for 'Services' provide clear evidence in the support of the argument that the estimated synthetic control is robust. Both the in-space placebo (right graph), as well as the leave-one-out (left graph) test are unmistakably significant.

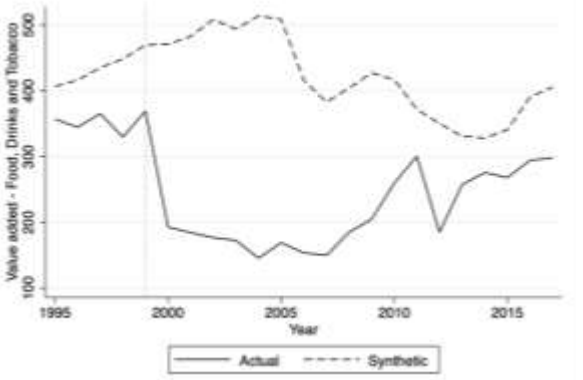
Focusing on the most significant sub-sector in the North Macedonian economy, Figure 10 presents the estimates for manufacturing (industries 10-33, ISIC rev. 4) as well as separate industries including 'Food, Drinks and Tobacco' (10-13); Textiles, Apparel, and leather related products (13-15); and Machinery and transport equipment (28-30). The outcome variable for this set of results is value added, since missing data on workers in the industries is present. The general trend for all of the series is that the pre-accession estimations of the synthetic control are poor, however, there are some interesting insights the can be observed. For instance, in the textiles, apparel and leather products (b) the actual observation outperforms the synthetic control after a dip in 2001, which is an idiosyncratic shock from the ethnic war. Nevertheless, the recovery after the war follows trends that outperform the synthetic, with declines over the post-accession period. It can be argued that these trends are perfectly in line with the diversion of trade and specialisation, stemming from deepening integration in Cyprus and Latvia (the donor countries). North Macedonia, however, as previously assumed begins to lean towards specialisation (to a degree) in textiles, apparel and leather goods as its terms of trade improve when other countries decide to specialise in other goods, thus open up a gap in demand. Making such assumptions, especially because North Macedonia does have a preferential free trade (CEFTA) agreement with some EU countries is difficult. Similarly, for Manufactoring (a), and Machinery and Transport Equipment (d), there are interesting trends developing toward the end of the series in 2017.



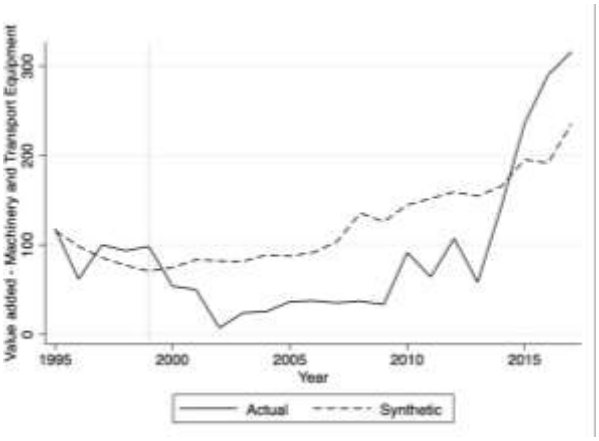

(a) Manufacturing




(b) Textiles, Apparel and Leather Products




(c) Food, Drinks and Tobacco




(d) Machinery and Transport Equipment

**Figure 10.** Sub-sectoral and industy level estimations - value added (2015 constant $ millions)

Note: The dashed line presents the synthetic country, while the straight is the actual observation (i.e., North Macedonia) trends in terms of labour productivity (constant 2015 dollars) for each respective sector. Results of the composition of donors and predictors in the synthetic is reported in the Appendix. Robustness tests are nor run for these industries as estimates already indicate a bad fit.

The actual manufacturing industries begin to overtake the artificial ones, right after the Eurozone crisis in 2010, which perhaps together with the 2009 recession could have caused some trade diversions. On the machinery and transport equipment developments, there was an inflow of foreign investments in the manufacturing of automobile parts due to the boom in the market of cars. The competitive location of the country has been attractive for multinational corporations operating in the near proximity of the country.

## Discussion

The findings of this paper suggest that if North Macedonia had joined the EU in 2004, the average welfare would have significantly improved in the period under analysis (2000-2019). As this paper was subjected to limitations in data, it is not unlikely that biased results were obtained in the analysis. The EU accessed countries that are similar in size to North Macedonia are limited. As aforementioned, this severely limits the study, however not its aim – sparking a larger body of literature targeted at the intrinsic vices and virtues that subjugate the European community, induced by small economies.

In any case labour productivity results are positive and evidently robust to the probing done by the placebo and leave one out tests. Moreover, throughout the results (mostly in sector divisions) the analysis suggests that trade diversion is one of the key channels through which labour productivity experiences growth. One line of thinking could lie in the Central European Free Trade Agreement (CEFTA) agreement that includes EU countries such as Poland, Hungary and Slovakia. Essentially, if these EU countries are able to freely import goods from non-EU countries at a lower exchange price, then their margins of imports expand, and as such does the labour productivity in the producing country. This, however, does not stand as a fact due to the European Commission regulating most trading activities.

On the sectoral level it seems as though services bare the largest proportion of income in the total calculated impact of labour productivity improvements from EU integration. Besides obtaining robust results for this sector, these are hardly interpretable. Nonetheless some intriguing findings in the Textile, Apparel and Leather industry seem to prove the assumptions suggested. Namely, the treatment effect for labour productivity seems to be negative. But in a scenario where North Macedonia enters the EU this would not be the case. Furthermore, since it comes to only three similar industries the results could not have been biased as they would for sectors. The suggested estimates, thus, represent a specialisation of the North Macedonian economy in these three industries, with increase in labour productivity.

One major concern in the exploration of sectors is that between North Macedonia and the donor pool countries, a high heterogeneity in the size and scope of industries exists. Therefore, one's analysis of the results makes the prediction of the mechanisms in operation difficult. In an attempt to overcome this, this paper analyses the predominant individual industries in North Macedonia. Again due to the lack of data, as well as existence of these industries in the countries that compose the donor pool, this analysis is limited. Industrial results as a whole are also likely biased because of the predictor variables used. Namely, in the matrix of **V** weights of covariates that predict the artificial countries, no variables that could measure the variability of (quality) human and fixed capital used in the production process. This is because measures particularly on the North Macedonian sectors and industries begin in the 2000s, which is insufficient in determining a good fit for the synthetic control.

**Conclusion**

This study is an attempt to provide a holistic overview of the implications that could arise from deepening North Macedonia's integration within the EU. Although the accession of North Macedonia to the EU has long been overdue, it is likely that this question will remain a status-quo, as it may for other small countries such as Bosnia, Montenegro, and Albania. Overall, this study suggests that North Macedonia will experience a significant net positive benefit from EU integration, perhaps as large as the Baltic countries. It also finds non-robust evidence that in the case of accession, North Macedonia is highly likely to divert its factor endowments and human capital towards the production of labour-intensive goods such as Textiles, Apparel and Leather.

Furthermore, despite some of the presented results being insignificant, the aim of this paper is a small piece of a greater body of academic research aimed at making a case for the implications of small countries joining the European Union.

As such I identify and aim at pursuing two key steps of future research. The first refers to the potential restructuring of the policymaking in the European community, where smaller countries are integrated into the EU through strategic and more stages than currently present

- which often lead to short term idiosyncratic shocks and long-term stagnation. This could enable the management of heterogenous effects, such as high immigration rates, while the country gradually converges towards the open market. Coupled with proportional perks to the GDP generated by the country an enticing argument for accepting newcomers could be presented – under the assumption that the political arena is neglected. The second step re-evaluates the current shibboleth of decision-making powers in the bureaucratic process trumping economic benefits. Specifically, the EU's economic gains from the inclusion of small countries are balanced against the relinquishment of agenda-setting authority. Ultimately, this research will provide valuable insights and, ideally, furnish evidence for informed risk management assessments during the decision-making process regarding the accession of small countries.

| Authors, title, journal/ publisher, date | Research question(s) | Method(estimator/tests) | How were key variables measured? | Dataset used | Model specification | Detailed description of the main results |
|---|---|---|---|---|---|---|
| Press to go back to literature review<br><br>Campos et al. (2019) | Are benefits from EU integration economic or political? Is such growth caused by EU integration? | Synthetic Control Method (SCM) | Economic wellbeing and labour productivity used to estimate the induced respective gap of EU integration | Penn World Tables 7.0, PPP<br><br>World Bank Development Indicators | $\hat{\tau}_{1t} = Y_{1t} - \sum_{i=2}^{N+1} w_i^* Y_{it}$ for all $t$ | Positive payoffs from EU membership, effects of 15% GDP per capita increase in on average across countries |
| Papazoglou et al. (2006) | What are the potential gains from the eastern and northern expansion of the EU single market? | Gravity model | Income variable is measured using GDP, Country pop. using census Dummy variables ADJDM and INTDM | IMF<br><br>OECD<br><br>World Atlas Data | $logX_{ij} = \alpha_0 + \alpha_1 logY_1 + \alpha_2 logY_j + \alpha_3 logN_i + \alpha_4 log_j + \alpha_5 log\ D_{ij} + \alpha_{61} ADJDM_{ij} + \alpha_{62} INTDM_{ij} + log\ u_{ij}.$ | Broadening EU membership to accession countries increases additional trade flow of 12% in imports and 50% in exports |
| Lejour et al. (2009)[a] | What are the implications of Croatian Accession to the European Union? | Computable general Equilibrium Model | Increase in GDP measured using trade and political and economic institution variables | GTAP (Global Trade Analysis Project) Database | $X_{ijs} = \alpha_S Z_{ijs} + \beta_S D_{ijs}^{EU}$ | Per capita GDP will increase by 9% when Croatia join the European Union |
| Toshevska-Trpchevska et al. (2022) | How important is the regional component of free trade agreements and mutual integration? | Gravity panel model | Gravity model measures (population, GDP, distance) used to estimate the increase in the trade from (C)EFTA | National Bank of North Macedonia (NBRM), World Bank Development Indicators | $lnTRADEijt = \alpha 1 lnGDPca\text{-}\ pitaijt + \alpha 2 lnREMOTNES\text{-}\ Sijt + \alpha 3 lnPOPijt + \alpha 4 EUjt + \alpha 5 CEFTAjt + \alpha 6 FTAjt$ | A 1% increase in trade with CEFTA countries leads to a 4.2% increase in North Macedonia's trade |
| Masten et al. (2008) | What are the effects of the process of euro adoption on financial development? | Ordinary Least Squares Panel using fixed effects | Per capita GDP, Financial development: sum of stocks of FDI in/outflows as share of GDP, sum of stocks of portfolio equity other corresponding flows | World Bank Development Indicators | $\Delta yit = \alpha i + \rho \Delta y_{i,t-1} + \beta IFI_{it} + \gamma' X_{it} + \delta t +$ uit | The depth of national financial markets lead to GDP growth (0.428 coeff)<br>Financial integration has significant positive effect in transition countries |

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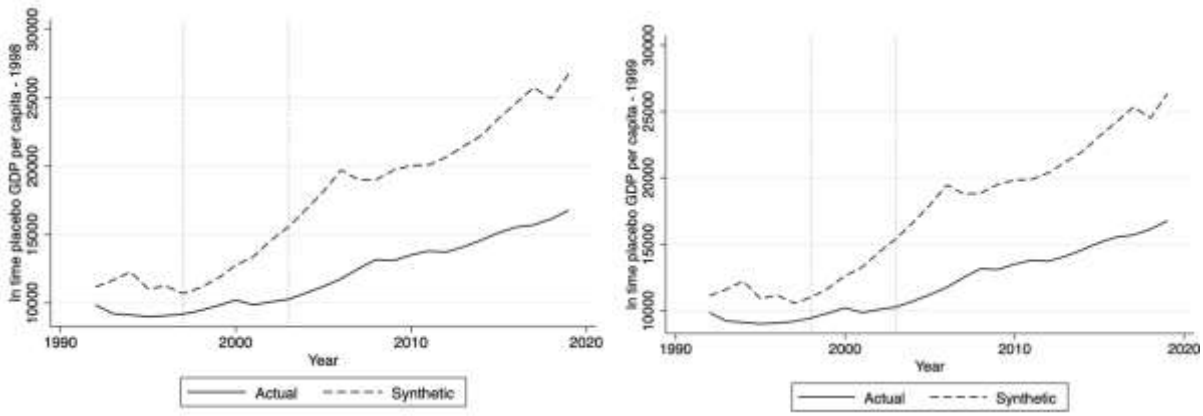
| Tochkov et al. (2011) | What are the determinants of efficiency of Bulgarian banks in the EU transition period? | Tobit regression | Ownership efficiency measured through Bank specific indicators measuring the performance of the respective banks | Bulgarian National Bank<br><br>EBRD Annual Transition Report | $EFF_{it} = \alpha_i + \sum \beta_k OWN_{it,m} + \sum \beta_k CAMEL_{it,m} + \sum \beta_z INST_{t,q} + \sum \beta_z EU_{t,z} + \varepsilon_{it}$ | Foreign owned banks were significantly more efficient<br>Private domestic banks became more efficient with EU membership |
| Disoska et al. (2018) | What economic and institutional factors are most determinative of the attractiveness of FDI in SEE countries? | Ordinary Least Squares Panel Model | Increase in FDI measured through variables such as: Law protection and enforcement Business freedom Monetary and financial freedom | World Bank Development Indicators, OECD, World Bank Doing Business Report | $fdi_{it} = \alpha + \beta_1 gdp_{it} + \beta_2 trade_{it} + \beta_3 productivity_{it} + \beta_4 unemployment_{it} + \beta_5 government \lambda_t + \upsilon_{it}$ | Trade is most important for attracting FDI in SEE countries<br><br>Government final consumption (1% leads to 10.7 % increase in FDI) |
| Simionescu, M. (2018) | What is the impact of European integration on bilateral FDI in Romania? | Gravity model | Increase of FDI measured through export/import specific variables, trade liberalisation, geography | World Development Indicators<br><br>UNCTAD database | $Xij = GSi\ Mj\ \theta ij$ | Romania attracted more FDI as a result of EU membership (0.69 estimated coefficient) at 1% significance |
| Kikerkova et al (2018) | What is the interconnection of FDI other economic indicators in North Macedonia? | Vector Error Correction Model | Inflow of FDI calculated as a function of GDP growth rate, labour productivity, trade openness, current account balance | National Bank of North Macedonia<br><br>World Development Indicators | $\Delta Y_t = \mu_1 + CX + A\Delta Y_{t-1} + \alpha(\beta 1, \mu 2) Y_{t-1} + \omega_t Y$ | According to the results economic/ endogenous variables (trade, gdp growth) constitute leading factors for attracting FDI in North Macedonia |
| Ivanovska et al. (2020) | Is the level of banking concentration and intermediation of North Macedonia to any EU or Balkan countries? | Cluster Analysis | Financial Integration: measured through various financial indices: Total assets to GDP, Loans/ Deposits, Household Loans to GDP ratio | European Central Bank<br><br>IMF | $D_{JM} = [((N_J + N_K) D_{JK} + (N_J + N_L) D_{JL} - N_J D_{KL})/(N_J + N_M)]$ | Economic institutions in North Macedonia better than other EU accession countries, but lagging behind EU countries |

| | | | | | | |
|---|---|---|---|---|---|---|
| Lejour et al. (2009) [b] | What is the impact of EU membership on trade and institutions? | Gravity Model | Trade increase measured through gravity model variables<br>Institutional variables captured using dummies | PWT 6.1<br><br>PC-TAS<br><br>*UNCTAD/WTO*<br><br>COMTRADE | $log(X_{ij}) = \beta_0 + log(Y_{ij}) + log(Y_i) + \beta_2 log(Y_j) + \beta_3 log(Y_i/N_i) + \beta_4 log(Y_j/N_j) + \delta_1 log(D_{ij}) + \ldots + u_{ij}$ | 27% increase in trade between two EU member states, added 23% increase in trade if institutions improve, yielding a total of 50% increase |
| Henrekson et al. (1997) | What is the effect of EU and EFTA membership on per capita GDP growth? | Ordinary Least Squares – Panel Data | Dummies measure the impact of CEFTA and EU membership on the average real GDP per capita | Summers and Heston (1988), Barro (1991), Dollar (1992) | $GROWTH = \alpha + \beta_1 Y_0 + \beta_2 SCHOOL + \beta INV + \beta_4 ECEFTA + \beta_4 RERD$ | EU and EFTA membership raises economic growth for a long time by about 0.6–0.8% per year<br>(not robust) |
| Badinger, H. (2005) | How much has EU impacted the welfare of its state members? | Panel Data Fixed Effects Model | Welfare measured using average growth rate of GDP and capital per worker | OECD<br><br>IMF<br><br>Barro and Lee (2000) | $\Delta lnk_t = Y_{K0} + Yk0\ \Delta INT_t$ | GDP per capita would have been around one fifth lower today had EU countries not been accessed since 1950 |
| Ozkan and Ceylan (2013) | What is the impact of agriculture income within the framework of EU membership?<br>What is the overall impact of EU membership? | Solow Growth Model using Panel Data | Average annual GDP growth rate, Sector specific measures: average annual agriculture / labour / export / inflation growth rate | World Development Indicators, Global Development Finance, International Country Risk | $lnY_{it} = \beta_0 + \beta_1 lnAVA_{it} + \beta_2 lnCS_{it} + ln\beta_4 E_{it} + \beta_5 EU_{it} + \beta_6 CR_{it} + \varepsilon_{it}$ | Per capita income was 5.6% (1995-2000) higher because of EU membership, with agriculture value-added elasticity of 0.025 |
| Schönfelder and Helmut (2019) | Does EU institutional convergence occur during the accession process? | Ordinary Least Squares Cross Section | Institutional divergence measured using WGI as well as convergence measured using per capita GDP | World Governance Indicators (WGI)<br><br>OECD | $D_{i,T} - D_{i,0} = k + \beta D_{i,0} + \varepsilon_i$ | Divergence in political institutions has remained the same after accession while economic convergence has occurred in most countries |
| Slaughter (2001) | Does trade liberalization contribute to per capita convergence across countries? | Difference-In differences | Per capita GDP<br><br>Dummies for EFTA and EU integration for trade openness | Penn World Tables<br><br>Summers and Heston(1997) | $Y_{it} = \alpha + \alpha^1 d + d^j + \beta d^{jt} + e^j{}_t$ | There is no systematic link between trade liberalization and convergence |

| | | | | | | |
|---|---|---|---|---|---|---|
| Campos et al. (2022) | How did the refusal of Norway to join the EU impact its economy across sectors and regions? | Synthetic Difference-in-Differences | Productivity measured using GVA per worker and growth rates of GVA per worker | Cambridge Econometrics European Regional Database (2017) Gennaioli et al. (2014) | $Y_i^{synthetic} = \sum_{j=2}^{n+1} w_j + Y_j$ | Productivity would have been +0.6% per year had Norway joined the EU in 1995 Industry/construction experience the most severe negative effects |
| Crespo Cuaresma et al. (2008) | Have per capita incomes converged towards each other in EU countries? Do these gains stem economic integration? | Panel Data with Fixed and varying Effects | Convergence measured using investment share, schooling, trade openness, Real per capita GDP | World Development Indicators Barro and Lee (2001) PWT 5.5 | $[ln(y_{Tt,i}) - ln(y_{0t,i})] / n_t = \beta_1 ln(y_{0t,i}) + \beta_2 (INV_{t,i}) + \beta_3 ED_{t,i} + \beta_4 INF_{t,i} + \beta_5 GOV_{t,i} + \beta_6 OP_{t,i} + \beta_6 OP_{t,I} + \beta_7 YEA_{t,I} + u_{t,i}$ | EU membership has had a positive and asymme-tric effect on GDP in countries , with smaller countries benefiting more than large ones |
| Martín-Retortillo and Pinilla (2015) | What were the causes of and the differences in economic growth in Europe? Why has the productivity of agricultural labour not converged in some EU countries? | Ordinary Least Squares – Pooled, fixed and random effects Panel | Labour productivity, Sector specific factors: factor endowments, subsidies, geography, trade openness and equivalent factors | Food and Agriculture Organization of the United Nations World Development Indicators | $Ln(product_{it}) = \alpha_0 + \alpha_1 ln(khumans_{it}) + \alpha_2 ln(GDPpc_{it}) + \alpha_3 ln(communist_{it}) \alpha_4 EUit + \alpha_5 subsi_{it} + \alpha_6 open_{it} + \alpha_7 geo + \gamma_1 Z_{1it}$ | EU membership caused a 0.5% increase in labour productivity in the agricultural sector |
| Doyle and O'Leary (1999) | What is the degree of aggregate and sectoral labour productivity convergence among 11 EU countries from 1970-1990? | Ordinary Least Squares - Panel | Labour productivity convergence: the change over time in the coefficient of variation of counties' productivity levels | OECD Sectoral Data, UN/ILO Yearbook of Labour and Ind-ustrial Statistics | $LP_{INTER/INTRA/SHARES\ i,t} = \sum_{s=1}^{3} (LP_{s,0t} W_{s,t})$ | Between 1970 and 1990 EU induced structural change contributed between 0.4 and 0.5 percent per annum to the aggregate convergence rate of labour productivity |

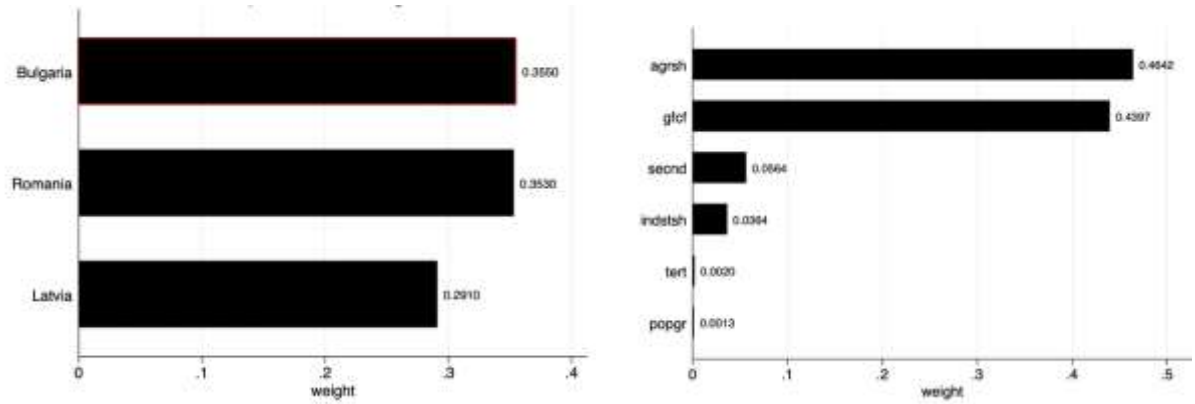
## Appendix

### A1. Per capita GDP estimations




**A1.1.** In-time placebo – per capita GDP (1998) **A1.2.** In-time placebo – per capita GDP (1999)

### 2000 Anticipation




**A1.3.** Unit weights comprising the synthetic (2000) **A1.3.** Optimal covariate weights (matrix **V)**

As data was unavailable in some countries for 1992-1995 other sources were used to replenish this for GDP:

- Lithuania (1992,1993,1994), Estonia (1992) - GDPPC (GDP / Population) (PWT 10.0)

**On the rate used in GDP per capita to deflate the estimates**

A discount factor could be used in the synthetic control observation to get more reliable estimations of the gap. This would be a sub-optimal way of estimating an adequate gap effect for North Macedonia in the circumstance where a larger pool of donor EU countries is available. The unfortunate reality is that this data this type of data could not possibly exist in the tangible world because of the systemic differences between countries (especially in this case). To find the deflated results, the average difference (in %) between the actual and synthetic observation is taken in the pre-accession period (1992-1999) and used as a discount factor for the values of the synthetic observation in the post-accession period (2000-2019). Outcomes show that the adjusted North Macedonian per capita GDP would have incurred a 30.65% average gap had it been accessed to the EU in 2004. This is in line with the results of Campos et al. (2019), who estimate a very similar gap for the Baltic countries. It should be noted that the post-accession period is significantly different (1998-2008). A further concern in comparing these results is that Campos et al. (2019) stopped the series in 2008, which means that there are no effects of the 2008 recession on their results. Perhaps another impactful factor is that North Macedonia received candidate status in 2005; thus, the estimated gap could be deflated with the potential effects of EU integration already taking place. As such, this exercise is not considered a robust estimate of the gap but rather an attempt to compare results with the relevant literature.

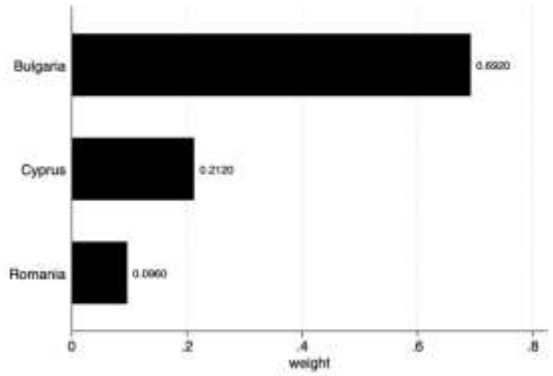
**Table T1.** Estimated results from the SCM in the post-accession period (per capita GDP,2000)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Synthetic | Actual | Induced gap % | % Growth Synthetic | % Growth Actual | % Difference |
| 2000 | 12671.1811 | 10224.72 | 23.93% | | | |
| 2001 | 13404.651 | 9869.541 | 35.82% | 5.79% | -3.47% | 2.31% |
| 2002 | 14532.056 | 10089.97 | 44.02% | 8.41% | 2.23% | 10.64% |
| 2003 | 15648.7598 | 10280.56 | 52.22% | 7.68% | 1.89% | 9.57% |
| 2004 | 16951.563 | 10730.53 | 57.98% | 8.33% | 4.38% | 12.70% |
| 2005 | 18461.3175 | 11213.67 | 64.63% | 8.91% | 4.50% | 13.41% |
| 2006 | 20206.8875 | 11770.23 | 71.68% | 9.46% | 4.96% | 14.42% |
| 2007 | 20312.3635 | 12511.74 | 62.35% | 0.52% | 6.30% | 6.82% |
| 2008 | 20247.0161 | 13174.86 | 53.68% | -0.32% | 5.30% | 4.98% |
| 2009 | 19970.3163 | 13103.46 | 52.40% | -1.37% | -0.54% | -1.91% |
| 2010 | 20087.0966 | 13515.01 | 48.63% | 0.58% | 3.14% | 3.73% |
| 2011 | 20342.7642 | 13807.5 | 47.33% | 1.27% | 2.16% | 3.44% |
| 2012 | 21155.8314 | 13727.81 | 54.11% | 4.00% | -0.58% | 3.42% |
| 2013 | 21943.2343 | 14108.93 | 55.53% | 3.72% | 2.78% | 6.50% |
| 2014 | 22700.3819 | 14596.64 | 55.52% | 3.45% | 3.46% | 6.91% |
| 2015 | 23846.4466 | 15139.29 | 57.51% | 5.05% | 3.72% | 8.77% |
| 2016 | 24837.1507 | 15553.48 | 59.69% | 4.15% | 2.74% | 6.89% |
| 2017 | 25964.7289 | 15706.48 | 65.31% | 4.54% | 0.98% | 5.52% |
| 2018 | 25664.9805 | 16145.58 | 58.96% | -1.15% | 2.80% | 1.64% |
| 2019 | 27315.1093 | 16773.08 | 62.85% | 6.43% | 3.89% | 10.32% |
| Gap | 54.21% | | | | Growth | 7.09% |

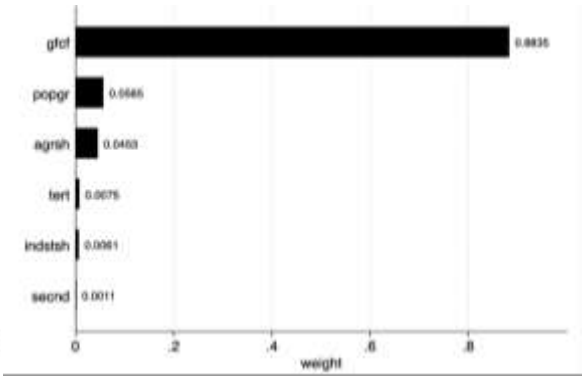
**Note:** The estimated results for the synthetic control method in the post-accession period where: (1) Synthetic estimation, (2) Actual observation, (3) The induced gap between the synthetic and actual for each year ((Synthetic-Actual)/Actual); (4) Yearly percentage growth in the synthetic (ex. (2001-2000)/2000); (5) Yearly percentage growth in the actual (ex. (2001-2000)/2000); (6) Difference in the relative year over year growth between actual and synthetic (Growth Synthetic – Growth actual). Furthermore, the 'Gap' is calculated as the average gap (row(3)) over the 20 year period, whereas 'Growth' represents the average relative difference (row(6)) in growth over the 20 year period.

**A2. Labour productivity**

**2004 Accession**

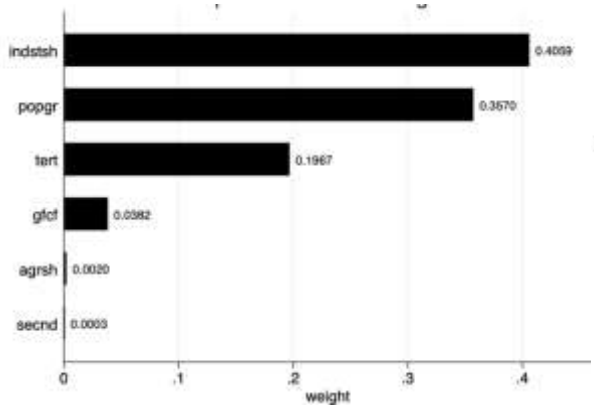



**A2.1.** Unit weights comprising the synthetic

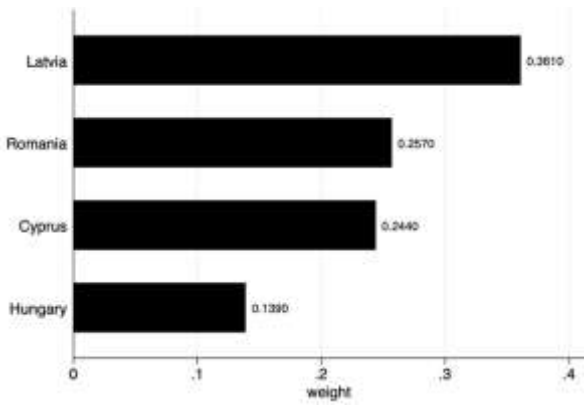



**A2.2.** Optimal covariate weights (matrix **V)**

**2000 Anticipation**




**A2.1.** Unit weights comprising the synthetic




**A2.2.** Optimal covariate weights (matrix **V)**

As data was unavailable in some countries for 1992-1995 other sources were used to replenish this for GDP per worker:

- Lithuania (1992,1993,1994), Estonia (1992) - GDP per worker calculated: GDP / Emplyed Population(from PWT 10.0)

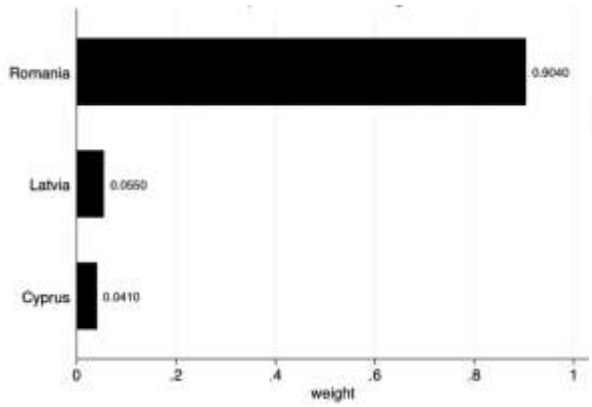
- Estonia(1993,1994) , Slovenia (1993,1994), Latvia (1992,1993,1994) - GDP per worker calculated: per capita * population / employed population (from IMF)

**Table T2**. Estimated results from the SCM in the post-accession period (Labour Productivity)

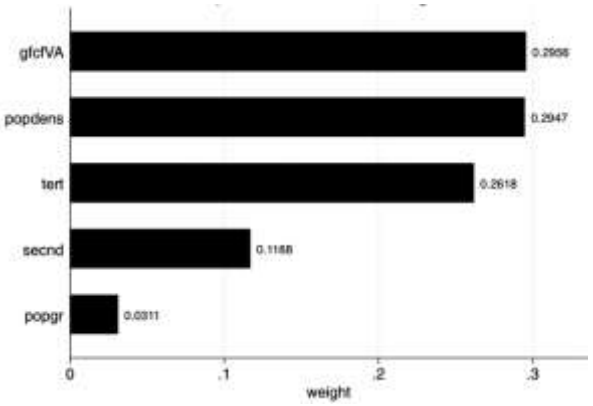
| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Synthetic | Actual | Induced gap % | % Growth Synthetic | % Growth Actual | % Difference |
| 2000 | 40307.8064 | 36773.96 | 9.61% | | | |
| 2001 | 41230.5502 | 34634.47 | 19.04% | 2.29% | -5.82% | 8.11% |
| 2002 | 43129.4193 | 36105.7 | 19.45% | 4.61% | 4.25% | 0.36% |
| 2003 | 44908.9804 | 37989.78 | 18.21% | 4.13% | 5.22% | -1.09% |
| 2004 | 47428.8972 | 39857.31 | 19.00% | 5.61% | 4.92% | 0.70% |
| 2005 | 50477.4874 | 41595.18 | 21.35% | 6.43% | 4.36% | 2.07% |
| 2006 | 53027.6996 | 42652.33 | 24.33% | 5.05% | 2.54% | 2.51% |
| 2007 | 54015.5361 | 43908.87 | 23.02% | 1.86% | 2.95% | -1.08% |
| 2008 | 53324.5961 | 44686.29 | 19.33% | -1.28% | 1.77% | -3.05% |
| 2009 | 53560.6405 | 42904.65 | 24.84% | 0.44% | -3.99% | 4.43% |
| 2010 | 54183.0365 | 43778.95 | 23.77% | 1.16% | 2.04% | -0.88% |
| 2011 | 54796.9224 | 44286.4 | 23.73% | 1.13% | 1.16% | -0.03% |
| 2012 | 56080.0464 | 43879.61 | 27.80% | 2.34% | -0.92% | 3.26% |
| 2013 | 56208.8331 | 43143.27 | 30.28% | 0.23% | -1.68% | 1.91% |
| 2014 | 56661.7315 | 43860.74 | 29.19% | 0.81% | 1.66% | -0.86% |
| 2015 | 58551.0774 | 44613.77 | 31.24% | 3.33% | 1.72% | 1.62% |
| 2016 | 60788.5872 | 44707.88 | 35.97% | 3.82% | 0.21% | 3.61% |
| 2017 | 62486.0567 | 44050.36 | 41.85% | 2.79% | -1.47% | 4.26% |
| 2018 | 63023.6829 | 44161.97 | 42.71% | 0.86% | 0.25% | 0.61% |
| 2019 | 66222.2029 | 43623.53 | 51.80% | 5.08% | -1.22% | 6.29% |
| Gap | 26.83% | | | | Growth | 1.72% |

**Note:** The estimated results for the synthetic control method in the post-accession period where: (1) Synthetic estimation, (2) Actual observation, (3) The induced gap between the synthetic and actual for each year ((Synthetic-Actual)/Actual); (4) Yearly percentage growth in the synthetic (ex. (2001-2000)/2000); (5) Yearly percentage growth in the actual (ex. (2001-2000)/2000); (6) Difference in the relative year over year growth between actual and synthetic (Growth Synthetic – Growth actual). Furthermore, the 'Gap' is calculated as the average gap (row(3)) over the 20 year period, whereas 'Growth' represents the average relative difference (row(6)) in growth over the 20 year period.

**A3. Labour productivity sectors – Total**




**A3.1.** Unit weights comprising the synthetic



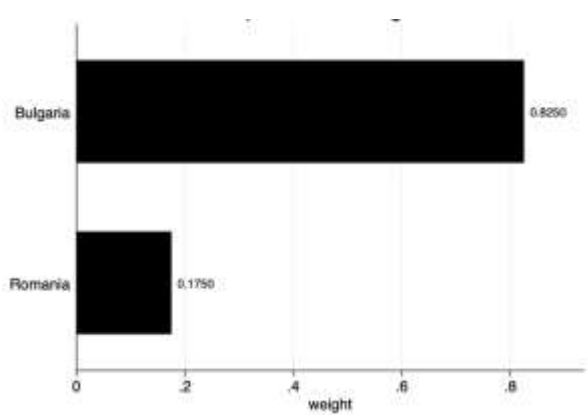

**A3.2.** Optimal covariate weights (matrix **V)**

**Table T3**. Estimated results from the SCM in the post-accession period (Total Labour Productivity in Sectors)

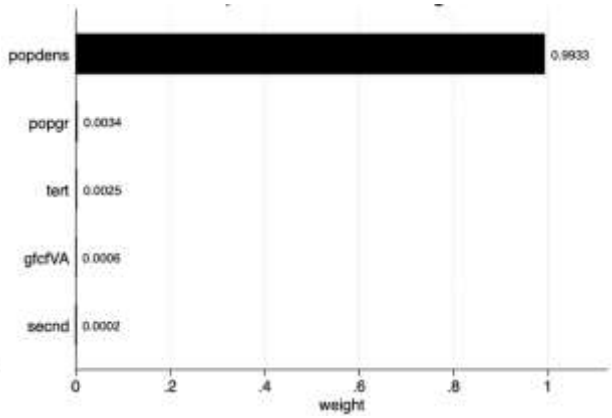
| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Synthetic | Actual | Induced gap % | % Growth Synthetic | % Growth Actual | % Difference |
| 2000 | 33579.6391 | 28967.452 | 15.92% | | | |
| 2001 | 34710.5859 | 26541.4965 | 30.78% | 3.37% | -8.37% | 11.74% |
| 2002 | 36317.2466 | 26780.6516 | 35.61% | 4.63% | 0.90% | 3.73% |
| 2003 | 38551.2766 | 29133.449 | 32.33% | 6.15% | 8.79% | -2.63% |
| 2004 | 40570.5349 | 30411.7157 | 33.40% | 5.24% | 4.39% | 0.85% |
| 2005 | 43265.6599 | 31203.5594 | 38.66% | 6.64% | 2.60% | 4.04% |
| 2006 | 47579.3273 | 31558.2442 | 50.77% | 9.97% | 1.14% | 8.83% |
| 2007 | 47274.3719 | 31814.1743 | 48.60% | -0.64% | 0.81% | -1.45% |
| 2008 | 45665.3284 | 33524.8434 | 36.21% | -3.40% | 5.38% | -8.78% |
| 2009 | 46215.0276 | 32367.9498 | 42.78% | 1.20% | -3.45% | 4.65% |
| 2010 | 50075.76 | 31996.6005 | 56.50% | 8.35% | -1.15% | 9.50% |
| 2011 | 49959.6516 | 32852.6356 | 52.07% | -0.23% | 2.68% | -2.91% |
| 2012 | 51497.2538 | 31614.2501 | 62.89% | 3.08% | -3.77% | 6.85% |
| 2013 | 52207.2732 | 31743.6124 | 64.47% | 1.38% | 0.41% | 0.97% |
| 2014 | 53598.9156 | 32811.5303 | 63.35% | 2.67% | 3.36% | -0.70% |
| 2015 | 55595.1692 | 33613.7361 | 65.39% | 3.72% | 2.44% | 1.28% |
| 2016 | 57646.8097 | 33409.8442 | 72.54% | 3.69% | -0.61% | 4.30% |
| 2017 | 59309.0103 | 32327.4963 | 83.46% | 2.88% | -3.24% | 6.12% |
| Gap | 49.21% | | | | Growth | 2.73% |

**Note:** The estimated results for the synthetic control method in the post-accession period where: (1) Synthetic estimation, (2) Actual observation, (3) The induced gap between the synthetic and actual for each year ((Synthetic-Actual)/Actual); (4) Yearly percentage growth in the synthetic (ex. (2001-2000)/2000); (5) Yearly percentage growth in the actual (ex. (2001-2000)/2000); (6) Difference in the relative year over year growth between actual and synthetic (Growth Synthetic – Growth actual). Furthermore, the 'Gap' is calculated as the average gap (row(3)) over the 20 year period, whereas 'Growth' represents the average relative difference (row(6)) in growth over the 20 year period.

**A4. Labour productivity sectors - Industry**




**A4.1.** Unit weights comprising the synthetic



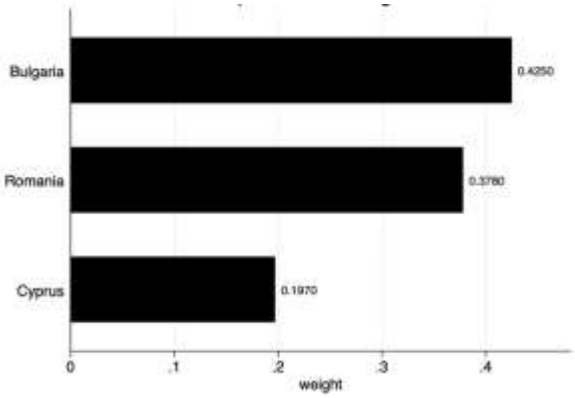

**A4.2.** Optimal covariate weights (matrix **V)**

**Table T4**. Estimated results from the SCM in the post-accession period (Labour Productivity in Industry)

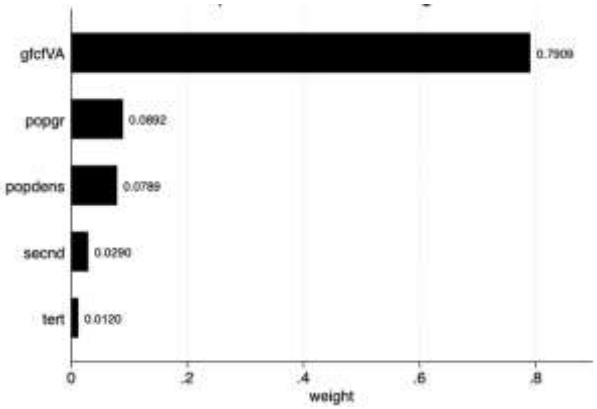
| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Synthetic | Actual | Induced gap % | % Growth Synthetic | % Growth Actual | % Difference |
| 2000 | 9652.3562 | 6181.93282 | 56.14% | | | |
| 2001 | 10255.676 | 5950.21383 | 72.36% | 6.25% | -3.75% | 10.00% |
| 2002 | 10196.5134 | 6224.97609 | 63.80% | -0.58% | 4.62% | -5.19% |
| 2003 | 10492.0965 | 7121.2273 | 47.34% | 2.90% | 14.40% | -11.50% |
| 2004 | 10982.5243 | 7390.29617 | 48.61% | 4.67% | 3.78% | 0.90% |
| 2005 | 11442.3545 | 8037.2029 | 42.37% | 4.19% | 8.75% | -4.57% |
| 2006 | 12053.9749 | 8443.32734 | 42.76% | 5.35% | 5.05% | 0.29% |
| 2007 | 12357.074 | 7630.08745 | 61.95% | 2.51% | -9.63% | 12.15% |
| 2008 | 12730.3994 | 7813.95905 | 62.92% | 3.02% | 2.41% | 0.61% |
| 2009 | 13923.9808 | 8086.57809 | 72.19% | 9.38% | 3.49% | 5.89% |
| 2010 | 13698.0002 | 8694.88065 | 57.54% | -1.62% | 7.52% | -9.15% |
| 2011 | 14253.6748 | 10466.0902 | 36.19% | 4.06% | 20.37% | -16.31% |
| 2012 | 14444.9638 | 9951.94528 | 45.15% | 1.34% | -4.91% | 6.25% |
| 2013 | 14939.4059 | 10089.9311 | 48.06% | 3.42% | 1.39% | 2.04% |
| 2014 | 15645.622 | 10766.3831 | 45.32% | 4.73% | 6.70% | -1.98% |
| 2015 | 15542.5889 | 11128.3226 | 39.67% | -0.66% | 3.36% | -4.02% |
| 2016 | 15392.3557 | 10629.0655 | 44.81% | -0.97% | -4.49% | 3.52% |
| 2017 | 15130.539 | 10465.4485 | 44.58% | -1.70% | -1.54% | -0.16% |
| Gap | 51.76% | | | | Growth | -0.66% |

**Note:** The estimated results for the synthetic control method in the post-accession period where: (1) Synthetic estimation, (2) Actual observation, (3) The induced gap between the synthetic and actual for each year ((Synthetic-Actual)/Actual); (4) Yearly percentage growth in the synthetic (ex. (2001-2000)/2000); (5) Yearly percentage growth in the actual (ex. (2001-2000)/2000); (6) Difference in the relative year over year growth between actual and synthetic (Growth Synthetic – Growth actual). Furthermore, the 'Gap' is calculated as the average gap (row(3)) over the 20 year period, whereas 'Growth' represents the average relative difference (row(6)) in growth over the 20 year period.

**A5. Labour productivity sectors – Services**




**A5.1.** Unit weights comprising the synthetic



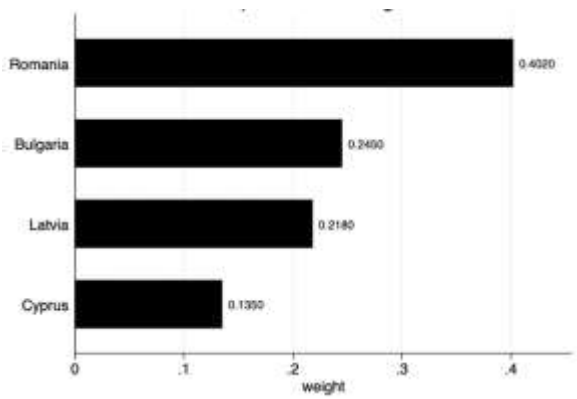

**A5.2.** Optimal covariate weights (matrix **V)**

**Table T5**. Estimated results from the SCM in the post-accession period (Labour Productivity in Services)

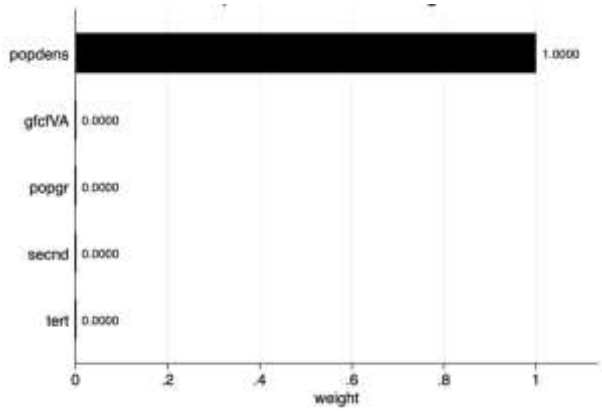
| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Synthetic | Actual | Induced gap % | % Growth Synthetic | % Growth Actual | % Difference |
| 2000 | 17887.7682 | 16589.1875 | 7.83% | | | |
| 2001 | 17543.0534 | 15274.6132 | 14.85% | -1.93% | -7.92% | 6.00% |
| 2002 | 17774.2472 | 15081.1811 | 17.86% | 1.32% | -1.27% | 2.58% |
| 2003 | 18635.6365 | 15050.4207 | 23.82% | 4.85% | -0.20% | 5.05% |
| 2004 | 19005.0621 | 15388.6611 | 23.50% | 1.98% | 2.25% | -0.27% |
| 2005 | 20491.6797 | 15327.5223 | 33.69% | 7.82% | -0.40% | 8.22% |
| 2006 | 20619.349 | 15269.6006 | 35.04% | 0.62% | -0.38% | 1.00% |
| 2007 | 20404.2205 | 15623.383 | 30.60% | -1.04% | 2.32% | -3.36% |
| 2008 | 20782.0678 | 15596.2059 | 33.25% | 1.85% | -0.17% | 2.03% |
| 2009 | 20788.9049 | 14416.0361 | 44.21% | 0.03% | -7.57% | 7.60% |
| 2010 | 23672.5418 | 14908.9425 | 58.78% | 13.87% | 3.42% | 10.45% |
| 2011 | 23124.0112 | 13994.4688 | 65.24% | -2.32% | -6.13% | 3.82% |
| 2012 | 23434.7673 | 14058.4914 | 66.69% | 1.34% | 0.46% | 0.89% |
| 2013 | 23100.0231 | 14348.2762 | 61.00% | -1.43% | 2.06% | -3.49% |
| 2014 | 23508.8049 | 14535.4246 | 61.73% | 1.77% | 1.30% | 0.47% |
| 2015 | 24056.1015 | 14762.5308 | 62.95% | 2.33% | 1.56% | 0.77% |
| 2016 | 25090.444 | 14700.6518 | 70.68% | 4.30% | -0.42% | 4.72% |
| 2017 | 25667.0101 | 14781.7352 | 73.64% | 2.30% | 0.55% | 1.75% |
| Gap | 43.63% | | | | Growth | 2.84% |

**Note:** The estimated results for the synthetic control method in the post-accession period where: (1) Synthetic estimation, (2) Actual observation, (3) The induced gap between the synthetic and actual for each year ((Synthetic-Actual)/Actual); (4) Yearly percentage growth in the synthetic (ex. (2001-2000)/2000); (5) Yearly percentage growth in the actual (ex. (2001-2000)/2000); (6) Difference in the relative year over year growth between actual and synthetic (Growth Synthetic – Growth actual). Furthermore, the 'Gap' is calculated as the average gap (row(3)) over the 20 year period, whereas 'Growth' represents the average relative difference (row(6)) in growth over the 20 year period.

**A6. Labour productivity sectors – Agriculture, fishing and forestry**




**A6.1.** Unit weights comprising the synthetic




**A6.2.** Optimal covariate weights (matrix **V)**

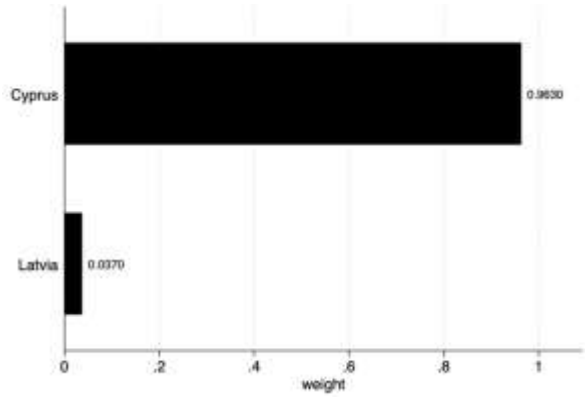
**Table T6**. Estimated results from the SCM in the post-accession period (Labour Productivity in Agriculture, fishing, and forestry)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Synthetic | Actual | Induced gap % | % Growth Synthetic | % Growth Actual | % Difference |
| 2000 | 7861.59021 | 6196.33168 | 26.87% | 8.79% | 1.64% | 7.15% |
| 2001 | 8222.95406 | 5316.66955 | 54.66% | 4.60% | -14.20% | 18.79% |
| 2002 | 8418.69154 | 5474.49446 | 53.78% | 2.38% | 2.97% | -0.59% |
| 2003 | 8209.8591 | 6961.80093 | 17.93% | -2.48% | 27.17% | -29.65% |
| 2004 | 8600.79814 | 7632.75843 | 12.68% | 4.76% | 9.64% | -4.88% |
| 2005 | 7886.00608 | 7838.83423 | 0.60% | -8.31% | 2.70% | -11.01% |
| 2006 | 8500.62891 | 7845.31632 | 8.35% | 7.79% | 0.08% | 7.71% |
| 2007 | 8345.70093 | 8560.70386 | -2.51% | -1.82% | 9.12% | -10.94% |
| 2008 | 8226.70752 | 10114.6785 | -18.67% | -1.43% | 18.15% | -19.58% |
| 2009 | 9156.10253 | 9865.3356 | -7.19% | 11.30% | -2.47% | 13.76% |
| 2010 | 8912.37098 | 8392.77735 | 6.19% | -2.66% | -14.93% | 12.26% |
| 2011 | 9093.78733 | 8392.07654 | 8.36% | 2.04% | -0.01% | 2.04% |
| 2012 | 10447.6634 | 7603.81348 | 37.40% | 14.89% | -9.39% | 24.28% |
| 2013 | 10097.8745 | 7305.40515 | 38.22% | -3.35% | -3.92% | 0.58% |
| 2014 | 9515.48926 | 7509.72257 | 26.71% | -5.77% | 2.80% | -8.56% |
| 2015 | 9860.46794 | 7722.88271 | 27.68% | 3.63% | 2.84% | 0.79% |
| 2016 | 10745.1526 | 8080.12683 | 32.98% | 8.97% | 4.63% | 4.35% |
| 2017 | 11960.0801 | 7080.31262 | 68.92% | 11.31% | -12.37% | 23.68% |
| Gap | 21.83% | | | | Growth | 1.36% |

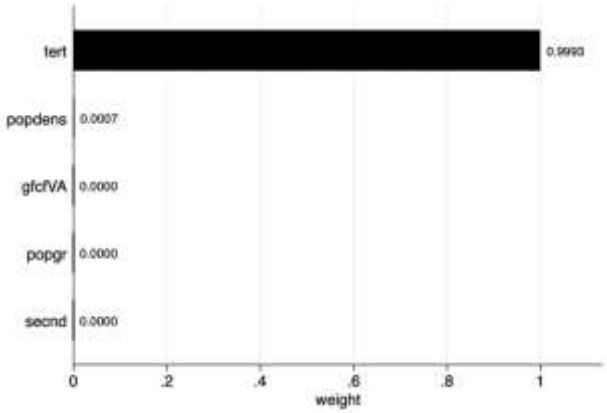
**Note:** The estimated results for the synthetic control method in the post-accession period where: (1) Synthetic estimation, (2) Actual observation, (3) The induced gap between the synthetic and actual for each year ((Synthetic-Actual)/Actual); (4) Yearly percentage growth in the synthetic (ex. (2001-2000)/2000); (5) Yearly percentage growth in the actual (ex. (2001-2000)/2000); (6) Difference in the relative year over year growth between actual and synthetic (Growth Synthetic – Growth actual). Furthermore, the 'Gap' is calculated as the average gap (row(3)) over the 20 year period, whereas 'Growth' represents the average relative difference (row(6)) in growth over the 20 year period.

## A7. Manufacturing and Industries Units and Optimal Covariate Weights

### Manufacturing

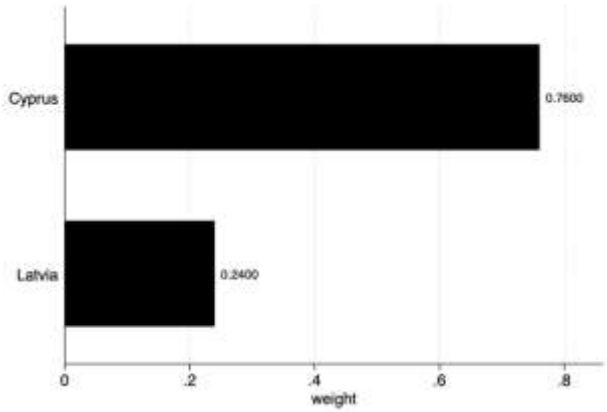



**A7.1.** Unit weights comprising the synthetic

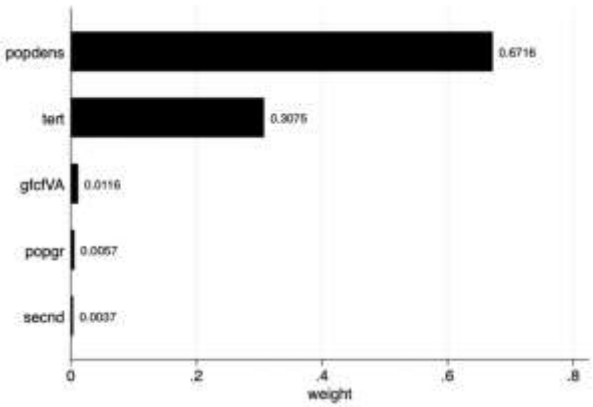



**A7.2.** Optimal covariate weights (matrix **V)**

### Machinery and transportation equipment

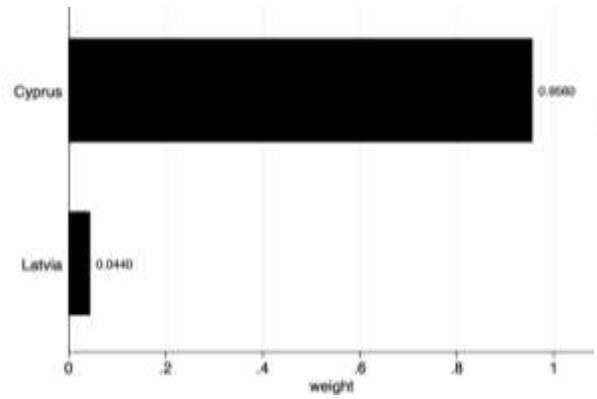



**A7.3.** Unit weights comprising the synthetic

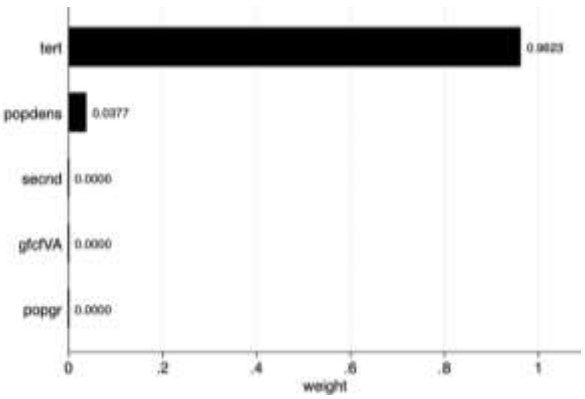



**A7.4.** Optimal covariate weights (matrix **V)**

### Food, Beverages and Tobacco

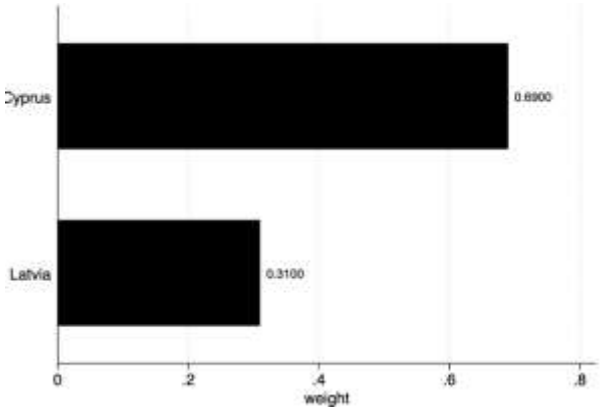



**A7.5.** Unit weights comprising the synthetic

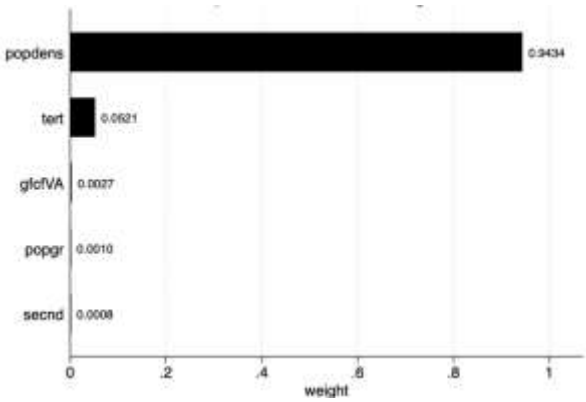



**A7.6.** Optimal covariate weights (matrix **V)**

**Textiles, Apparel and Leather Goods**




**A7.7.** Unit weights comprising the synthetic




**A7.8.** Optimal covariate weights (matrix **V)**

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