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Institutional integration and economic growth in Europe

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ABSTRACT

The literature on the growth effects of European integration remains inconclusive. This is due to severe methodological difficulties mostly driven by country heterogeneity. This paper addresses these concerns using the synthetic control method. It constructs counterfactuals for countries that joined the European Union (EU) from 1973 to 2004. We find that growth effects from EU membership are large and positive, with Greece as the exception. Despite substantial variation across countries and over time, we estimate that without European integration, per capita incomes would have been, on average, approximately 10% lower in the first ten years after joining the EU.

1. Introduction

Undoubtedly, the creation of the European Union (EU) and its subsequent enlargements represent one of the deeper examples of voluntary institutional change involving a large number of countries during the post-war period. The importance of such institutional integration has recently been brought to the center of political debates in relation to Brexit, the first example of a country exiting the EU. The literature on the effects of European integration on economic growth and productivity remains largely inconclusive because of well-known methodological difficulties (Eichengreen, 2007; Crafts, 2016). Probably the most serious difficulty is the heterogeneity of country experiences before and after their accession to the European Union (EU).[1]

The aim of this paper is to present new estimates of the economic effects of European integration that address these concerns. It does so using the synthetic control method (or "synthetic control method for causal inference in comparative

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[1] We use the term European Union (or EU for short) for convenience throughout, that is, even when referring to what was then called the European Economic Community or, later on, the European Communities.

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case studies") pioneered by Abadie and Gardeazabal (2003).[2] There are various important issues in assessing the benefits from EU membership, but there is consensus that building counterfactuals is essential although, as Boltho and Eichengreen note, "imagining the counterfactual is no easy task" (2008, p.13).

In estimating the net benefits from EU membership, we address the following main questions. What would be the level of per capita income and productivity in a given country had it not joined the EU? Are these pay-offs from integration temporary or permanent? Do they vary across countries?

In order to explicitly deal with country heterogeneity, these payoffs are estimated at country level for all main EU enlargements (i.e., 1973, 1981, 1986, 1995 and 2004 enlargements).[3] To construct our historical counterfactuals, we take advantage of the binarity of membership in the EU (a country is or is not a full-fledged EU member). However, the timing and the complexity of integration are two important issues to bear in mind.

Timing refers to the fact that the effects of EU entry may be felt before the formal date of accession. Economic actors may anticipate entry. This issue is particularly relevant for the later enlargements, which were preceded by long periods of preparation.

Complexity refers to the fact that, although EU membership may be binary, there is a continuum of degrees of economic integration, which cannot be fully captured by a dummy variable. The extent of integration may vary across different areas (e.g., goods, finance, services, technology, policies, etc.) and over time.[4] For instance, joining the EU in 1973 is different from joining in 1995 (as the degree and type of integration at entry is different). Similarly, the institutional and regulatory changes that countries need to make to become members are different: a country with a higher level of institutional development goes through a simpler accession process than a less institutionally developed country.

Our case-study counterfactual approach addresses the difference in the degree of integration across countries and across enlargements. Indeed, it provides measures of the effect for each single country that joined the EU and, thus, the effects of the (binary) membership status reflect the country entering conditions and EU institutions at the time of enlargement. Moreover, the synthetic control method allows us to assess how these effects change over time for each individual country. In contrast, standard panel or difference-in-difference approaches can only estimate "the overall average effect" of EU membership and not the dynamic effects of EU membership on each individual country that joined the EU.

The main conclusion from our analysis is that the economic benefits from EU membership are generally positive and large. Unsurprisingly, we find considerable heterogeneity across countries. However, our estimates indicate that only one country, Greece, experienced smaller GDP and productivity levels after EU accession. Overall, our estimates suggest that per capita European incomes in the absence of the institutional integration would have been about 10% lower on average in the first ten years after joining the EU. Although this figure varies across enlargements and over time, it is within the range of existing estimates, which go from a minimum of 5% gains in per capita income from EU accession (Boltho and Eichengreen, 2008), to a maximum of 20% gains (Badinger, 2005). Differently from the rest of the literature, our estimates are robust to a large set of sensitivity checks, including changes in the composition of the control group of non-EU countries used to construct the counterfactuals. The latter is a methodological innovation we introduce in this paper.

The paper is organized as follows. Section 2 discusses previous attempts of estimating the growth and productivity effects from EU membership. Section 3 presents the synthetic control method and the data used in the empirical analysis. Section 4 introduces our baseline estimates for the northern and southern enlargements, while Section 5 presents the estimates for the eastern enlargement. Section 6 discusses various robustness checks. Section 7 investigates the potential reasons for the variation of the effects of EU entry across countries and over time. Section 8 concludes.

2. European integration: growth and productivity effects

Theoretically, the link between integration and growth remains a subject of debate. Using an endogenous growth framework, Rivera-Batiz and Romer (1991) show that economic integration for countries at similar levels of per capita income leads to long-run growth when it accelerates technological innovation (mostly through R&D and new ideas). Such effects can also be achieved through trade in goods if the production of ideas does not need the stock of knowledge as an input (this is the so-called "lab-equipment" model). In other words, the effects of economic integration on growth depend on specific channels leading to possible long-term benefits either through larger flows of goods or flows of ideas (Ventura, 2005). Further, the size of the growth dividend also depends on the similarity of per capita income levels.

These problems in deriving clear-cut effects of integration on growth are related to a lack of debate on the type of integration (e.g., deep versus shallow integration, as discussed in Brou and Ruta, 2011, and Campos et al., 2015). In the economic literature, the distinction between "shallow" and "deep" integration was introduced by Lawrence (1996). Lawrence identified

[2] A recent authoritative review of empirical methods argues that "The synthetic control approach developed by Abadie, Diamond, and Hainmueller (2010, 2015) and Abadie and Gardeazabal (2003) is arguably the most important innovation in the policy evaluation literature in the last 15 years. This method builds on difference-in-differences estimation, but uses systematically more attractive comparisons." (Athey and Imbens, 2017, p. 9).

[3] There are important reasons for focusing on enlargement episodes instead of the experience of the six founders of the EU. One is that integration was initially gradual, with trade barriers reduced over a ten-year period. By contrast, countries involved in the subsequent enlargements joined an already largely liberalized trade area. Moreover, there are various difficulties in building a panel dataset of candidate countries for the pre-1957 period that could serve as potential counterfactuals for the EU founding members as this would necessarily encompass the WWII years.

[4] See Dorrucci et al. (2004) for continuous indexes of economic integration in Europe.

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shallow integration with traditional trade agreements affecting tariffs and other border measures, while he identified deep integration with trade agreements that go beyond traditional areas and affect competition and regulation policies. As an increasing numbers of trade agreements have deep provisions (Hoffman et al., 2017) here we refer to this as "institutional integration" to distinguish it from the political integration process, which is yet another layer of depth.

In view of the theoretical and conceptual difficulties in deriving clear-cut effects of integration on growth (chiefly regarding economic versus institutional integration) empirical analysis remains crucial.

2.1. A brief history of European integration and survey of the empirical literature

The massive destruction from World War II was followed by swift economic recovery. By the early 1950s, most European countries already register per capita GDPs above pre-war levels. A period known as the Golden Age of European growth followed and between 1950 and 1973 Western and Eastern Europe grew at unprecedented rates (Eichengreen, 2007). Deep trade liberalization shore up this extraordinary economic expansion in the context of both EU-6 and EFTA.[5]

European integration progressed over time in depth and extent. The deepening of trade liberalization in the 1960s was followed by the first EU enlargement in 1973 (with the accession of the UK, Ireland and Denmark). The 1980s saw further increases in EU membership (Greece in 1981 and Spain and Portugal in 1986), which were followed by deepening in terms of the Single Market. Next came another enlargement (Austria, Finland and Sweden in 1995) and then yet another deepening with the introduction of the common currency. This was finally followed by the largest, in terms of number of countries involved, of the enlargements (eight eastern countries plus Cyprus and Malta in 2004, Bulgaria and Romania in 2007 and Croatia in 2013).

The deepening and broadening of European integration generated substantial growth and productivity payoffs to the point that many scholars attach exceptionality to Europe. According to Eichengreen (2007), Europe is the only region showing evidence of unconditional beta and sigma convergences.

Focusing on the channels through which European integration affects growth, the early literature argues that the effects of integration on growth worked mostly through the effects of trade integration (for a critical view see Slaughter, 2001). Baldwin and Seghezza (1996) survey the evidence and found that the main channel through which European integration accelerated European growth was through the boost to investment in physical capital, induced by efficiency gains brought about by trade integration.[6]

In spite of a large literature on the benefits from trade liberalization associated to the EU, from the Single Market, and from the Euro, there is a relative dearth of econometric estimates of the benefits from EU membership.[7] Not only studies about the benefits of EU membership are few,[8] but also the majority of these (few) studies openly warn against the lack of robustness of their estimates.

Henrekson et al. (1997) estimate the benefits from membership to be about 0.6 to 0.8% per year but note that such estimates are "not completely robust" (1997, p. 1551). Badinger (2005) estimates that "GDP per capita of the EU would be approximately one-fifth lower today if no integration had taken place since 1950" but cautions that these are "not completely robust" (p. 50). Crespo et al. (2008) find large growth effects from EU membership, but warn that country heterogeneity remains a severe concern.

Ben-David (1993, 1996) studies European integration as an engine for income per capita convergence. In his 1993 paper, he concludes that European trade integration leads to a reduction of income dispersion. To overcome identification problems, Ben-David (1996) contrasts the "trade-integration club" with alternative random clubs of the same size, in terms of number of countries involved. Indeed, convergence is observed only for the trade integrated clubs.

Ben-David's analysis does not generate a robust counterfactual, as the selection of the non-integrated clubs does not ensure that they behave like the integrated club prior to integration. Yet, his analysis is a main motivation for our work, as it emphasizes the significantly different economic effects between creating an integrated area such as the EU, which involves both economic and institutional integration, and simple trade liberalization among countries, which only involves economic integration.

In short, most of the previous literature on the growth dividends from EU membership uses panel data econometrics and information up to the 1990s enlargement to infer the size of these net benefits and whether they are permanent or temporary. We echo Boltho and Eichengreen's (2008) concern that a main difficulty in such analyses is the identification of a benchmark, a baseline for comparison, a relevant counterfactual. The literature has not yet satisfactorily addressed this issue.

[5] The European Free Trade Association (EFTA) was established in 1960. The founding members were Denmark, United Kingdom, Portugal, Austria, Sweden, Norway and Switzerland (only the last two are still members today).

[6] This earlier literature focuses on the effects of international trade on growth and often assumes that all the increase in trade is driven purely by intra-European integration efforts. Moreover, the extent of trade diversion of "deep" agreements such as the EU is questionable as they contain both provisions that discriminate between members and non-members (such as tariffs) and provisions that favor trade with all (provisions that limit state aid to domestic producers or that increase competition). Recent evidence finds that deep agreements increase members' trade but do not significantly divert trade with non-members (Mattoo et al, 2017).

[7] See among others Boltho and Eichengreen (2008).

[8] Crafts (2016) and Sapir (2011) survey the literature.

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3. Methodology, sample and data

The aim of this paper is to estimate what would have been the levels of per capita GDP or productivity in a given country if it had not become a full-fledged member of the European Union. We answer this question for the countries that became EU members in the 1973, 1980s, 1995 and 2004 enlargements, using the "synthetic control method for causal inference in comparative case studies" or synthetic control method (SCM), developed by Abadie and Gardeazabal (2003) and Abadie et al. (2010, 2015).[9]

3.1. The synthetic control method

In general, the dynamic effect of an intervention or event occurring at a given time (T_0) on a country could be represented by:

$$\tau_{it} = Y_{it}^{I} - Y_{it}^{C} \qquad \text{for all } t \geq T_0 \tag{1}$$

where Y_{it}^{I} is country's i outcome at time t, and Y_{it}^{C} is country i's outcome at time t had it not been affected by the intervention, that is, the counterfactual. Since we do observe Y_{it}^{I} for $t \geq T_0$ but we cannot observe Y_{it}^{C} for $t \geq T_0$, we need to provide an estimation of the counterfactual (i.e., $\widehat{Y_{it}^{C}}$) to assess the dynamic effect of the intervention on country i (i.e., $\hat{\tau}_{it}$).

In our context, countries affected by the event (EU membership) are clearly not randomly selected. Therefore, to assess the effect of the event we need to compare the country that joined the EU against a group of control countries (non-EU members) before and after.

To make such a comparison we use the SCM. It differs from methods such as difference-in-differences in that it "moves away from using a single control unit or a simple average of control units, and instead uses a weighted average of the set of control" (Athey and Imbens, 2017, p. 9). Indeed, the SCM focuses on the construction of the "synthetic control" or "artificial country", which serves as the counterfactual scenario for the country affected by the event (or "actual country").

Consider a set of $N+1$ countries for each period $t \in [1, T]$, where $i = 1$ is the country joining the EU at time $T_0 \in (1, T)$, and $i = 2, \ldots, N+1$ are the non-EU control countries (or "donor pool"). Abadie et al. (2010) show that an unbiased estimate of the counterfactual obtains by assigning a weight w to each control country, so that $\sum_{i=2}^{N+1} w_i^* Y_{it} = \widehat{Y_{1t}^{C}}$ for $t \geq T_0$. An unbiased estimate of the dynamic effects of EU membership on country i can therefore be represented by:

$$\hat{\tau}_{it} = Y_{1t} - \sum_{i=2}^{N+1} w_i^* Y_{it} \qquad \text{for all } t \geq T_0. \tag{2}$$

The combination of optimal weights (w_i^*) assigned to the control countries in Eq. (2) is chosen to minimize the pre-event (pre-EU accession) differences between the country in question and its synthetic (weighted) control in terms of a set of predictors of the outcome (Z), so that $\sum_{i=2}^{N+1} w_i^* Z_i = Z_1$ and $\sum_{i=2}^{N+1} w_i^* Y_{it} = Y_{1t}$ for $t < T_0$.

All else the same, the longer is the pre-event period, the more accurate is the synthetic control. Indeed, the year-by-year match during the pre-event period between the country and its synthetic control permits to deal with time-varying omitted variables. This is a further improvement with respect to other methods, such as panel fixed-effects or difference-in-differences, which can only account for confounders that are time-invariant or share a common trend.[10]

There are two key assumptions in SCM: (1) the choice of predictors of the outcome should include variables that can approximate the path of the country affected by the intervention but should not include variables that anticipate the effects of the intervention; and (2) the countries used to estimate the synthetic control (the "donor pool") should not be affected by the event.

The first assumption implies that the effects of the event on the country are not anticipated. In our case, the absence of anticipation effects means that the growth effects of EU membership are observed only after each candidate country effectively becomes a full-fledged member, not before. If agents anticipate these effects, then the SCM is likely to generate a lower-bound estimate of the true effects because part of it occurs before membership.

The second assumption requires that the performance of the countries selected in the "donor pool" should not be affected by the EU accession of the country under analysis. Although this assumption obviously holds when one defines the intervention as "full-fledged EU membership," one should keep in mind that in a globalized world, spillovers occur and cannot be fully excluded. Yet the direction of the bias that spillovers can introduce in our estimations is unclear. Indeed, through their trade or financial links, some donor countries can benefit from the EU integration of the country affected by the event, while other donor countries can lose.

3.2. Data and model specification

In our application of the SCM, we employ two alternative outcome variables (Y_{it}) GDP per capita and labor productivity (the latter, defined as GDP per worker; both variables are from Penn World Tables).

[9] See Imbens and Wooldridge (2009) for a discussion of SCM in comparison to similar econometrics methods.
[10] See Bove et al. (2017) for a comparison of SCM and panel fixed effects.

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Our choice of the predictors (Z_i) of the outcome is based upon the specification used by Abadie et al. (2003, 2015) and is in line with the empirical growth literature (Levine and Renelt, 1992). The specification includes the investment share in GDP, population growth and pre-intervention income (all from Penn World Tables), share of agriculture and share of industry in value added, secondary and tertiary gross school enrolment (from the World Bank's World Development Indicators). As noted, in order to avoid the inclusion of variables that are directly affected by the event, we deliberately exclude trade, foreign direct investment and financial integration variables. We indirectly assess the role of these latter variables in Section 7 below, by estimating the main determinants of the effects of EU integration derived from the SCM.

The weights on the countries forming the synthetic counterfactual are determined on the basis of the match produced by the determinants of GDP per capita or labor productivity. Therefore, countries forming the "artificial country" may differ from the treated country in the more structural dimensions associated to geography, culture and institutions. However, those variables typically are "slow-moving", unlikely to change in the donor pool during the pre and post-treatment periods. In summary, the synthetic counterfactual matches the outcome's predictors so that the outcome variables mimic both the levels and the trend of the actual country's outcome before the event occurs.[11]

3.3. Sample

We estimate counterfactuals for each country in four EU enlargements, namely for Denmark, Ireland and the UK in 1973, for Greece, Portugal and Spain in the 1980s, for Austria, Finland and Sweden in 1995 and for the eight eastern European countries in 2004.[12] As our focus is on long run effects, our analysis stops in 2008 to avoid confounding effects from the global financial crisis.

For the estimation of the baseline results we use a donor pool that excludes EU27 but includes OECD, EU neighbouring countries, Mediterranean and newly industrialized countries.[13] Two points are worth stressing. First, following Abadie et al. (2015), the donor pool does not have to include only countries having high probability of becoming EU members in the future (indeed, as discussed in Section 3.1, the condition that cannot be violated is that countries in the control group are not affected by the EU accession of the country under analysis). Second, the specific donor pool selected is important for the point estimates but it is not critical. As shown in Section 6.2, our results are robust to random selection of the countries in the donor pool.

In general, the SCM addresses endogeneity and omitted variable concerns but one of its main drawbacks is that it "does not allow assessing the significance of the results using standard (large-sample) inferential techniques, because the number of observations in the control pool and the number of periods covered by the sample are usually quite small in comparative case studies" (Billmeier and Nannicini, 2013, p. 987).

One needs to be aware of the potential dependence of our results on idiosyncratic shocks affecting countries in the donor pool. The occurrence of such idiosyncratic shocks in the post-accession period may be incorrectly interpreted as showing the effect of the EU membership on the new member State. Therefore, in Section 6.2, we implement a simple yet novel solution to test the robustness of our findings to the composition of the donor sample. Namely, for each EU country under analysis, we construct one thousand alternative counterfactuals based on alternative donor samples that include countries randomly selected from the full donor pool sample. We then compare our main estimates with those obtained with the random samples, both in terms of pre-accession fit and estimated effects induced by the EU membership.

4. Results for the northern and southern enlargements

Figs. 1 and 2 present the counterfactual baseline results for the countries that joined the EU during the 1970s, 1980s, and 1990s.

Fig. 1 reports, for the countries taking positive weights, the set of optimal weights that allows the synthetic country to mimic as close as possible each country before the accession to the EU. For most countries, there are only a few donors with positive weights. For instance, the set of optimal weights for "synthetic Spain" are 0.373 to Brazil, 0.358 to New Zealand, and 0.268 to Canada (and 0 for Albania or Japan or any other country in the donor sample). This means that the "synthetic Spain" is composed for the 37.3% by Brazil, the 35.8% by New Zealand, and the 26.8% by Canada.

Given these estimated weights obtained for each synthetic country, Fig. 2 shows the actual and counterfactual series of GDP per capita: the continuous line represents the actual per capita GDP, while the dashed line shows its estimated synthetic counterfactual. The vertical dashed line divides the pre-accession to the EU period (over which the weights for the 'synthetic country' are estimated) from the post-accession period (over which the 'synthetic country' is projected).

Greece is the only of the 17 countries we consider for which net benefits are negative. Our estimates show that Greek per capita GDP would have been higher if Greece had not become a full-fledged EU member in 1981. Yet the gap shrinks

[11] One should also keep in mind that growth regressions using traditional panel methods implicitly attribute weights to the various countries, with no non-negative restriction on such weights. The countries included in the panel estimations are highly heterogeneous, but it is accepted that the effect say of investments or education on growth is similar across countries (Abadie et al., 2015).

[12] We have excluded from our analysis Cyprus and Malta due to data availability and to their relative small size (and the difficulties this may generate to find satisfactory matching countries), and Bulgaria, Croatia and Romania because the period post-EU membership is too short.

[13] See the appendix for the full list of countries.

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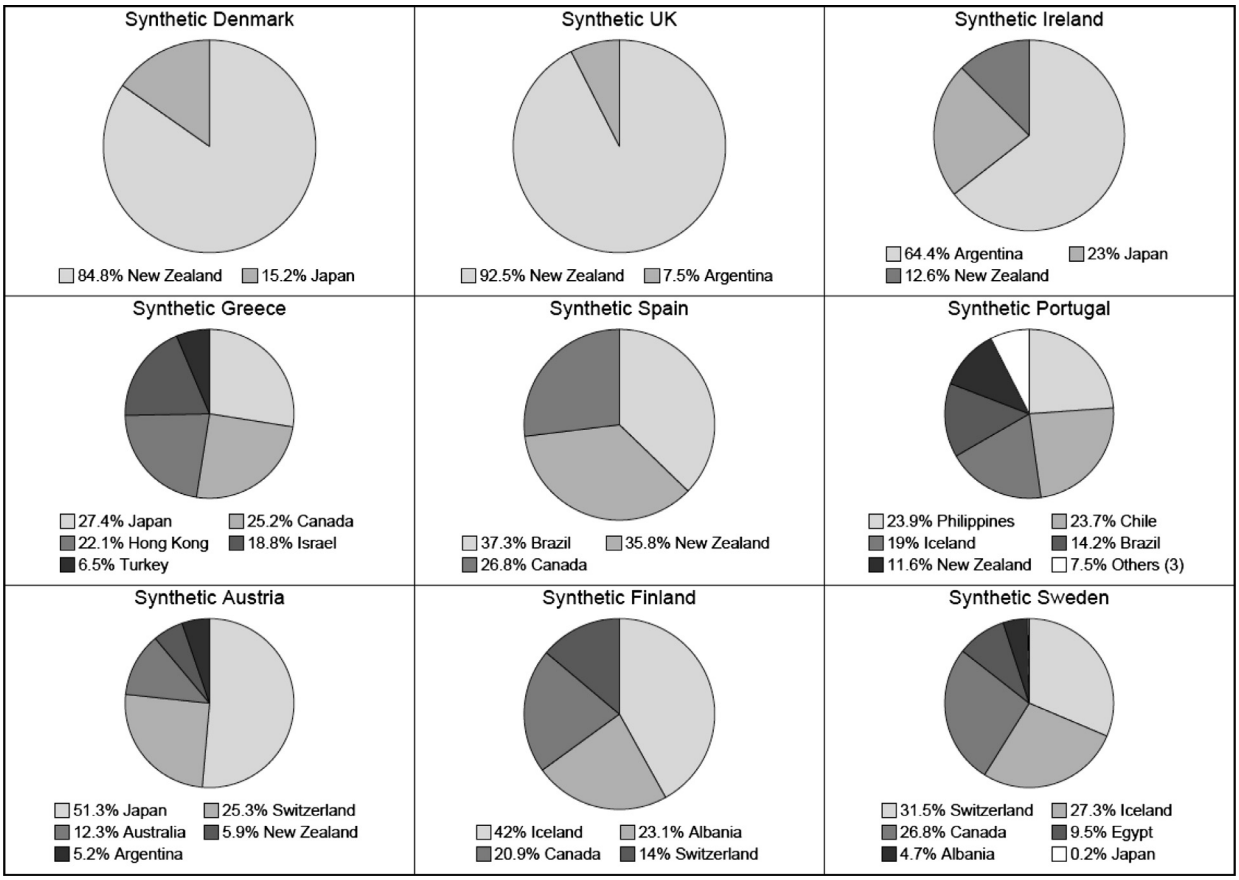

Fig. 1. Composition of the synthetic country – GDP per capita, northern and southern enlargements.
Note: In each graph, the pie chart reports the six donor countries (and the relative weights) that contribute the most to the construction of the synthetic country in question. For full details see Table A.1 in Appendix.

over time, particularly after 1995. This result does not imply Greece would be better off leaving or never joining the EU. From 1981 to 1995, growth rates in the EU were relatively high and Greece experienced divergence (Vamvakidis, 2003). The opening up of an uncompetitive domestic industry may have been too sudden.[14] However, entry into the economic and monetary union represents a turnaround, with growth rates in Greece faster than in the EU for 1996–2008, mostly driven by telecommunications, tourism and the financial sector (Arkolakis et al., 2017). Interestingly, the latter is one of the few areas in which the country implemented structural reforms (Mitsopoulos and Pelagidis, 2012).

Concerning the countries that joined the EU in 1973, the results in Fig. 2 suggest that per capita GDP would be considerably lower in these countries had they not joined the EU. The actual and the synthetic series are reasonably close before 1973 and diverge afterwards. The dynamics of these benefits is noteworthy. For example, the benefits from EU membership for the UK (although substantial throughout) may have slowed down in later years while for Ireland they seem to have instead accelerated. This would suggest that perhaps the UK benefited more from the Single Market while Ireland benefited more from the common currency. This "sequence of deepening" also illustrates how difficult it is to separate temporary from permanent effects.

The results for Austria, Sweden and Finland suggest that EU membership generated positive dividends in terms of per capita GDP. Overall, the estimated payoffs from EU membership for Sweden, and to a lesser extent Austria and Finland, are small compared to those in the 1973 enlargement. One possible explanation is that when these countries joined the EU in 1995 they already had a relatively high level of per capita income. However, Denmark and the UK were at similar income per capita levels relative to existing EU countries.[15] An alternative explanation is that, while the main impediment for the 1995 countries to join was political (the Cold War), the 1973 countries designed, implemented and benefited from

[14] In 1976, the Council of Ministers extraordinarily rejected the European Commission's view that was against opening accession negotiations with Greece and in favor of delaying entry until Greek producers were deemed able to compete in the Common Market.

[15] The "per capita income gap at entry" is the percentage difference between the per capita income average of existing members and that of candidate countries, in USD PPP, for the official accession year. We calculate that candidate countries in 1973 had on average 96% of the per capita income of existing members, in the 1980s this was 63%, in 1995 this was 103%, while in 2004 it was 45%.

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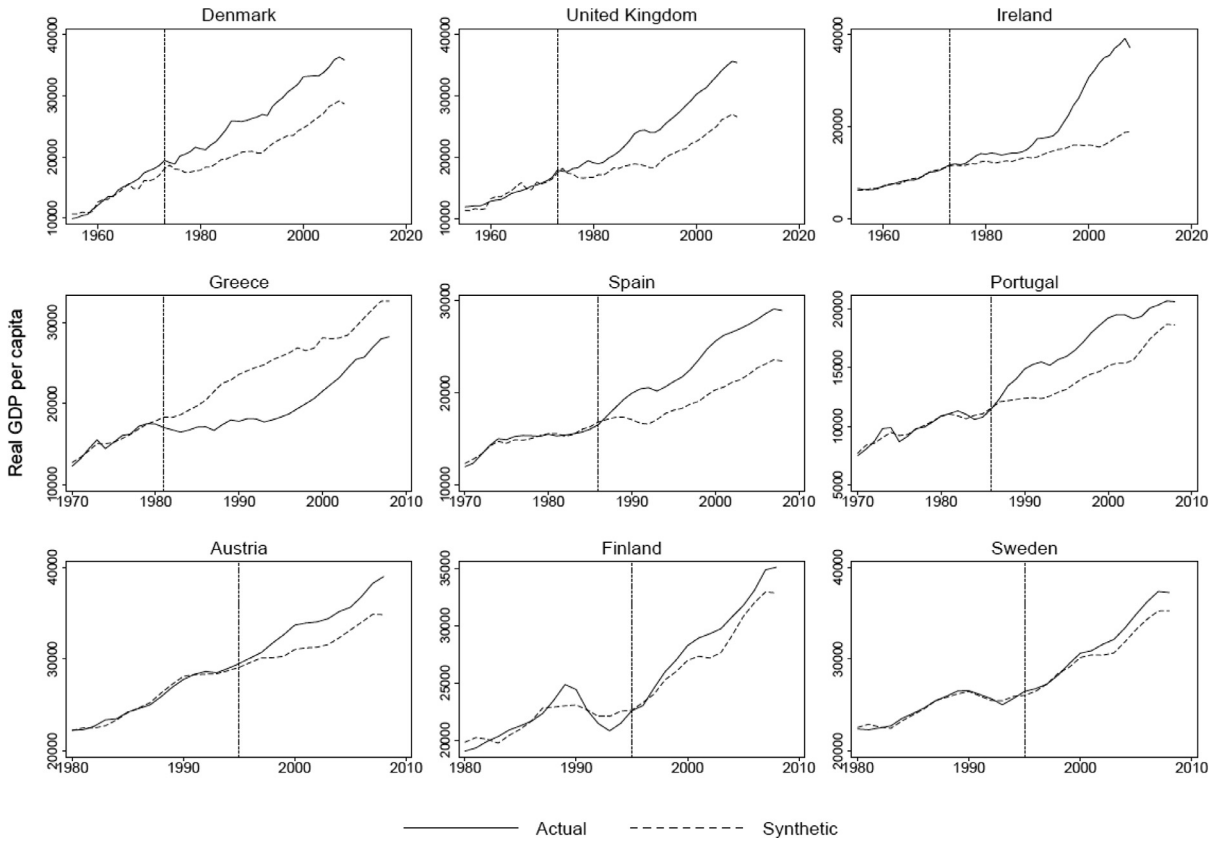

Fig. 2. Actual vs. synthetic – GDP per capita trends, northern and southern enlargements.
Note: In each graph, the continuous line represents the trend of the real GDP per capita (PPP, 2005 International Dollars) for the actual country, while the dashed line shows the trend for the same variable for the synthetic country. For each country the analysis ends in 2008. The composition of each synthetic country is reported in Figure 1 and full details in Table A.1 in Appendix.

the Single Market (1986–1992) and from the common currency and attendant financial integration. A possible line of inquiry could focus on institutions. If the benefits are due to the potential positive effect of EU accession on institutional integration, then one would expect smaller potential gains from membership in the case of Austria, Finland and Sweden in 1995, as they had already relatively high levels of institutional development.

5. Results for the eastern enlargement

Let us now focus on the results for the eastern European countries that joined the EU in 2004. Given the shorter data series, we must be more cautious when interpreting this set of results.

Fig. 3 reports the results for the 2004 eastern enlargement. Results are mixed, with benefits that are positive and large for some countries, while weak or even negative for others.

In contrast with all other previous enlargements, the eastern enlargement was preceded by a long preparation process, which entailed substantial institutional change both for entrants and for the EU itself (see Bache et al., 2011 and Campos and Coricelli, 2002). Moreover, the pre-accession period involved free trade and economic integration agreements. The 2004 enlargement is the first one for which a conscious effort to guarantee satisfactory levels of institutional integration takes place *before* the official accession date. Therefore, it is likely that part of the effects related to the entry in the EU manifested before 2004 (Bruszt and Campos, 2017).

Furthermore, economic agents may have anticipated the future EU membership of these countries. The main political signal on the forthcoming enlargement was given by the European Council in December 1997, which established the procedures for the eastern enlargement following the indications of the report "Agenda 2000" submitted by the EU Commission. Accordingly, in order to assess the effects for the eastern enlargement we re-estimate the synthetic counterfactuals using 1998 as the accession year, rather than the official accession date (2004).[16]

[16] Other enlargements are less likely to be affected by anticipation effects: Kutan and Yigit (2007) show that structural breaks in GDP and productivity series for the 1980s and 1990s enlargements occur substantially close to the "official" accession dates.

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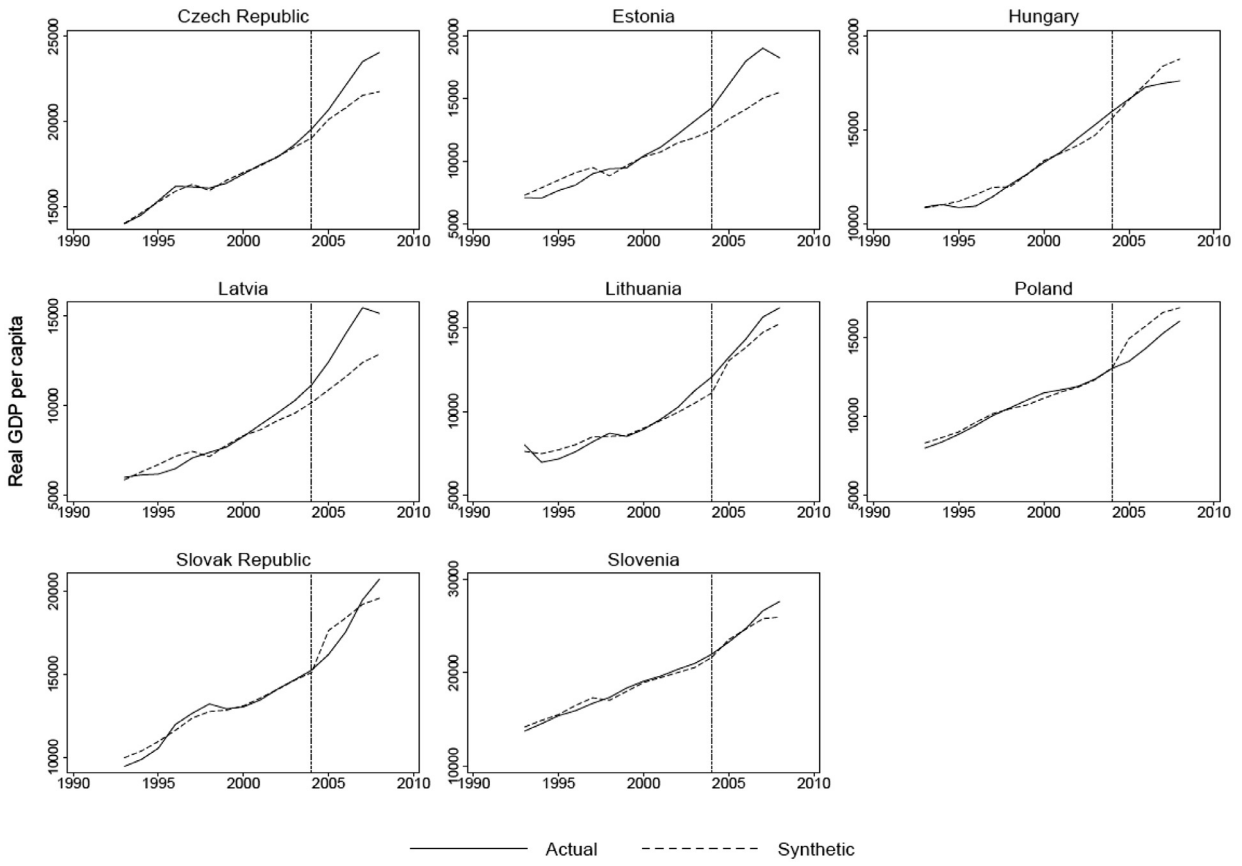

Fig. 3. Actual vs. synthetic country – GDP per capita trends, eastern enlargement (2004 accession).
Note: In each graph, the continuous line represents the trend of the real GDP per capita (PPP, 2005 International Dollars) for the actual country, while the dashed line shows the trend for the same variable for the synthetic country. For each country the analysis ends in 2008. The composition of the synthetic country is reported in Figure A.1 and full details in Table A.2 in Appendix.

Fig. 4 reports the set of optimal estimated weights that allows the synthetic country to mimic as close as possible each actual country before 1998. Results in Fig. 5 show that the benefits from EU integration are positive and large across these countries with the exception of the Slovak Republic.

Given the long preparation before accession, one can argue that in addition to anticipation effects there could be effects due to actual implementation of pre-accession agreements leading to further integration with EU member states. Indeed, there is evidence of such effects, which, together with the results on the anticipation effects, helps to explain the ambiguous and not robust effects for the 2004 accession date.[17]

6. Magnitude of the effects and sensitivity analysis

To further probe the robustness of our results, first we calculate the net benefits from EU membership at different time horizons, and, then, we report estimates using randomly-generated donor samples to address concerns that the estimates above may be driven by the specific composition of a sample of donor countries.

6.1. Post-accession effects at different time horizons

Because the time horizon over which we can reasonably attribute the dynamics of per capita GDP or productivity relative to a synthetic counterfactual to EU accession varies, in Table 1 we report the average difference between actual and the

[17] We thank an anonymous referee for this observation. In the Appendix, we provide a first and partial attempt using the SCM. The event we assess is the joint presence of free trade and economic integration agreements between eastern candidates and EU members (the definition of the year of treatment follows Regional Trade Agreements Database from Egger and Larch, 2008). Figures A.8 and A.9 (and Tables A.7 and A.8) show that the effects are positive both on GDP per capita and labor productivity. A full treatment of multiple treatment effects goes beyond the scope of this paper and it is an interesting area for future research.

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Table 1
Percentage effects.

	GDP per capita			Labor productivity		
	(1) All post-accession	(2) 10 years post-accession	(3) 5 years post-accession	(4) All post-accession	(5) 10 years post-accession	(6) 5 years post-accession
Denmark	23.863	14.298	10.292	12.673	−0.562	−0.494
United Kingdom	23.694	8.586	4.824	32.832	8.537	5.551
Ireland	48.9	9.395	5.242	28.348	8.555	6.64
Greece	−19.758	−17.336	−11.591	−12.293	−14.144	−11.456
Portugal	18.351	16.537	11.733	11.66	12.321	10.261
Spain	19.806	13.662	9.348	4.032	3.724	0.759
Austria	7.208	6.364	4.467	13.342	12.896	10.811
Finland	4.365	4.017	2.185	4.261	4.469	4.099
Sweden	3.174	2.353	0.823	2.925	2.617	1.713
Czech Republic	5.615	5.615	2.11	3.665	3.665	−0.563
Estonia	24.153	24.153	16.342	20.462	20.462	15.981
Hungary	12.299	12.299	8.734	17.697	17.697	12.937
Latvia	31.692	31.692	18.016	19.37	19.37	14.952
Lithuania	28.082	28.082	17.352	24.114	24.114	15.31
Poland	5.93	5.93	8.67	9.387	9.387	10.257
Slovak Republic	0.302	0.302	1.315	−1.755	−1.755	−1.985
Slovenia	10.35	10.35	6.327	12.778	12.778	10.848
Northern enlargement (1973)	32.152	10.76	6.786	24.617	5.51	3.899
Southern enlargement (1981 and 1986)	6.133	4.288	3.164	1.133	0.633	−0.145
Southern enlargement (1986)	19.078	15.099	10.541	7.846	8.022	5.51
Northern enlargement (1995)	4.915	4.244	2.491	6.843	6.661	5.541
Eastern enlargement (1998 anticipation)	14.803	14.803	9.858	13.215	13.215	9.717

Note: For each EU country, the *% Effect* is given by the percentage difference between the average real GDP per capita (or real GDP per worker, i.e. labor productivity) of the actual country in the post-accession period (or first ten, or first five years from the accession) and the average real GDP per capita (or labor productivity) of the synthetic country in the same period. For eastern countries we consider the 1998 as the beginning of the post-accession period.

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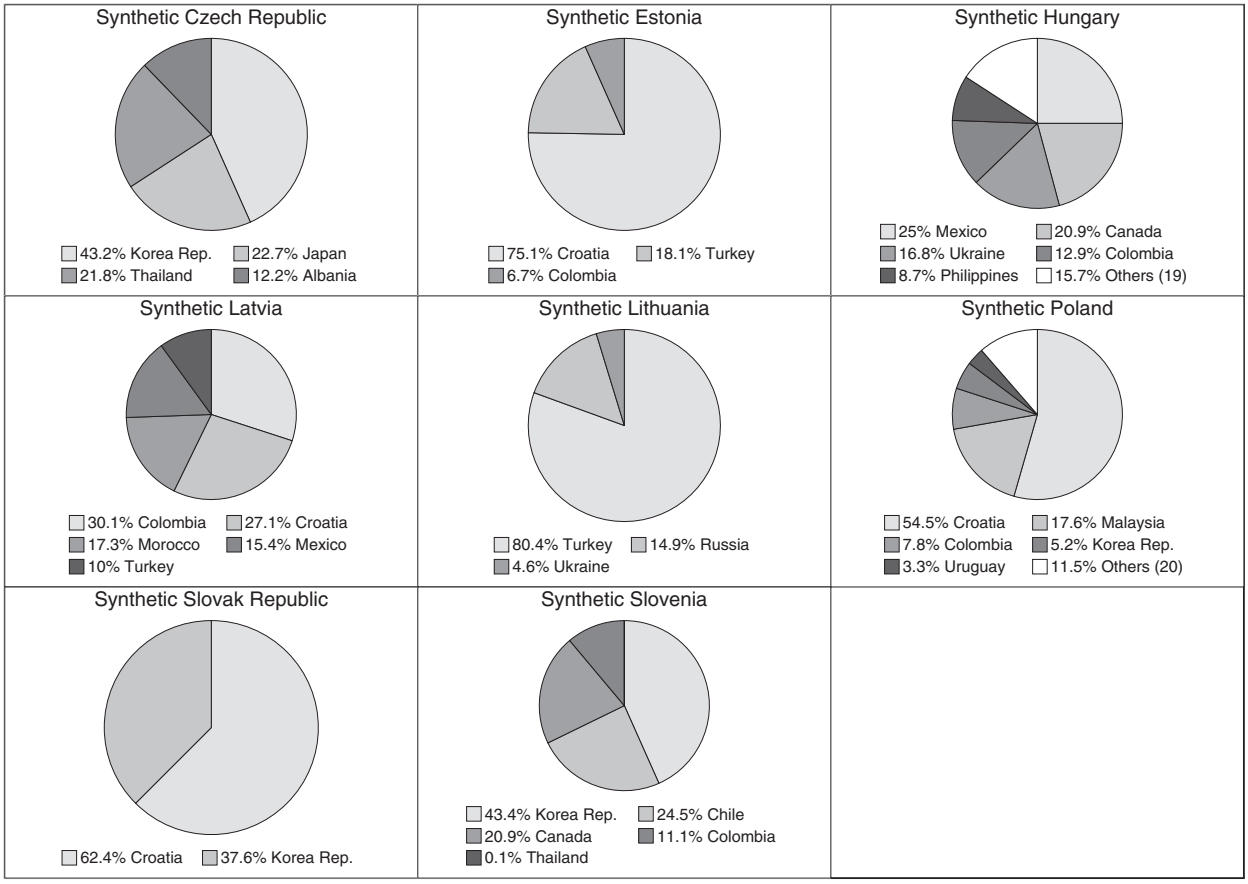

Fig. 4. Composition of the synthetic country – GDP per capita, eastern enlargement (1998 anticipation).
Note: In each graph, the pie chart reports the six donor countries (and the relative weights) that contribute the most to the construction of the synthetic country in question. For full details see Table A.3 in Appendix.

synthetic country for the whole post-accession period, for the first ten, and for the first five years after accession to the EU. For the eastern enlargement, Table 1 considers the results obtained using 1998 as the *de facto* accession year.

Focusing on both per capita GDP (columns 1 to 3) and productivity (columns 4 to 6, in Table 1), there is little evidence that the effects of EU accession decrease over time after each enlargement.[18] This high degree of persistence of the effects of accession may indicate the continuous deepening of the integration process. For instance, countries involved in the 1973 and 1980s enlargements experienced a major deepening of EU integration after their accession thanks to the Single Market. Using a medical metaphor, one may be worried that the treatment was strengthened after a given period. Of course, we cannot claim from our evidence whether the deepening of integration through the Single Market contributed to sustain the early effects or whether it increased the dividends from EU membership. However, it is worth noting that for these countries we find smaller but substantial effects also at the five and ten-year windows post-accession. Thus, such strengthening of the treatment does not seem to crucially affect the positive benefits from the membership even before the creation of the Single Market.[19]

Focusing on the more comparable "first ten years after accession," the 1970s, 1980s (excluding Greece), and the eastern enlargement (considering anticipation effects) have similar net benefits. One can identify large heterogeneity of the effects across countries, with Latvia, Lithuania and Estonia as the countries that have benefited the most and Greece as the one that has benefited the least (to a lesser extent, the others are Sweden, Finland and the Czech and Slovak Republics).

[18] Although in this section we comment results for both GDP per capita and labor productivity, for reasons of space the full set of results for labor productivity are in the Appendix. See Figures from A.2 to A.7 and Tables from A.4 to A.6.

[19] Note that recent literature on the effects of the Single Market suggests that such deepening had relatively modest effects on EU GDP per capita (Mariniello et al., 2015).

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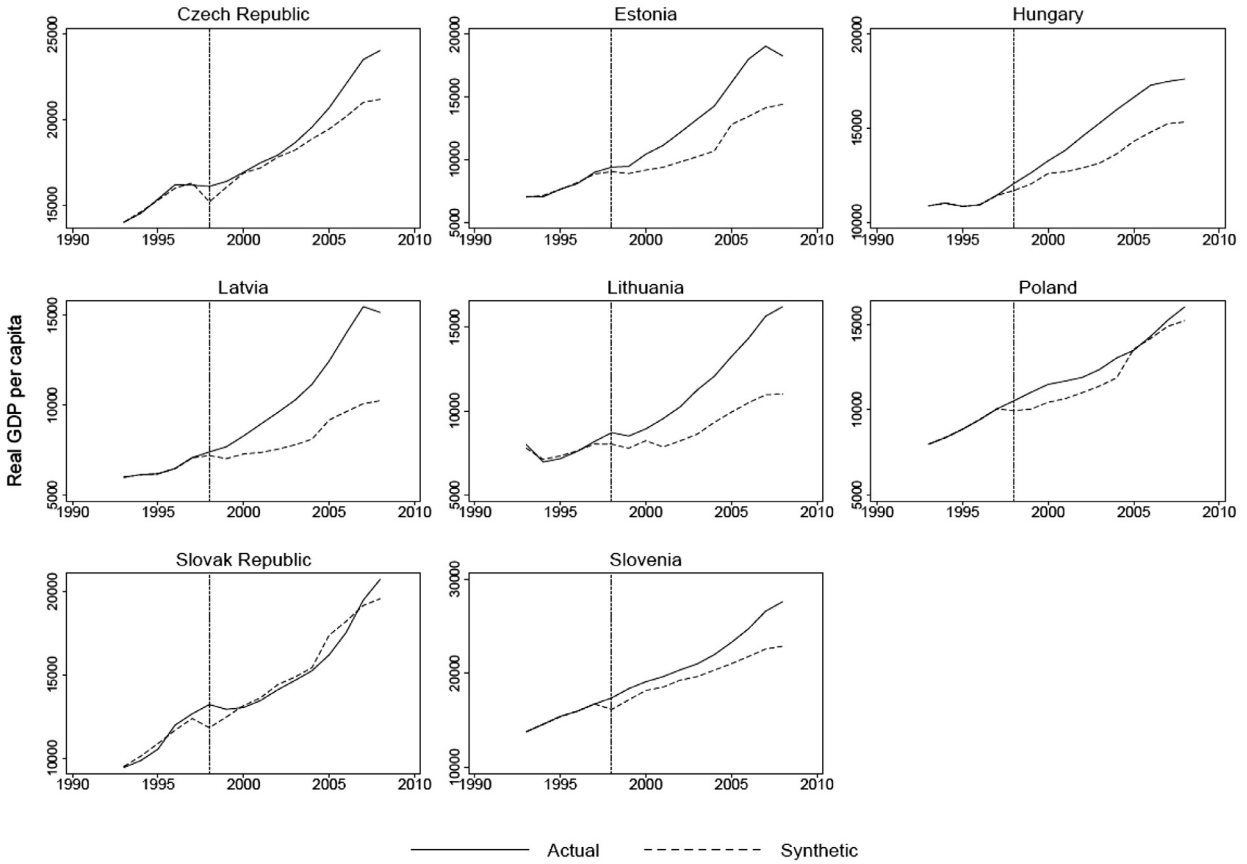

Fig. 5. Actual vs. synthetic country – GDP per capita trends, eastern enlargement (1998 anticipation).
Note: In each graph, the continuous line represents the trend of the real GDP per capita (PPP, 2005 International Dollars) for the actual country, while the dashed line shows the trend for the same variable for the synthetic country. For each country the analysis ends in 2008. The composition of each synthetic country is reported in Figure 4 and full details in Table A.3 in Appendix.

6.2. Random donor samples

The other concern we must address is that our estimates could be affected by the specific composition of the donor sample. If countries in the donor sample were affected by spillover effects, such as trade diversion induced by EU membership on a non-EU trade partner country that is part of the donor sample, this would bias our results upwards. Similarly, if a country in the donor sample experienced a positive idiosyncratic shock during the years after joining the EU, this would bias our results downward.

In order to assess whether the estimation results are influenced by the presence of a specific country in the donor pool, Abadie et al. (2010, 2015) suggest excluding each time a country from the counterfactual and compare the estimates obtained after these exclusions. Building on this idea and taking into account the uncertainty of the goodness of the choice of the countries composing the donor pool, we propose a new systematic way to check the sensitivity of the SCM results.[20]

We construct alternative donor samples and compare the obtained results with our baseline estimates. More precisely, for each EU country under analysis, we iteratively re-estimate the synthetic counterfactual using one thousand alternative donor samples. Each donor sample includes the same number of countries used for our main estimation, randomly drawn from the largest set of countries for which we have available data. Therefore, each alternative donor sample has a (randomly assigned) probability of being affected by idiosyncratic shocks, which would lead to spurious results. If (i) most of the interval of estimates obtained with alternative donor samples is systematically different from zero, (ii) a very large share of alternative estimates indicates effects that are of the same sign of the baseline estimate, and (iii) the baseline estimate is not extreme with respect to these alternative estimates, then we can attach more confidence to the estimates obtained with the preferred donor sample presented above.

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Table 2
GDP per capita effects after 10 years from the accession using 1000 random donor samples.

	(1) % Effect (our main estimation)	(2) Median % effect across 1,000 random samples	(3) Average % effect across 1,000 random samples	(4) % of estimations with negative effects (out of 1000 random samples)	(5) % of estimations with positive effects (out of 1000 random samples)	(6) % effect using the best pre-accession fit
Denmark	14.298	−8.008	−4.407	78.5	21.5	−3.067
United Kingdom	8.586	0.922	0.342	41	59	2.041
Ireland	9.395	1.012	1.958	44.3	55.7	4.237
Greece	−17.336	−13.655	−11.821	94.2	5.8	−16.283
Spain	13.662	13.695	14.400	0.1	99.9	13.696
Portugal	16.537	19.318	20.518	0	100	18.264
Austria	6.364	2.548	3.700	38.6	61.4	3.547
Finland	4.017	6.630	7.899	5.1	94.9	12.497
Sweden	2.353	−0.380	2.461	53.6	46.4	4.472
Czech Republic	5.615	1.169	−1.358	41.9	58.1	2.515
Estonia	24.153	30.563	29.966	0.1	99.9	21.423
Hungary	12.299	15.465	15.293	0.1	99.9	16.411
Latvia	31.692	30.866	31.489	0	100	26.259
Lithuania	28.082	27.022	24.979	0	100	28.082
Poland	5.930	8.085	7.558	7.5	92.5	2.432
Slovak Republic	0.302	6.642	7.302	3.7	96.3	0.302
Slovenia	10.350	12.591	12.406	5.3	94.7	16.057

Note: For each EU country, the *% Effect* is given by the percentage difference between the average real GDP per capita of the actual country in the first ten years from the accession and the average real GDP per capita of the synthetic country in the same period. For eastern countries we consider the period 1998–2008.

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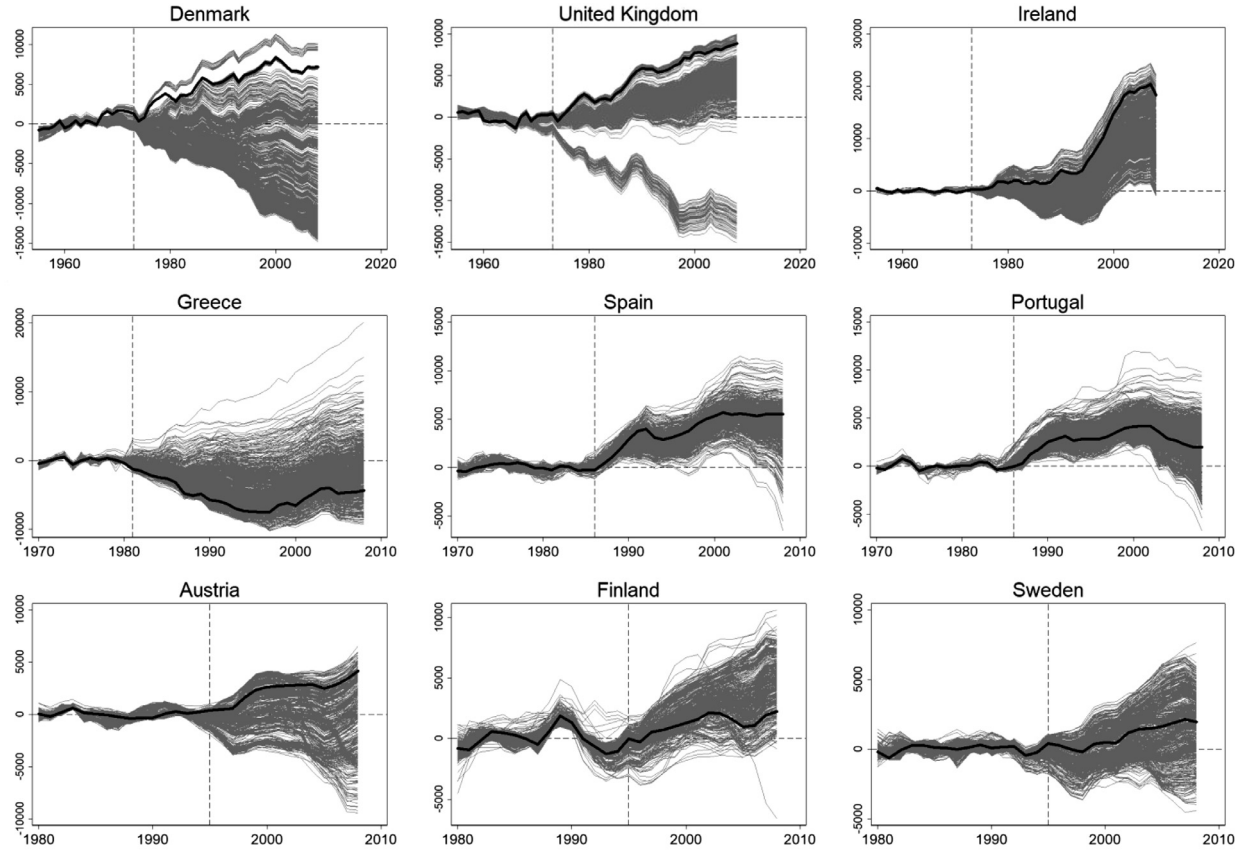

Fig. 6. Random donor samples (1,000 replications) – GDP per capita, northern and southern enlargements.
Note: In each graph, on the y-axis is represented the difference between the real GDP per capita of the actual country in question and its synthetic counterfactual. The black line represents this difference for our main estimation reported in Figure 2 for northern and southern enlargements. The grey lines represent this difference for the estimations obtained using 1,000 alternative, and randomly chosen, donor samples. Each alternative donor sample includes the same number of countries than the donor sample used for the main estimation.

Figs. 6 and 7 display these results for GDP per capita, while Table 2 compares our baseline estimated effects from EU accession with those obtained with the random donor samples in the first ten years of membership.[21] In this exercise, we consider again for the eastern countries the results obtained using the 1998 as the accession year. In column 1 of Table 2 we report our main estimated effects. Columns 2 and 3 show the median and the mean, respectively, of the estimated effects obtained with the one thousand alternative donor samples. Column 4 and 5 show the percentages of the estimations for the alternative donor samples with a negative or positive (respectively) sign of the effects.

Despite a few interesting differences, results broadly confirm the baseline estimations. For five countries (Denmark, Ireland, United Kingdom, Austria, and Czech Republic) our baseline estimates clearly overestimate the effects, while for four countries (Finland, Estonia, Poland and Slovakia) our baseline estimates are clearly lower than the median or average effect obtained with the alternative donor samples. For all countries (except for Denmark and Sweden) most random donor samples estimates have the same sign as our main estimated effects. Overall, the average across countries of the mean (median) effects obtained with the alternative donor samples indicates that these countries would have had an income per capita 10% (9%) lower in the absence of EU membership after ten years from the accession. This value is similar to the average across countries of our baseline estimates for the same period (which is also 10%).

Results are even more in line with our baseline estimates if we concentrate on the random estimates having the best pre-treatment fit, which are more comparable with our baseline estimates (column 6).

[20] In other words, we want also to test whether the specific choice we made to build our donor sample drives our results. In the Appendix, we provide further discussion about the complementarity between the placebo tests and our approach.

[21] Figures 6 and 7 display, for each country, the differences in GDP per capita between the actual and the synthetic country for our main estimation and for the estimations obtained with the random samples that have comparable pre-accession matches (i.e., lower than 3 times the root mean squared prediction error of our main estimation).

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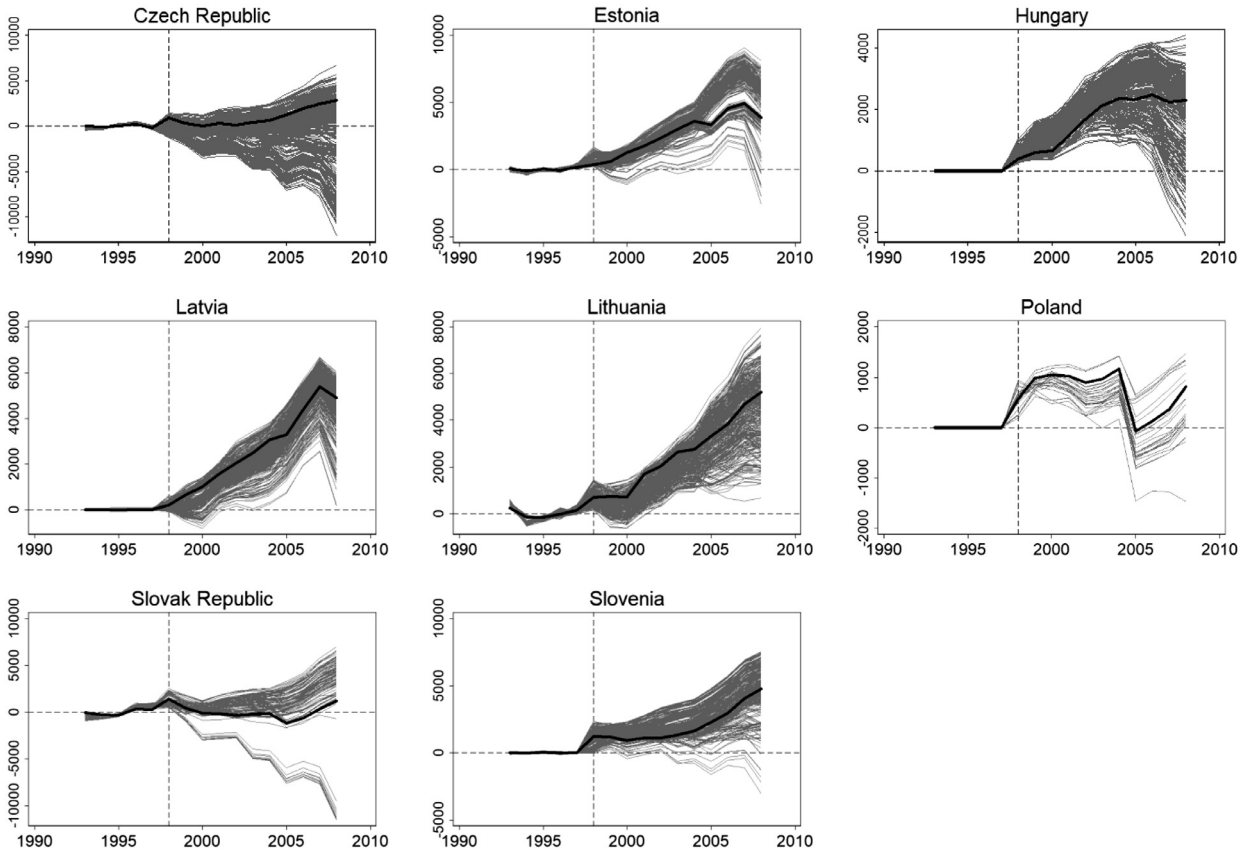

Fig. 7. Random donor samples (1000 replications) – GDP per capita, eastern enlargement (1998 anticipation).
Note: In each graph, on the y-axis is represented the difference between the real GDP per capita of the actual country in question and its synthetic counterfactual. The black line represents this difference for our main estimation reported in Figure 5 for the eastern enlargement. The grey lines represent this difference for the estimations obtained using 1,000 alternative, and randomly chosen, donor samples. Each alternative donor sample includes the same number of countries than the donor sample used for the main estimation.

For most countries, the first ten years after accession seem to generate clear, robust, positive net benefits in terms of higher per capita income levels and higher levels of labor productivity.[22]

In summary, our results strongly support the crucial role of case studies, as the effects of integration are highly heterogeneous both across countries and over time. Nevertheless, the approach allows us to infer an average effect by averaging the country-level gains from EU integration.[23]

7. Correlates of the benefits from EU membership

Why do some countries benefit a lot while others benefit relatively little from joining the EU? Has the introduction of the common currency (the Euro) and the extensive preparations that preceded it, affected the growth payoffs from EU membership? To answer these questions and shed some light on the variation across countries and over time of the benefits from EU membership that we estimated above, it is worth using a more systematic approach.

In addition to the traditional channel of trade integration, we focus on the relative roles of institutional quality, financial development, and financial globalization. More financially developed countries are expected to be better able to exploit (and distribute) the benefits of integration. This is a complex relationship that may depend on the level of development

[22] The ten-year interval is clearly arbitrary, as we cannot a priori identify the relevant horizon for long-run effects of accession to the EU. However, the only main difference of the effects over the entire post-entry period, with respect to the ten-year horizon, is that Ireland now displays very large positive effects, which are determined by large gains occurring in the 1990s and especially the 2000s. See Table A.9 in Appendix for the comparison of our baseline estimated effects with those obtained with the random donor samples for GDP per capita in the whole post-accession period, and Tables A.10 and A.11 for the comparisons for productivity.

[23] We also tested whether the average post-accession difference between the actual and synthetic series are statistically different. Considering the limitations due to the small number of observations, results in Table A.12 in Appendix show that, for the whole post-accession period, the differences are statistically different from zero in most of the countries and in every enlargement.

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Table 3
Determinants of the growth dividends from EU membership.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag percentage gap	0.887***	0.877***	0.861***	0.880***	0.847***	0.856***
	(0.035)	(0.034)	(0.042)	(0.036)	(0.046)	(0.047)
Trade openness	0.164***	0.143***	0.153***	0.142***	0.155***	0.134***
	(0.031)	(0.026)	(0.028)	(0.027)	(0.029)	(0.032)
Financial int.	−0.001	0.012***	0.012***	0.012***	0.012***	0.012**
	(0.002)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
Financial int. (sq)		−0.000***	−0.000***	−0.000***	−0.000***	−0.000***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Euro	0.014*	0.014*	0.011	0.014*	0.013*	0.026***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.010)
EPL			−0.004		−0.003	−0.078***
			(0.007)		(0.007)	(0.025)
EPL (sq)						0.016***
						(0.005)
ETCR			0.013**		0.015**	0.022*
			(0.005)		(0.006)	(0.011)
ETCR (sq)						−0.000
						(0.002)
Polity2				0.003	−0.007	−0.687*
				(0.004)	(0.007)	(0.376)
Polity2 (sq)						0.037*
						(0.021)
POLCON				0.007	−0.007	−0.063
				(0.027)	(0.034)	(0.256)
POLCON (sq.)						0.045
						(0.321)
Year of memb.	0.002***	0.003***	0.004***	0.003***	0.004***	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	295	295	239	295	239	239
R-squared	0.986	0.987	0.991	0.987	0.991	0.992

Note: OLS estimates with robust standard errors in parentheses. Inference: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable is the percentage difference between the actual and the synthetic series of real GDP per capita for each country and each year post accession for countries that joined in the northern and southern enlargements and each year after 1998 for the eastern European countries. The covariates are: *Lag Percentage gap*: the (1-year) lag of the dependent variable; *Trade openness* is openness at 2005 constant prices from Penn World Tables. *Financial int.*: an indicator of financial integration computed as the sum between total assets and total liabilities over GDP (source: Lane and Milesi-Ferretti, 2007); *Euro*: a dummy variable that takes value 1 if the country has joined the Euro area, the value 0 otherwise; *EPL*: an indicator of employment protection legislation (source: OECD; missing values were interpolated using data from Allard, 2005); *ETCR*: an indicator of regulation in non-manufacturing sectors (source: OECD; missing values for 1973, 1974 and 2008); *Polity2* from the Polity IV project is a measure of a country's political regime; *POLCON (political constraints)* is a measure for "the feasibility of policy change (the extent to which a change in the preferences of any one actor may lead to a change in government policy)" (POLCON_2005 codebook); *Year of memb.* is a count variable that indicates the years the country has been member of EU for countries in the northern and southern enlargements, and the years post-1998 for the countries in the eastern enlargement. In each model, country and year fixed effects are included. Note that the number of observations change because both EPL and ETCR are *missing* for non-OECD countries or because we do not have information for some countries.

achieved by domestic political institutions (Campos and Coricelli, 2012). By the same token, this reasoning should hold for those countries that are better integrated internationally through, for example, foreign direct investment and cross-border banking.

Table 3 presents a set of panel OLS estimates in which the dependent variable is the "EU membership-induced gap", that is the yearly percentage difference between the actual level of per capita GDP and that estimated from the synthetic counterfactuals for the 17 countries we analyze after they joined the EU (for eastern countries we consider the anticipation effects from 1998). The estimated model specifications include inertia ("lagged gap") and allow an evaluation of various different potential determinants: trade openness, international financial integration, adoption of the common currency (a dummy variable for the adoption of the Euro) and economic and political institutions. Further, two key structural reforms are captured by measures of labor market flexibility (EPL, employment protection legislation) and economic regulation (ECTR, competition regulation in utilities industries).[24] The two reported measures of political institutions are a general index of

[24] ETCR is the measure constructed by the OECD summarizing indicators of regulation in energy, transport and communications.

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democracy (from Polity IV) and an index of political constraints on the executive (POLCON).[25] All specifications include the number of years of EU membership and country and year fixed-effects.

The results in Table 3 suggest that three main factors are closely associated with the magnitude of the net benefits from membership in the EU across countries and over time: trade openness, financial integration and the adoption of the Euro.

It should be clear from this exercise that we are highlighting association and not a causal relationship. With this in mind, the coefficient for Euro membership suggests that countries that (later on) adopted the Euro have pay-offs from EU membership (i.e., percentage differences between actual and synthetic levels of per capita GDP) that are approximately 2 percentage points larger, on average, than for those countries that have not yet adopted the Euro (recall the average payoff is about 10%). Similar statements apply to both trade openness and financial integration.[26]

A second set of results refers to employment protection legislation and utilities regulation. As it can be seen from Table 3, the effects of EPL are ambiguous. Yet the results for the stringency of product market regulation (ECTR) suggest that countries that have successfully converged to the EU policy framework seem to benefit more from EU membership. It should be noted that the source of these two reform variables is the OECD and that data are available exclusively for OECD members during the period of analysis. The fact that various eastern European countries that joined the EU are not OECD members explains the discrepancy between the number of observations of the first two columns and the remainder of Table 3. Thus, we consider the EPL and ECTR results in column 6 useful mainly for checking for possible non-linearities and to assess whether the fullest specification would affect the results for what we consider the three key factors (namely, trade openness, financial integration and the Euro). We find that controlling for EPL and ECTR does not qualitatively affect these conclusions.

Regarding political institutions, none of the relevant coefficients are statistically significant at conventional levels (except for democracy, Polity 2, in the full specification of column 6, but this may be capturing unduly the effects of the smaller sample size). Perhaps, this is because after accession there is little variation among EU members regarding levels of development of political institutions and thus we should not expect it to be a key factor in explaining cross-country variation. Nevertheless, we believe a fruitful avenue for future research would be to extend the set of political institutions and to investigate further their pre- and post-accession dynamics and how they may affect differently the pace and magnitude of the estimated net benefits.

8. Conclusions

In this paper, we attempted to provide a novel and more satisfactory answer to the question of whether there are significant and substantial net benefits from deep economic integration in terms of higher per capita GDP and labor productivity using the European experience as a case study. The main finding is that of strong evidence for positive net benefits from EU membership, despite considerable heterogeneity across countries. More specifically, focusing on the 1973, 1980s, 1995 and 2004 enlargements, we find that per capita GDP and labor productivity increase with EU membership in Ireland, United Kingdom, Portugal, Spain, Austria, Estonia, Hungary, Latvia, Slovenia and Lithuania. The effects tend to be smaller, albeit still mostly positive, for Finland, Sweden, Poland, Czech Republic and Slovakia. Finally, our evidence shows that only one country (Greece) experienced lower per capita GDP and labor productivity after EU accession than its counterfactual.

We identify three main directions for further research. First, we think research is needed to provide a fuller understanding of why Greece turned out to have such an exceptionally negative economic performance since EU accession. Second, further research should focus on the specific mechanisms and channels through which EU membership seems able to support faster GDP and productivity growth rates, as these mechanisms, and their effectiveness, may change over time and particularly after the Great Recession. Above we document that trade openness, financial integration and the adoption of the Euro are important factors in driving these benefits so future research should investigate the inter-relationships among these factors as well as how they change over time. Finally, future research should focus on disentangling the various aspects of the integration process, including the political economy dimension. Future research should focus not only on economic and institutional integration but also on the political support for European integration, which ultimately affect reform policies in the EU and in its member states.

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[25] POLCON is described in detail in Henisz (2000) and the source for the democracy variable is the Polity IV dataset.

[26] Adding the linear and the squared term yields an average positive effect of financial integration.

integration: estimating the benefits from membership in the European Union using the synthetic counterfactuals method". All remaining errors are our own.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmoneco.2018.08.001.

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