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The EU Miracle: When 75 Million Reach High Income

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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). In the subsequent 15 years, their GDP per capita doubled. Synthetic control methods show the new members' GDP per capita was 32% higher in 2019 thanks to the EU adhesion. I do not find a significant effect on the pre-2004 members. These findings are robust. Growth was primarily driven by the Solow residual. Data show rapid convergence in the main aggregates and declining misallocation measures, whereas TFP has not fully converged. These results point toward a large positive impact of the EU.

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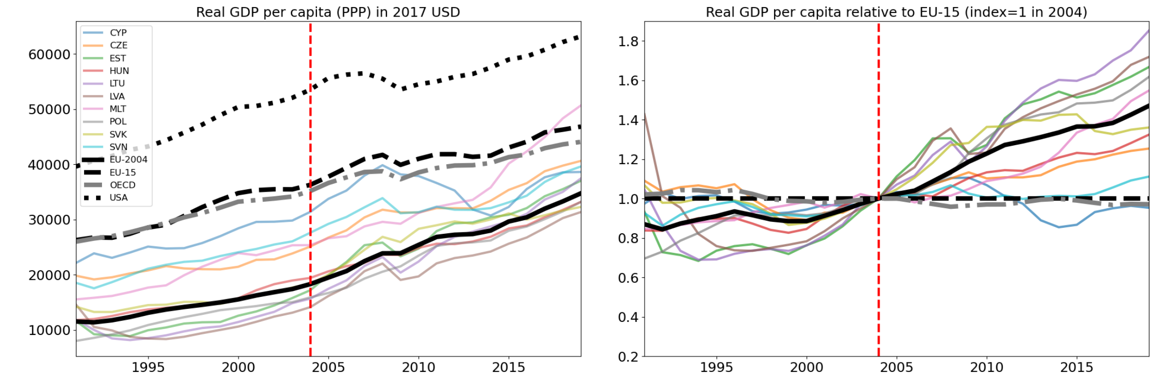
The European Union (EU), founded in 1957, aims to foster peace and prosperity in territories that have experienced war for at least 11 centuries. In 2024, this political union represents 450 million people and one-sixth of the world's GDP. In May 2004, in its largest expansion since its foundation, 75 million people across 10 countries (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia) became members of the 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. The World Bank classified them in the high-income group, whereas they were in the upper-middle-income group in 2004 (except for Cyprus and Malta). Was part of this economic miracle the result of the adhesion to the EU?

Any country wishing to join the EU must conform to the Copenhagen criteria, established in 1993 and strengthened in 1995 by the European Councils. These criteria include the stability of institutions guaranteeing democracy, the rule of law, human rights, the 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, which allows for potential EU enlargement. Implementation of this agreement made clear that the EU would be enlarged to Eastern European countries, Cyprus, and Malta. On May 1, 2004, 10 countries effectively joined the EU. My empirical results are consistent with a causal effect on GDP per capita of the regulatory and institutional changes associated with the 2004 EU enlargement. The mechanism driving this effect is the rapid growth of Total Factor Productivity (TFP). This paper has three main contributions. First, the EU adhesion process is a laboratory to test the role of institutions on growth (Acemoglu et al., 2001): the enlargement can be seen as the implementation of EU institutions to the 10 new member countries. Second, the EU adhesion has made these countries move from the middle-income group into the high-income group, a challenge that countries such as China and India are now facing. Finally, because the EU adhesion process implies reforms similar to the so-called Washington Consensus (Williamson, 1989), this paper provides empirical evidence supporting a robust positive effect of this type of reform.

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 EU in 2004, and the EU-15, which consists of the 15 member states before the 2004 enlargement. Figure 1 shows the GDP per capita for the EU-2004, EU-15, and a few countries in level in the left panel and relative to the EU-15 in the right panel. GDP per capita growth of the EU-2004 and the EU-15 were similar before 2004, but they differed consistently after 2004, due to the EU enlargement. I use the synthetic control method (SCM) introduced by Abadie and Gardeazabal (2003) to go beyond the raw data. The idea is to construct a synthetic control country for the EU-2004 or the EU-15 as a weighted average of countries from a donor pool.

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.

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 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 EU-2004 is 32%, or 8,433 USD, higher than its synthetic control. This difference represents about half of the increase in GDP per capita between 2004 and 2019. I do not find robust evidence of a difference between the synthetic and actual EU-15 GDP per capita.

To assess the robustness of these results, I perform a leave-one-out (LOO) test, in-country and in-time placebos, explore alternative donor pools, and use simulation from a neoclassical growth model with a change in frictions. The LOO test removes alternatively each country with non-zero weight and reestimates 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 treated and untreated countries 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 distribution's right tail, whereas 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 are similar to the baseline, whereas are lower for the EU-15. I also explore alternative donor-country pools, such as countries in geographical Europe that have never joined the EU, countries from the same half of the income distribution, non-EU G20 countries, or ex-communist countries. These exercises give similar results to the baseline for the EU-2004, whereas they show a non-robust effect for the EU-15. Finally, I show, in simulation from a neoclassical growth model, SCM can identify the transition to a new balanced growth path due to a reduction in friction.

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

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

Literature Review. Several papers have studied the economics of the EU, such as Alesina et al. (2017) on the political economy, Head and Mayer (2021) on the economic integration, and Lane (2006) on monetary union. Brexit has generated numerous papers on different aspects of this episode (e.g., Sampson 2017 or Broadbent et al. 2023). Some papers have specifically studied enlargement episodes. In earlier work, Baldwin et al. (1997) attempt a cost-benefit analysis of the EU enlargement to eastern European countries. Rapacki and Próchniak (2009) look at the effect of variables related to the EU enlargement on growth for the period 1996-2007. Campos et al. (2019) use the non-adhesion of Norway in 1995 to estimate the gain for Denmark, Caliendo et al. (2021) focus on the good and factor integration due to EU enlargement, whereas Hagemejer et al. (2021) and Campos et al. (2022) also use SCM to study the effect of enlargement episodes. Whereas the last two papers focus on the heterogeneity across countries, my paper focuses on the overall effect of the 2004 enlargement on both the *new* and *old* members, while pointing to the role of misallocation and productivity in this growth miracle.

Several papers have explored similar episodes, such as the German reunification (Peters 2022, Dauth et al. 2021, Bachmann et al. 2023, Akcigit et al. 2023), the Chinese and Indian growth episodes (Song et al. 2011, Fernández-Villaverde et al. 2023, Fan et al. 2023), and the transition to capitalism (Cheremukhin et al., 2016). This paper provides empirical evidence supporting the view of this macro-development literature that reducing friction and providing better institutions and regulations can generate growth.

This paper is similar in methodology to Funke et al. (2023), who study the impact of electing a populist government on GDP per capita; Billmeier and Nannicini (2013), who study the effect of economic liberalization; and Born et al. (2019), who focuse on Brexit. These papers also uses SCM developped in Abadie and Gardeazabal (2003), Abadie et al. (2010), and Abadie (2021). This research provides a complete set of tests, including simulated data of transition from a growth model, to establish the robustness of the empirical results.

Outline. The remainder of the paper is organized as follows. Section 1 explains the empirical strategy and exposes the baseline results. Section 2 explores the robustness of the main results. Section 3 describes a simple growth accounting exercise. Section 4 studies the dynamics of the main aggregates, misallocation, and TFP of the EU-2004. Section 5 concludes.

1 Synthetic Control Results

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

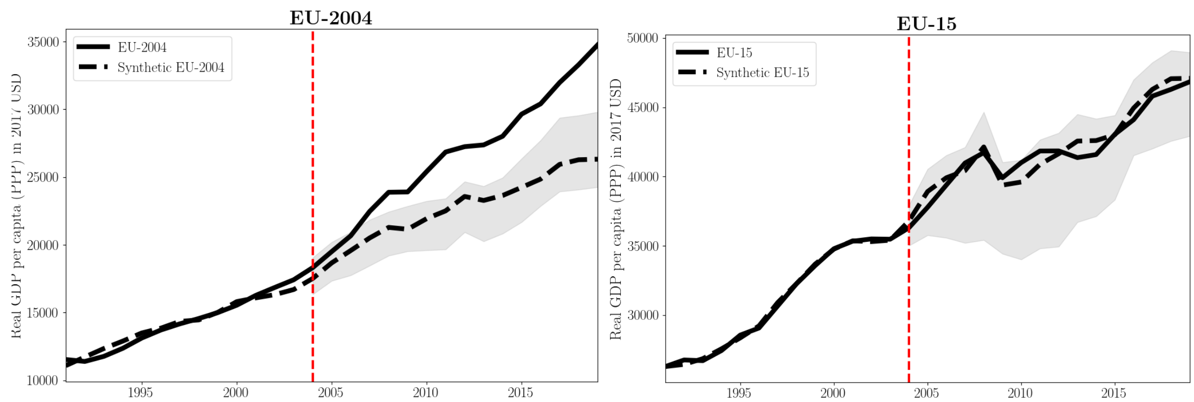
Setup. I observe the outcome variable, here real GDP per capita in PPP expressed in 2017 US dollars, for N+1 countries and T_0+T_1 years. For each country i and time t, the outcome can take the values $Y_{it}(0)$ if untreated and $Y_{it}(1)$ if treated. From $t = 1$ to $t = T_0-1$, all countries are untreated, whereas starting from T_0, the country $i = 1$ is treated. The SCM's objective is to estimate the counterfactual untreated value of the outcome variable for the treated country, $Y_{1t}(0)$. 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 weights w_i are 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-semidefinite symmetric matrix V is chosen using a data-driven approach as recommanded by Abadie et al. (2010). The constraints on the weights are here to ensure the estimator $\widehat{Y}_{1t}$ is in the convex simplex constructed by the untreated countries and avoids extrapolation.

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

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. Right panel: EU-15. The red vertical line indicates the year 2004. Shaded area shows the confidence intervals computed following Cattaneo et al. (2021, 2022).

EU enlargement. Indeed, from early 2000, the enlargement of the EU to some former communist countries, Cyprus and Malta, would clearly happen. The treated unit considered is the aggregation of all its countries to limit the spillover.

As explained in Cattaneo et al. (2021, 2022), inference for SCM methods are constructed from randomness in the construction of the weights in the pre-treatment period (in-sample uncertainty) and from the out-of-sample prediction due to the stochastic error after the treatment (out-of-sample uncertainty). I use their methods to compute confidence intervals, using a simulation-based approach for both sources of uncertainty, with 200 simulations and sub-Gaussian bounds.

EU-2004. I consider as the 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 country-pool is composed of OECD countries that never joined the EU: Australia, Canada, Chile, Colombia, Costa Rica, Iceland, Israel, Japan, Mexico, New Zealand, Norway, Republic of Korea, Switzerland, Turkey, and the US.

Using the SCM described above for the EU-2004 yields the estimates of GDP per capita displayed in the left panel of Figure 2 with simulation-based confidence intervals. Costa Rica, the Republic of Korea, and Norway have non-zero weights equal to 0.772, 0.126, and 0.102, respectively. The GDP per capita pre-treatment match is contained 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. The estimates fall outside the confidence intervals. 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: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the UK. The donor-country pool is identical to the one considered for the EU-2004 above: OECD countries that never joined the EU.

The results are displayed in the right panel of Figure 2 with simulation-based confidence intervals. Australia, Iceland, Israel, Costa Rica, Norway, and Canada have non-zero weights equal to 0.290, 0.247, 0.215, 0.146, 0.072, and 0.030, respectively. 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 averages 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; however, these estimates are within the confidence intervals.

2 Robustness

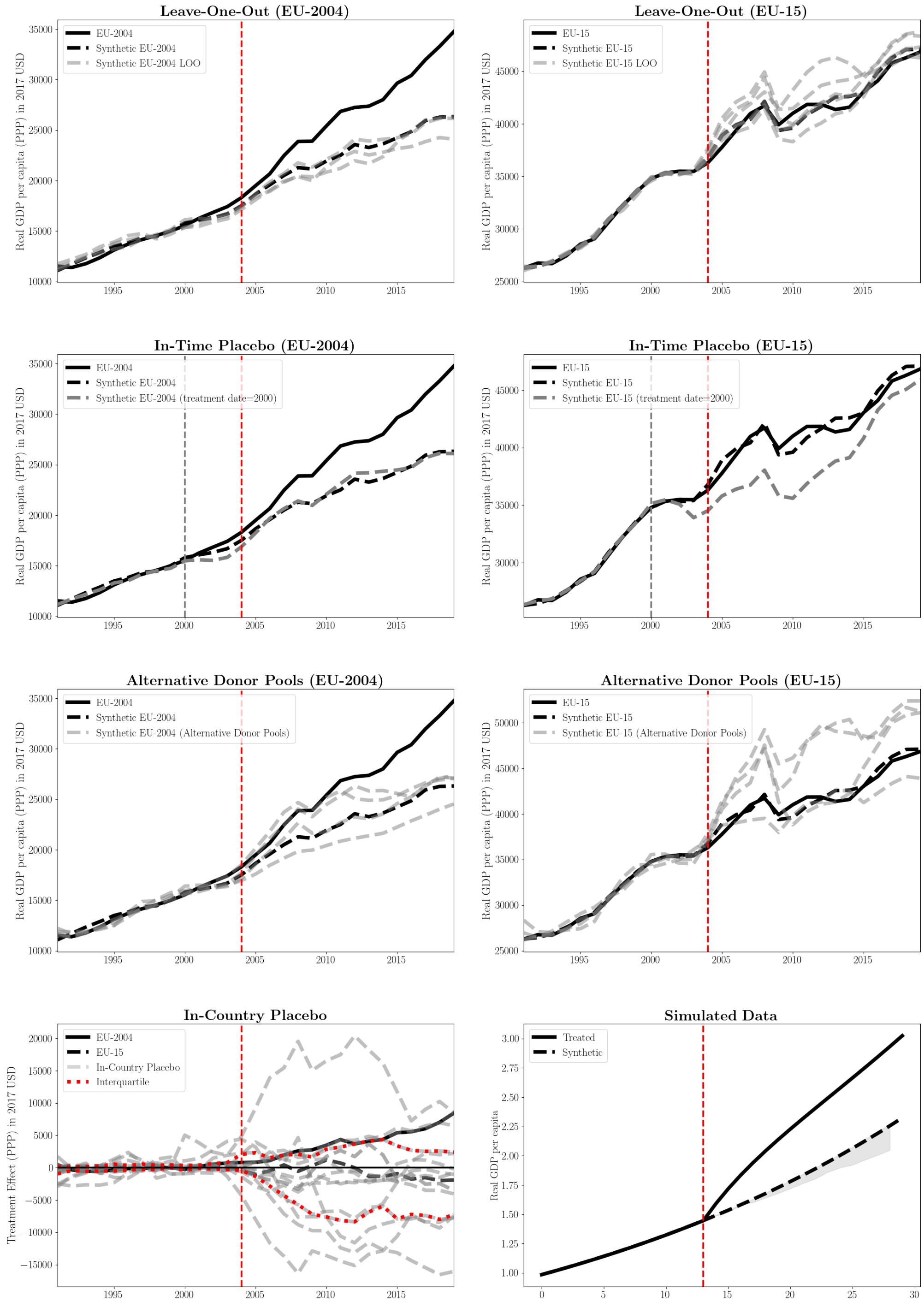
In this section, I assess the robustness of the baseline results by performing a LOO test, an in-country placebo, an in-time placebo, exploring alternative donor pools, and simulated treatment from a neoclassical growth model.[1]

Leave-One-Out. I remove each country with non-zero weights from the donor-country pool and reestimate the synthetic control. The top row of Figure 3 shows the results. The effect of the EU enlargement in 2004 is robust and yields a large positive effect for the EU-2004 and a zero effect for the EU-15. The estimated baseline effect is not due to the particular dynamics of one country in the donor pool.

In-Country Placebo. In this exercise, I counterfactually assign the treatment status to each country in the donor pool iteratively. I then estimate the treatment effect for each of these countries and get a distribution of treatment effects. For the untreated countries, this treatment effect should be centered around zero, whereas if it is significant, it should be on the tails of that distribution for the treated country. The distribution of the treated effects for each country in the donor pool is shown in the left panel of the last row of Figure 3. The treatment effect of the EU-2004 (solid) is on the distribution's right tail and outside the interquartile range. The treatment effect is around zero and inside the interquartile

[1]Importantly, for each of the robustness exercises in this section, a new set of weights is estimated. The implied synthetic control is thus a weighted average of different countries than the baseline.

Figure 3: Robustness of Synthetic Control



DATA: Penn World Table 10.0. NOTE: for the first three rows, the first column is for EU-2004 and the second column is for EU-15. First row: leaves-one-out (LOO). Second row: in-time placebo test. Third row: alternative donor pools (non EU geographical Europe, non EU geographical Europe without Norway, top half of the income distribution, ex-communist countries for EU-2004, and non-EU G20 for the EU-15). Fourth row left: in-time placebo test. Fourth row right: simulated data from neoclassical growth model.

range for the EU-15 (dashed).

In-Time Placebo. I reestimate the synthetic control with a counterfactual treatment date in 2000. The second row of Figure 3 shows the results. The synthetic control for the EU-2004 (left) estimated with the treatment date 2000 has similar dynamics to the baseline. The one for the EU-15 (right) yields a lower GDP per capita. The enlargement's large positive effect on EU-2004 is robust to an alternative treatment date, whereas the effect on EU-15 is not.

Alternative Donor Pool. I explore the role played by the donor-pool choice. The third row of Figure 3 shows the synthetic control for the EU-2004 (left) and EU-15 (right) with various donor pools. For both the EU-2004 and the EU-15, I use countries in geographical Europe with and without Norway, and countries from the same half of the income distribution. I also use ex-communist countries for the EU-2004 and non-EU G20 countries for the EU-15. For the EU-2004, these alternative specifications yield treatment effects in 2019 that are similar to the baseline. For the EU-15, varying the donor pool yields either negative or positive effects of the 2004 EU enlargement.

Simulated Data. I use a textbook neoclassical growth model where firms face a friction modeled as a tax, τ, on the rental rate of capital. From this model, I simulate a treated country and 15 untreated countries. The latter are on their balanced growth path (BGP) with random long-term growth rates and initial levels of TFP. The treated country starts from a BGP with positive friction ($\tau > 0$); after 13 periods, the friction is removed ($\tau = 0$), and output per capita converges to a new BGP. I run the baseline specifications of the SCM on these simulated data. As shown in the bottom-right panel of Figure 3, I estimate the positive effect of removing the friction on output per capita. This test indicates the SCM can identify the transition to a new BGP.

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, as expected from an estimated non-significant effect.

3 Growth Accounting

In this section, I decompose GDP growth (Solow, 1957; Baqaee and Farhi, 2019) into the contribution of capital, labor, and the Solow residual for the actual EU-2004 and the synthetic EU-2004. Formally, I decompose the growth rate of GDP g_Y as follows:

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

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, and 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 (labor share $\frac{wl}{Y}$, capital share $\frac{rK}{Y}$, 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 in the first row and for the synthetic EU-2004 in the second row.

This table provides three main takeaways. First, the annualized growth rate of GDP between 2004 and 2019 is close to 4% for the actual EU-2004, whereas 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 Solow residual contribution to growth is almost three times larger for the EU-2004 than for the synthetic EU-2004. This decomposition shows the additional growth due to the EU adhesion was mainly due to stronger growth of the Solow residual, whereas the extra mobilization of capital and labor had a smaller contribution.

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
EU-2004	3.98	2.53	1.62	0.49
Synthetic EU-2004	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-2004 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.

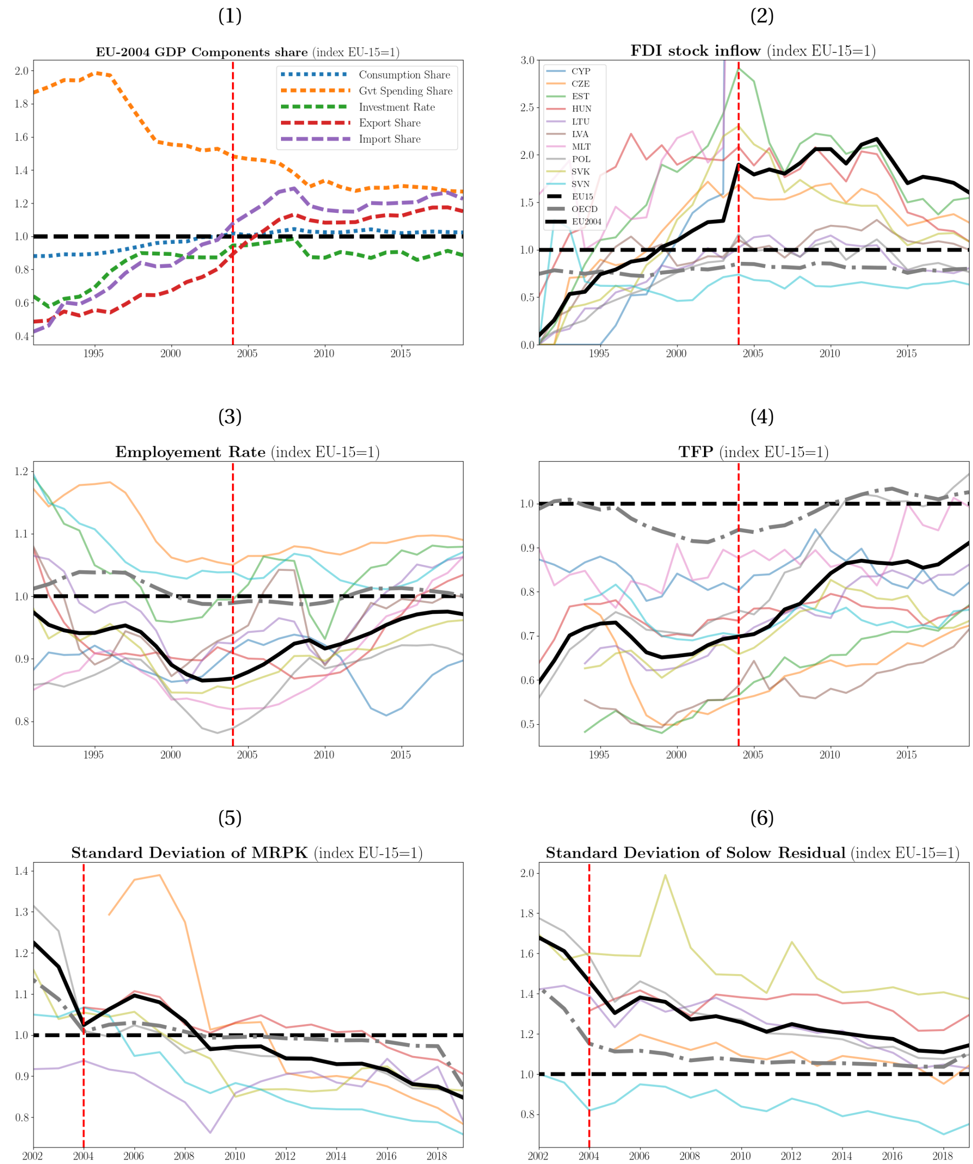
4 Mechanism

In this section, I explore the dynamics of a few aggregates of the EU-2004 to evaluate what could be the mechanism behind this growth episode.

Panel (1) of Figure 4 shows the dynamics of consumption, government spending, investment, and export and import share. These demand components have converged to a stable level relative to EU-15 before or around 2004. Notably, the export

[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: Mechanism



DATA: Penn World Table 10.0. NOTE: the panels show (1) consumption, government spending, investment, and export and import share, (2) FDI stock inflow share, (3) employment rate, (4) TFP as estimated by the Penn World Table 10.0, (5) standard deviation of MRPK, and (6) Standard Deviation of Solow Residual where the last two panel are computed using CompNet firm-level moments based on a cost-share estimation of the production function.

and import share have converged respectively to a level 10% and 20% higher than the EU-15, whereas they were 50% lower in 1991.

Panel (2) of Figure 4 shows the relative dynamics of the inflow of FDI stock as a share of GDP. The FDI inflow stock has grown since 1991 and experienced an upward shift in 2004 mainly due to a sudden and large increase in this measure for Cyprus and Malta.[3] As the demand components, FDI seems to have converged to a stable level related to the EU-15.

Panel (3) of Figure 4 displays the dynamics of the employment rate. Starting from a level close to the EU-15 in 1991, the relative employment rate declined until 2004 to a level more than 10% lower than the EU-15. Between 2004 and 2019, the employment rate increased to its initial level. This peculiar dynamic might indicate intense labor reallocation around 2004, consistent with the evidence in Dauth et al. (2021) on the labor market in East Germany after reunification.

Panel (4) of Figure 4 shows the dynamics of TFP, as computed by the Penn World Table (Feenstra et al., 2015) relative to the EU-15 level. TFP seems to grow faster after 2004 relative to EU-15. In 2019, the TFP gap between the EU-2004 and the EU-15 is less than 10%.

Figure 4 displays the standard deviation of the firm-level marginal revenue product of capital (MRPK) in panel (5) and the Solow residual in panel (6) relative to their industry average. These measures are computed from CompNet data (CompNet, 2021) by aggregating from 2-digit industries to countries and to the EU-2004 and EU-15 aggregates. These variables are usual measures of static factor misallocation (Hsieh and Klenow, 2009). Although the coverage across time and countries is sparse, these measures sharply declined around 2004 and kept decreasing to a level close to or lower than the EU-15.

Indicators of product market regulation (PMR) as computed by the OECD show similar convergence dynamics for the EU-2004.[4] In the EU-2004, the PMR indicator for barriers to trade and investment went from 2.83 in 1991 to 0.38 in 2008, while it was 0.73 and 0.42 for the EU-15. The PMR indicators for state control or barriers to entrepreneurship have similar dynamics. These numbers indicate a convergence in regulation indices of the EU-2004 to the level of the EU-15.

5 Conclusion

I find adhesion to the EU is associated with a significant increase in GDP per capita of about 32% for the 75 million people living in the EU-2004. I do not find a robust

[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.

[4]Lower values indicate better regulation. These indicators are only available for a few years and a small subset of the new member countries.

effect on the EU-15, the countries already in the EU. The EU enlargement seems to be a positive sum game. Whereas the main aggregates of the EU-2004 seem to have converged before or around 2004, the TFP level and measure of misallocation have not yet fully converged. This finding is consistent with an improvement measure in regulation indices and with the growth accounting exercise. The latter points out the residual as the main driver of GDP growth in the EU-2004.

This analysis has several limitations that require caution when interpreting the results. 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 consistent with a large and significant positive effect of the EU adhesion on GDP per capita on the newly joining member states and a non-statistically significant effect on the pre-existing member states.

Further research on the adhesion process is needed to understand how such a change in policies, regulations, and institutions can have a significant positive effect. Several mechanisms are worth exploring, such as technological transfer, competition, trade, migration, fiscal transfers, and monetary policy. Equipped with models of these mechanisms, one could evaluate the impact of future adhesion. In 2024, nine countries are candidates to join the EU, including Ukraine.

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