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The EU Miracle: When 75 Million Reach High Income*

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Abstract

In 2004, 75 million people across 10 countries joined the European Union (EU). Over the subsequent 15 years, their GDP per capita had increased by 90%. Using a synthetic control method, I show that half of this increase is attributed to the EU accession. I found that without joining the EU, the GDP per capita of the new members would have been 8,433 USD or 24% lower in 2019. The same methodology does not identify a robust effect on the 15 countries that were already members of the EU before 2004. These findings are robust to various tests and specifications: a leave-one-out test, an in-country placebo, an in-time placebo, and alternative donor pools. A simple growth accounting decomposition shows that the contribution of the Solow residual to growth of the new member countries is three times larger. The data shows convergence in investment, consumption, government spending, export/import shares, employment rate, FDI, and regulations indices. The TFP of the new member states has been growing at a higher rate since 2004. These results raise the question of why accession to the EU had such a large impact.

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1 Introduction

The European Union, founded in 1957, aims to foster peace and prosperity to territories that have experienced war for at least eleven centuries. In 2024, this political union represents 450 Million people and 1/6 of world GDP. In May 2004, in its largest expansion since its foundation, 75 million people across 10 countries (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia) have become members of the European Union (EU). Between 2004 and 2019, the gross domestic product (GDP) per capita of these countries almost doubled from 18,314 USD to 34,753 USD as shown in Figure 1. The World Bank classified them in the high-income group while they were in the upper-middle-income group in 2004 except Cyprus and Malta. Was part of this economic miracle the result of the adhesion to the EU?

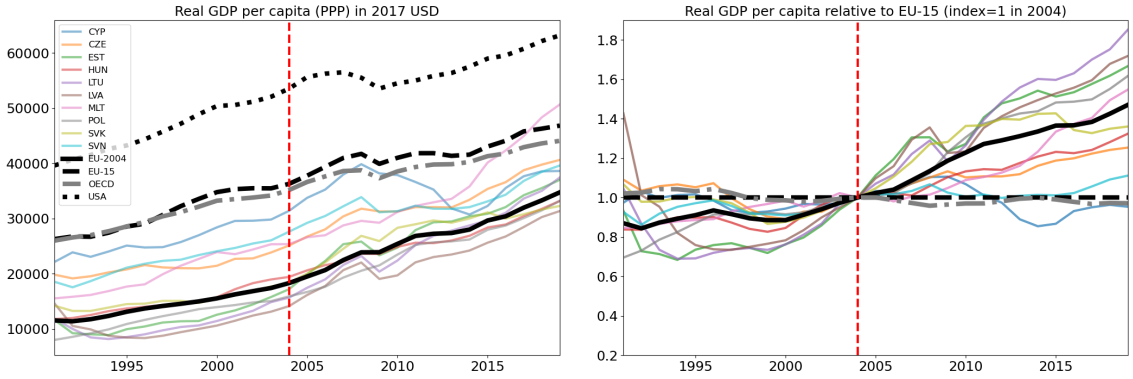
In this paper, I examine the effect of the EU enlargement on two aggregated economies: the EU-2004, which includes the new member states that joined the European Union in 2004, and the EU-15, which consists of the member states prior to the 2004 enlargement. Figure 1 shows the GDP per capita for the EU-2004, EU-15 and a few select countries in level on the left panel, and relative to the EU-15 on the right panel.

Using a synthetic control method, I construct a counterfactual EU-2004 that mimics the dynamics before 2004 of the actual EU-2004. I show that this synthetic control has in 2019 a GDP per capita lower by 8,433 USD or 24% than the EU-2004. Similarly, I construct a synthetic EU-15 that does not exhibit robustly different dynamics than the actual EU-15. These results are robust to a variety of different specifications, a leave-on-out test, an in-country and in-time placebo tests, and alternative donor pools. Furthermore, for the EU-2004, I perform a simple growth accounting exercise that shows that the growth rate of the Solow residual is almost 3 times lower for the synthetic EU-2004. Finally, I explore the dynamics of consumption, investment, government, FDI inflow, export, and import share in GDP that have converged to a stable level in the EU-2004 relative to the EU-15. Employment rate and OECD indicator for market regulations seem to also have converged. The dynamic of TFP is still showing signs of convergence with the EU-15. These results are consistent with a causal effect of joining the EU on economic growth for these 75 million people spread over these 10 countries.

The main contribution of this paper is to show that the data are consistent with a strong positive causal effect of the adhesion to the EU on GDP per capita. In the context of further future potential EU enlargement, where nine countries are recognized as official candidates, this large estimated positive effect provides a rational motivation for starting the adhesion process.[1] Furthermore, the return of wars and geopolitical instability in Europe was partly due to the Russian reaction

[1] Albania, Bosnia and Herzegovina, Georgia, Moldova, Montenegro, North Macedonia, Serbia, Turkey, and Ukraine are recognized candidates for membership in the European Union.

Figure 1: GDP per Capita



DATA: Penn World Table 10.0. NOTE. Left panel: GDP per capita in current PPP expressed in 2017 US dollars. Right panel: ratio of GDP per capita and GDP per capita of the EU-15 normalized to one in 2004. EU-2004: aggregation of the 10 countries that joined in 2004. EU-15: aggregation of the 15 countries EU members before 2004. OECD: aggregation of OECD countries.

to the desire of the people of some of these countries to join the EU. The results in this paper show that the aspiration of the people to be part of the EU is justified by potentially higher standards of living. However, these results open more questions than they give answers. What could be the mechanism that leads to such strong and sustained growth associated with the adhesion to the EU? What is the role of the resulting regulation reforms, trade openness, foreign direct investment (FDI), or technological transfer? Should we expect these gains to materialize in future EU enlargement? This analysis does not aim to answer all these questions but seeks to identify and highlight empirical patterns related to them.

The Maastricht treaty concluded in 1992 established a list of criteria, the Copenhagen criteria, to which any country wishing to become a member of the European Union (EU) must conform. These criteria include the stability of institutions (democracy, the rule of law, human rights, and rights of minorities), a functioning market economy, and the capacity to implement the rules, standards, and policies that make up the body of EU law. In March 1999, the then-EU countries agreed on the financial framework for the period 2000-2006, the so-called Agenda 2000, which allows for potential enlargement of the EU. After, this agreement it was clear that an enlargement of the EU to Eastern Europe countries, Cyprus and Malta would happen. On May 1st, 2004, ten countries effectively joined the EU.

I use the synthetic control method introduced by Abadie and Gardeazabal (2003) to estimate the effect of the 2004 EU enlargement. The idea is to construct a synthetic control country for the EU2004 or the EU15 as a weighted average of countries from a donor pool. In the baseline specification, the donor pool is composed of OECD countries that never joined the EU. The weights are chosen to match the dynamics of the variable of interest and potentially other covariates in the pre-treatment period. The effect of the treatment, here joining the EU, is defined as the

difference between the post-treatment dynamics of the treated country and the synthetic control. I find that the GDP per capita of the synthetic EU-2004 would have been 24%, or 8,433 USD, lower than the actual EU-2004. This difference represents about half of the increase in GDP per capita between 2004 and 2019. Additionally, I do not find evidence of a non-zero difference between the synthetic and actual EU-15 GDP per capita.

To assess the robustness of these results, I perform a leave-one-out test, an in-country placebo, in-time placebo, and explore alternative donor pools. The leave-one-out (LOO) test consists of removing alternatively each country with non-zero weight and reestimating the synthetic control. This test gives the same result as in my baseline specification. The in-country placebo consists of iteratively estimating the treatment effect for all the countries, treated and untreated, in the donor pool. The treatment effect of the treated unit should be an outlier in the distribution of treatment effects. For the EU-2004, the treatment effect is on the right tail of the distribution, while it is close to the median for the EU-15. The in-time placebo consists of reestimating the synthetic control for a counterfactual treatment date, here in 2000. The resulting synthetic EU-2004 dynamics post-2004 is similar to the actual one, while it is lower for the EU-15. Finally, I also explore an alternative donor country pool, namely countries in geographical Europe that have never joined the EU. The result of this exercise for the EU-2004 is similar to the baseline while it leads to a higher GDP per capita for the synthetic EU-15 than the actual EU-15.

A simple growth accounting exercise, in the spirit of Solow (1957) and following Baqaee and Farhi (2019), shows that the contribution to GDP growth of capital and labor is around 60% higher while the contribution of the Solow residual is almost three times larger for the actual EU-2004 compared to its synthetic control. The data shows that consumption, investment, government spending, export and import shares in GDP of the EU-2004 relatie to the EU-15 have converged to a stable level around 2004 together with employment rate, and foreign direct investment as a share of GDP. Measures of TFP still show signs of catching up relative to the EU-15 in 2019.

Taken together, these results point to a strong positive effect of the adhesion to the EU on the GDP per capita of the EU-2004 and no effect on the EU-15. Furthermore, this growth miracle seems to have mostly been driven by technological growth while the EU-2004's main aggregates have converged rather quickly.

Literature Review. Several papers have studied the economic role of the European Union from the political economy aspect as in Alesina et al. (2017), the integration as in Head and Mayer (2021), the role of integration as in Campos et al. (2022), or the monetary union process as in Lane (2006) and many others. Surprisingly little research has been done on the role of the EU on GDP per capita growth.

Several studies have explored similar episodes such as the German reunification

(Abadie 2021, Peters 2022, Dauth et al. 2021, Bachmann et al. 2023 or Akcigit et al. 2023), the Chinese or Indian growth episodes (Song et al. 2011, Fernández-Villaverde et al. 2023 or Fan et al. 2023), and the transition to capitalist as Cheremukhin et al. (2016). Notable exceptions are papers by Rapacki and Próchniak (2009), Caliendo et al. (2021), or Hagemejer et al. (2021) that focus on the EU enlargement in 2004.

This paper is similar in methodology and spirit to Funke et al. (2023) which studies the impact on GDP per capita of electing a populist government. This paper also uses synthetic control methods introduced by Abadie and Gardeazabal (2003), extended in Abadie et al. (2010) and summarized Abadie (2021). The synthetic control methods have been widely used in economics, for instance in Billmeier and Nannicini (2013) or Born et al. (2019) to name a few. This research use this methodology in the particular context of the adhesion to the EU in 2004.

Outline. The remainder of the paper is organized as follows. Section 2 explains the empirical strategy and exposes the baseline results. Section 3 explores the robustness of the main results. Section 4 describes a simple growth accounting exercise. Section 5 studies the dynamics of the main aggregate and the TFP of the EU-2004. Section 6 discusses the limitations and the implications of these results before concluding.

2 Synthetic Control

In this section, I briefly describe the synthetic control method (SCM) following Abadie (2021), before exposing the baseline results of applying the SCM to the EU-2004 and the EU-15.

Setup. I observe the outcome variable, here real GDP per capita in PPP expressed in 2017 US dollars, for N+1 countries and T_0+T_1 years. For each country i and time t, the outcome can take the values $Y_{it}(0)$ if untreated and $Y_{it}(1)$ if treated. From $t=1$ to $t=T_0-1$ all countries are untreated while starting from T_0 the country $i=1$ is treated. The objective of the SCM is to provide an estimate of the counterfactual untreated value of the outcome variable for the treated country, that is $Y_{1t}(0)$. This estimate is constructed as a weighted average of the outcome variable across untreated countries:

$$\widehat{Y}_{1t}(0) \equiv \sum_{i=2}^{N+1} w_i Y_{it}(0).$$

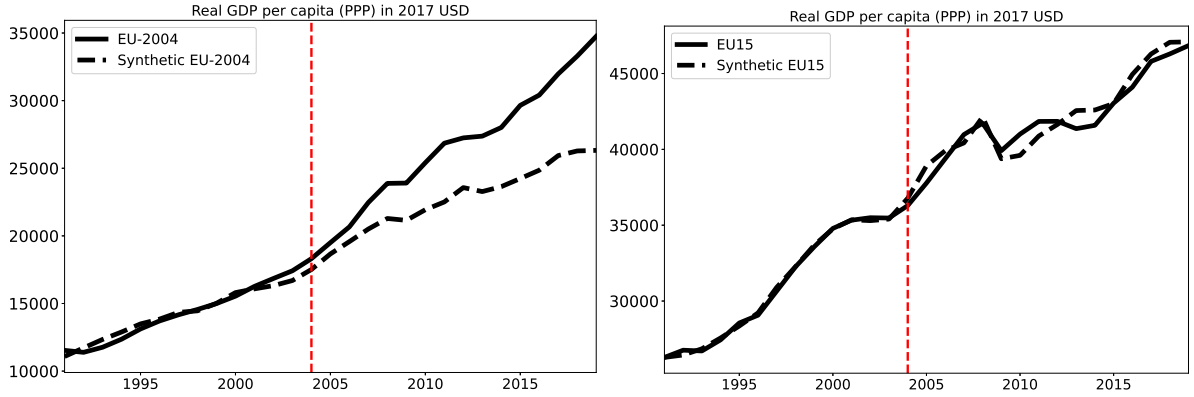
The vector of weights w_i is chosen to minimize the distance between the weighted average of the outcome variable across untreated countries and the treated country outcome variable before the treatment. Formally, Y is the vector of the outcome variable for the treated unit before the treatment date, here in 2004. X is the $T_0 - 1 \times N$ matrix collecting GDP per capita for untreated countries before 2004. The vector W of weights w_i is chosen to minimize:

$$(Y - X'W)'V(Y - X'W)$$

such that $w_i \geq 0$, $\sum_{i=2}^{N+1} w_i = 1$, and where the postivie-semidefinie symmetric matrix V is chosen using a data-driven approach as recommanded in Abadie et al. (2010). The constraints on the weights are here to ensure that the estimator $\widehat{Y}_{1t}$ is in the convex simplex constructed by the untreated countries.

Implicitly, this setup assumes no spillover across countries and no anticipation of the treatment. These assumptions are not perfectly satisfied in the case of the 2004 EU enlargement. Indeed, from early 2000 it was clear that the enlargement of the EU to some former communist countries, Cyprus and Malta would happen. The treated country considered is the aggregation of all the countries that joined the EU in 2004 to limit the spillover.

Figure 2: Synthetic Control for EU-2004 and EU-15



DATA: Penn World Table 10.0. NOTE: Synthetic control was estimated by matching the real GDP per capita from 1991 to 2003. Left panel: EU-2004, the aggregation of the 10 new member countries in 2004. Right panel: EU-15, the aggregation of the 15 member countries before 2004. The red vertical line indicates the year 2004.

EU-2004. I consider as treated country the EU-2004, which is the aggregation of the 10 countries that joined the EU in 2004. I sum the real GDP and the population as reported in the Penn World Table 10.0 (Feenstra et al. 2015). The period considered starts in 1991 and finishes in 2019. The baseline donor countries pool is composed of OECD countries that never joined the EU namely Australia, Canada,

Chile, Colombia, Costa Rica, Iceland, Israel, Japan, Mexico, New Zealand, Norway, Republic of Korea, Switzerland, Turkey, and, the United States.

Using the SCM described above for the EU-2004 yields the estimates of GDP per capita displayed on the left panel of Figure 2. Costa Rica, the Republic of Korea, and Norway have non-zero weights equal respectively to 0.772, 0.126, and 0.102. The GDP per capita pre-treatment match is good and contains in a 5% bound around the true EU-2004 value. The treatment effect, the difference between the outcome variable for the treated unit and the synthetic control, is equal to 801 USD in 2004 and increases to 8,433 USD in 2019 with an average of 3,903 USD in the post-2004 period. According to these calculations, in 2019, the effect of joining the EU results in a 32% increase in GDP per capita for the new member states.

EU-15. The EU-15 is constructed as the aggregation of the 15 countries that were members of the EU before 2004 namely Austria, Belgium, Danemark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom. The donor country pool is identical to the one considered for the EU-2004 above: OECD countries that never joined the EU.

The SCM yields estimate for GDP per capita is displayed on the right panel of Figure 2. Australia, Iceland, Israel, Costa Rica, Norway, and Canada have non-zero weights equal respectively to 0.290, 0.247, 0.215, 0.146, 0.072, and 0.03. The pre-treatment GDP per capita of the synthetic control is within 1.2% of the actual level for the EU-15. The treatment effect averaged to -214 USD in the post-2004 period and is equal to -247 USD in 2019. These calculations yield a fall in GDP per capita of about 0.5% after the enlargement of the EU in 2004.

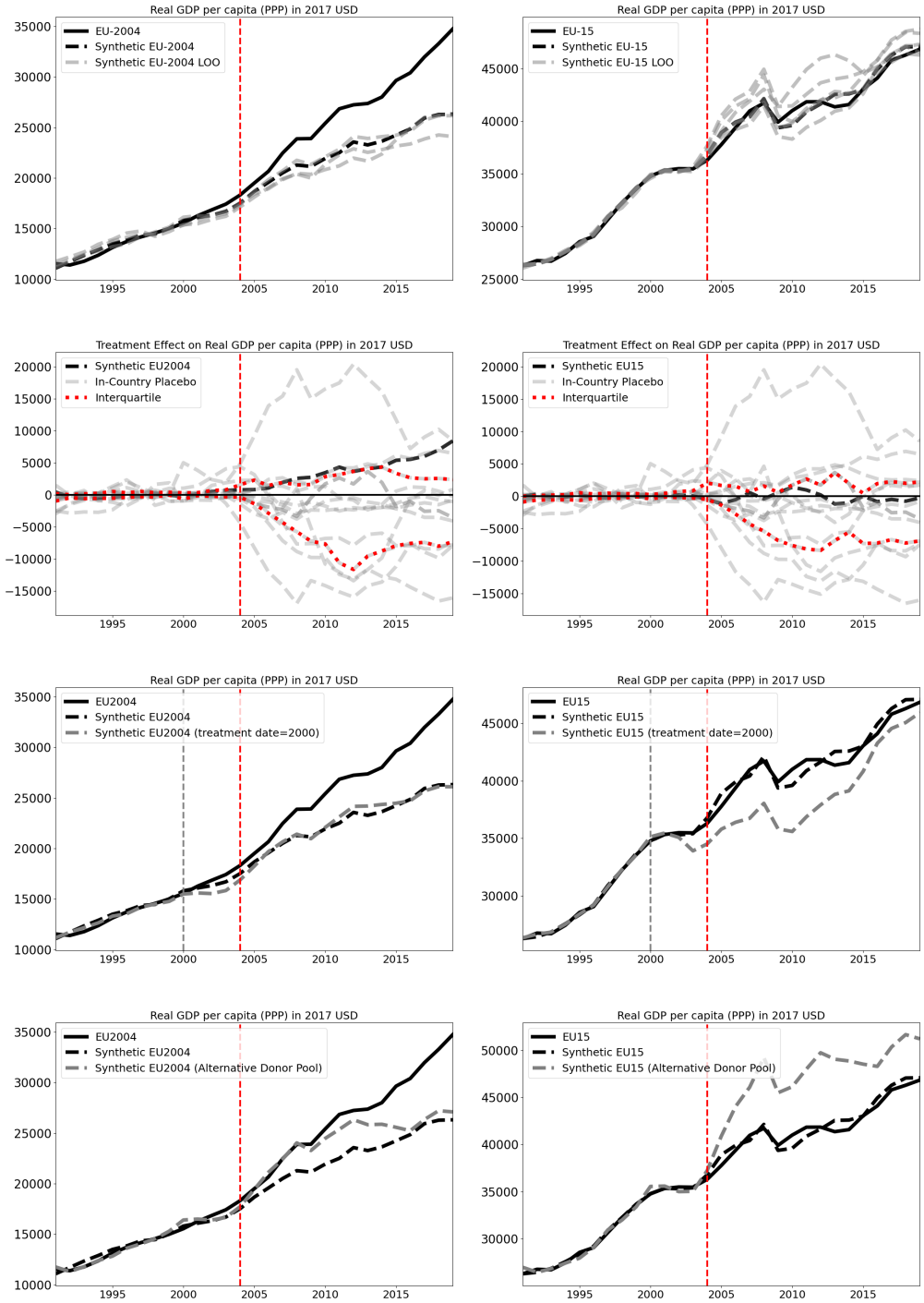
3 Robustness

In this section, I assess the robustness of the baseline results by performing a leave-one-out test, an in-country placebo, an in-time placebo, and exploring an alternative donor pool.

Leave-One-Out. This test consists of removing from the donor countries pool each country with non-zero weights and reestimating the synthetic control. The results are displayed on the first line of Figure 3 where the left panel is for the EU-2004 and the right panel for the EU-15. The effect of joining the EU is robust to this leave-one-out test yielding a large positive effect for the EU-2004 and a negligeable effect on the EU-15.

In-Country Placebo. In this robustness test, we counterfactually assign the treatment status to each country in the donor pool iteratively. We then estimate the treatment effect for each of these countries to get a distribution of treatment effects. For the untreated countries, this treatment effect should be centered around

Figure 3: Robustness of Synthetic Control for EU-2004 and EU-15



DATA: Penn World Table 10.0. NOTE: first columns for EU-2004, second columns for EU-15. First row: leaves-one-out (LOO). Second row: in-country placebo test. Third row: in-time placebo test. Fourth: alternative donor pool composed of geographical Europe that never joined the EU.

zero while it should be on the tails of that distribution for the treated country if significant. The distribution of the treated effects for each country in the donor pool is shown on the second line of Figure 3. The left panel is for the EU-2004 and the right panel is for EU-15. The treatment effect of the EU-2004 is on the right tail of the distribution and outside the interquartile range. The treatment effect is around zero and inside the interquartile range for the EU-15.

In-Time Placebo. This placebo test reestimates the synthetic control with a counterfactual treatment date in the year 2000. The third line of Figure 3 shows the results with the left panel for the EU-2004 and the right panel for the EU-15. The synthetic control for the EU-2004 estimated with a treatment date of 2000 has a similar dynamics than the baseline specification. The one for the EU-15 yields a lower GDP per capita. The latter is not robust to this test while the former is.

Alternative Donor Pool. In this test, we explore the role played by the choice of donor countries pool. On the last row of Figure 3, I show respectively in the left and right panels the synthetic control for the EU-2004 and EU-15 with donor countries from geographical Europe that never joined the EU. These countries are Albania, Belarus, Bosnia and Herzegovina, Iceland, Montenegro, North Macedonia, Norway, Moldavia, Russia, Serbia, Switzerland and Ukraine. For the EU-2004, this alternative specification yields a treatment effect in 2019 of 7,648 USD similar to the baseline results of 8,433 USD. For the EU-15, changing the donor pool yields a negative effect of the EU 2004 enlargement. Other donor pools, such that countries from the same half of the average GDP per capita, yield similar results.

Alternative Specifications. Both for the EU-2004 and the EU-15, the baseline results are robust to alternative specifications that match in the pre-treatment periods not only the GDP per capita but also the average GDP per capita growth rate, the average investment rate, inflation rate, and export share, and import share.

Taken together these robustness exercises point toward a robust and positive effect of the EU adhesion on the GDP per capita of the EU-2004. The effect on the EU-15 is not robust and sometimes above or below the baseline estimate.

4 Growth Accounting

In this section, I perform a standard and simple decomposition of GDP growth into the contribution of capital, labor, and the Solow residual for the actual EU-2004 and the synthetic EU-2004. Inspired by Solow (1957) and following Baqaee and Farhi (2019), I decompose the growth rate of GDP g_Y as follow:

$$g_Y = g_R + \overline{\frac{rK}{Y}}_{04-19} g_K + \overline{\frac{wl}{Y}}_{04-19} g_L \tag{1}$$

Table 1: Growth Accounting

	g_Y GDP	g_R Residual	$\overline{\frac{rK}{Y}}_{04-19} g_K$ Capital	$\overline{\frac{wl}{Y}}_{04-19} g_L$ Labor
EU2004	3.98	2.53	1.62	0.49
Synthetic EU2004	2.04	0.88	1.05	0.30

DATA: Penn World Table 10.0. NOTE: the first row shows the decomposition for the actual EU-2004. The second row shows the synthetic EU-14 with the baseline specification. A synthetic control is estimated for each variable used in the decomposition: $\frac{rK}{Y}$, K, $\frac{wl}{Y}$, and L.

where g_X is the growth rate of the variable X which can be output Y, capital stock K, employment L, or the Solow residual R, where $\overline{\frac{rK}{Y}}_{04-19}$ and $\overline{\frac{wl}{Y}}_{04-19}$ are respectively the average of the capital and labor share of GDP in 2004 and 2019.[2]

As in Funke et al. (2023), I estimate a separate synthetic control for each of the variables used in this decomposition, that are, the labor share $\frac{wl}{Y}$, the capital share $\frac{rK}{Y}$, the capital stock K and employment L using the baseline specification. Table 1 shows the value of each term of equation (1) for the EU-2004 on the first row and for the synthetic EU-2004 on the second row.

There are three main takeaways from this table. First, the annualized growth rate of GDP between 2004 and 2019 is close to 4% for the actual EU-2004 while it would have been halved if these countries had not joined the EU. Second, the contribution to growth of capital and labor is respectively 54% and 63% larger for the EU-2004 than for the synthetic EU-2004. Finally, the residual contribution is almost three times larger for the EU-2004 than for the synthetic EU-2004. This decomposition shows that the additional growth due to the EU adhesion was mainly due to stronger growth of the residual while the extra mobilization of capital and labor had a smaller contribution.

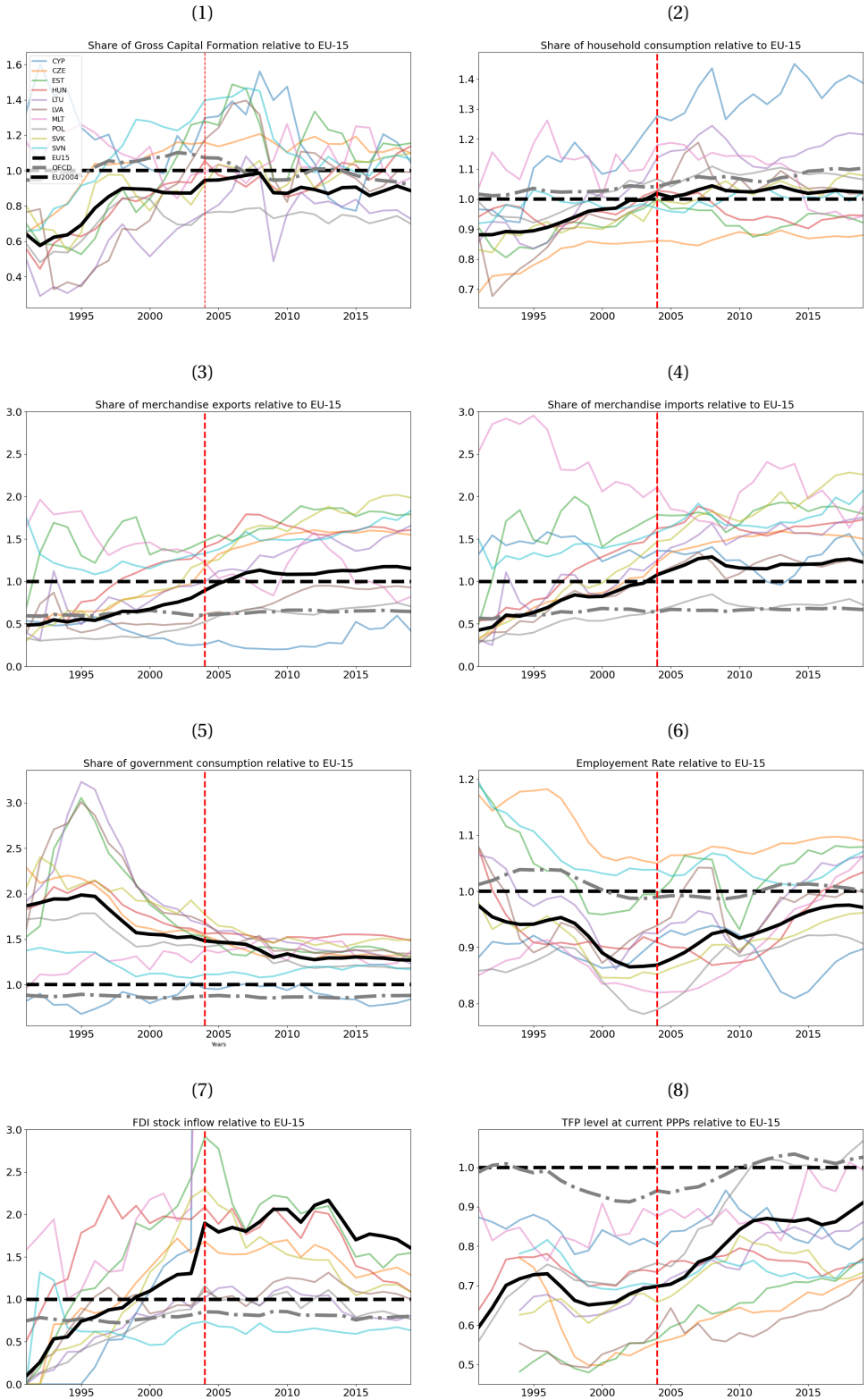
5 Mechanism

In this section, I explore the dynamics of a few aggregates of the EU-2004 and its constituent countries from 1991 to 2019 relative to the EU-15.

The first five panels of Figure 4 show the dynamics of investment, consumption, export, import, and government spending as a share of GDP relative to the EU-15. These components of demand have converged to a stable level relative to EU-15 either before 2004 for investment or consumption share, or around 2004, for

[2]The variables used for this decomposition from the Penn World Table 10.0 dataset are K =`cn`, L =`emp`, rK =`irr*cn` and $\frac{wL}{Y}$ =`labsh`.

Figure 4: Main Aggregate Relative to EU-15



DATA: Penn World Table 10.0. NOTE: the panels show (1) investment share, (2) consumption share, (3) export share, (4) import share, (5) government spending share, (6) employment rate, (7) FDI stock inflow share, and (8) TFP as estimated by the Penn World Table 10.0.

government spending and export/import share. Except for the investment share, these variables have converged to a higher level than the EU-15. This is especially the case for the export and import share that are between 10% and 20% higher than their counterpart for the EU-15 while they were 50% lower in 1991. The component of demand of the EU-2004 has therefore converged and made these economies more open to trade.

Panel (6) of Figure 4 displays the dynamics of the employment rate relative to the EU-15. Starting from a level close to the EU-15 in 1991, the relative employment rate first declined until 2004 to a level more than 10% lower than the EU-15. Between 2004 to 2019, the employment rate increased back to its initial level. This peculiar dynamic might indicate labor reallocation which generates a high level of frictional unemployment. This dynamic is consistent with the evidence showed in Dauth et al. (2021) which studies the labor market in East Germany after the reunification.

Panel (7) of Figure 4 shows the relative dynamics of the inflow of foreign direct investment (FDI) stock as a share of GDP. The FDI stock as a share of GDP has grown since 1991 and experienced an upward shift in 2004 which is mainly due to a sudden and large increase in this measure in Cyprus and Malta.[3] Since 2015, it seems that the growth of the FDI stock inflow as a share of GDP relative to the EU-15 has stopped and, if anything, is trending down. Once more, this variable seems to have converged to a stable level related to the EU-15.

Indicators of product market regulation (PMR) as computed by the OECD show similar convergence dynamics for the EU-2004. However, these indicators are only available for the years 1998, 2003, 2008, and 2013 and for a subset of the new member countries (only Hungary and Poland for 1998 and 2003). In the EU-2004, the PMR indicator for barrier to trade and investment went from 2.83 in 1991 to 0.38 in 2008 while it was respectively 0.73 and 0.42 for the EU-15. The PMR indicator for state-control or barriers to entrepreneurship have a similar dynamics. These numbers seem to indicate a convergence in regulation indices of the EU-2004 to the level of the EU-15.

Finally, panel (8) of Figure 4 shows the dynamics of TFP, as computed by the Penn World Table (see Feenstra et al. (2015) for details) relative to the EU-15 level. After a burst in the mid-1990s, TFP seems to grow faster after 2004 relative to the EU-15. The gap between this TFP measure between the EU-2004 and the EU-15 is less than 10%. While the main aggregates of Figure 4 seem to have converged before or around 2004, the TFP level of the EU-2004 relative to EU-15 has not yet converged and seems the main driver of the growth of GDP in the EU-2004 consistently with the growth accounting exercise of the section 4.

[3] To improve readability the y-axis of the FDI panel is restricted to the range 0 to 3 and crop out the post-2004 dynamics for Cyprus and Malta.

6 Conclusion

Using a synthetic control method, I find that the adhesion to the EU is associated with a large increase in GDP per capita of around 8,433 USD, or 24%, for the 75 million people living in the EU-2004. I do not find any robust effect on the EU-15, the countries already in the EU. This additional growth of the EU-2004 seems to have mostly come from sustained growth in the Solow residual rather than just an increase in labor and capital. The components of demand, employment rate, FDI, and regulations have now converged to a stable level relative to the EU-15. TFP seems to keep increasing and closing the gap with the EU-15.

This analysis has several limitations which require caution in the interpretation of the results. First, the adhesion was certainly anticipated at least for a subset of the 10 new member countries. However, the fact that I find a similar effect on the EU-2004 for the in-time placebo test is an indication that the results remain valid. Second, the validity of the synthetic control methodology comes from a long enough pre-treatment period which is, in this exercise, 13 years. Overall this exercise is a bit heroic, and even if the results are robust to various tests and specifications, we should be cautious when interpreting them as causal. However, the results are most consistent with a large positive effect of the EU adhesion on GDP per capita on the newly joining member states, and a null effect on the pre-existing member states

To conclude, I found a large positive effect of new membership to the EU without cost to previous members. The EU enlargement seems to be a positive sum game. An analysis of the data points toward a large role of the Solow residual or TFP. It seems that further research on the adhesion process is needed to understand the mechanism through which a change in policies, regulations, and institutions can have such large positive effects. Several mechanisms worth exploring such as technological transfer, competition, trade, migration, fiscal transfers, and monetary policy to name a few. Micro-level data exist that are and could be exploited. Equipped with good models of these mechanisms, we could evaluate the qualitative and quantitative impact of future adhesion. In 2024, nine countries are currently candidates to join the EU including Ukraine.

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