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JEL Classification: C33, F15, F55, O43, O52

Keywords: Institutional integration, economic integration, Productivity Growth, European Union, European Economic Area

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Institutional Integration and Productivity Growth: Evidence from the 1995 Enlargement of the European Union*

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October 2021

Abstract

This paper studies the productivity effects of integration deepening. The identification strategy exploits the 1995 European Union (EU) enlargement, when all candidate countries joined the Single Market but one — Norway — did not join the EU. Our synthetic difference-in-differences estimates on sectoral and regional data suggest had Norway chosen deeper integration, the average Norwegian region would have experienced an increase in yearly productivity growth of about 0.6 percentage points. This method also helps determining the sources of heterogeneity, apparently inherent to integration, highlighting higher costs of the missed deeper integration for more peripheral regions and industrial sector.

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1 Introduction

In the last decades the world economy witnessed significant changes in the way developed and developing economies integrate.[1] Integration has, in fact, changed dramatically. From the immediate post World War II until the oil shocks of the 1970s, it basically involved tariff reduction. Since then, non-tariff barriers became the primary focus and, more recently,

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[1]Important contributions to this literature are, among others, Baldwin and Jaimovich (2012), Brou and Ruta (2011), Guiso, Herrera, and Morelli (2016), Hofmann, Osnago, and Ruta (2017), Laget et al. (2020), Liu and Ornelas (2014), Maggi and Rodríguez-Clare (2007), Mansfield, Milner, and Pevehouse (2008), Martin, Mayer, and Thoenig (2012), and André Sapir (2011).

integration has been mostly fuelled by regulatory alignment (Lawrence, 1996). Campos, Coricelli, and Moretti (2019) argue that what we now observe is "institutional integration." Institutional integration means that countries delegate to super-national institutions some political control over selected policies. These selected policy areas have gone beyond those covered traditionally by trade agreements and include social, labour, competition, environmental and technological concerns, to name a few. The clearest example of institutional integration is the European Union (EU).[2]

What are the productivity effects of deepening integration, that is, of moving further from purely economic to institutional integration? In order to disentangle the productivity gains from deepening integration, our identification strategy centres on the 1995 EU enlargement. In 1994, four countries had successfully completed accession negotiations, fulfilled all the requirements for EU membership and accepted membership in the European Economic Area (EEA) – Austria, Finland, Norway and Sweden. EEA membership meant unrestricted access to the European Single Market.[3] The four were all deemed ready to join the EU, but only three of them (Austria, Finland and Sweden) actually joined. Norway decided to reject full-fledged EU membership in a national referendum in November 1994.

What were the costs or benefits in productivity terms for Norway of the decision against deeper integration? To answer this question we use sectoral and regional data from these candidate countries and the recently developed synthetic difference-in-differences method (Arkhangelsky et al., forthcoming). This method fits well with our aims as it also allows studying the effects of non-membership in the EU by constructing counterfactuals for each Norwegian region and sector.

We find significant net benefits from institutional integration in terms of productivity growth. Our estimates indicate that had Norway chosen institutional integration in 1995, instead of pursuing purely economic integration, the average Norwegian region would have experienced an additional 0.6 percentage points in yearly average productivity growth. This is large given average productivity growth being normally between 1.5 and 2% per annum. Moreover, we document that the effects of not joining vary considerably across sectors and regions, with larger negative effects estimated for industrial sectors. Our estimates are robust to various sensitivity checks, including changes to the definition of the dependent variable, the level of territorial aggregation and the composition of the comparison sample.

One key concern in our identification strategy refers to the prominence of the oil and gas sector in the Norwegian economy. Is it possible that natural resources explain both the decision to reject institutional integration and the productivity performance of the Norwegian economy? We address this concern in various ways. First, we call attention to the econometric evidence showing that Norway has not suffered from Dutch disease (Holden, 2013; IMF International Monetary Fund, 2013). Second, we follow the political science literature and argue the main drivers of the rejection of EU membership both in 1972 and in 1994 were political and not economic (Archer, 2005; Sogner and Archer, 1995). Furthermore, in order for natural resources to undermine our analysis, it should be true that the impact of natural resources on the Norwegian economy has a break after the date of the decision on EU entry, thus affecting the economy in a significantly different way in the post versus the pre-entry referendum.

Our results indicate that institutional integration delivers significantly larger benefits than pure economic integration. There are various possible channels through which insti-

[2]We use the term European Union (or EU for short) for convenience throughout, i.e., even when referring to the European Economic Community (up to 1967) and European Communities (until 1992).

[3]The EEA agreement covers the so-called "four freedoms" (i.e., free movement of goods, services, persons and capitals) and legislation concerning competition, state aids and some other policies areas (such as consumer protection, company law, environment and social policy). EU full-fledged member states are institutionally integrated because they share additional competencies such as regional, agricultural and fishing policies, custom union, common trade policy, foreign and security policies, justice and home affairs, taxation and economic and monetary union (https://www.efta.int/eea/eea-agreement/eea-basic-features).

tutional integration may affect economic performance, chiefly the trade productivity channel, the political economy channel, and the technology frontier channel. Despite the fact that with currently available data at the regional level it is very hard to determine the exact roles each of these channels play, we believe trade leads the effects, although we suspect that it interacts importantly with the political economy mechanisms (especially in the poorer regions) and with the technology frontier mechanism (in the richer regions).

Our analysis is the first to estimate the economic gains induced by institutional integration, in addition to those from pure economic integration, at regional and sectoral levels. Campos, Coricelli, and Moretti (2019) use country-level data to assess the effects of EU membership estimating counterfactuals using countries that do not belong to the EU or to the EEA. Here we go further by focusing on the additional net benefits of institutional over economic integration, by contrasting full-fledged membership with participation in the EEA.

The paper is organised as follows. Section 2 puts forward a theoretical framework. Section 3 presents our identification strategy. Section 4 discusses the methodology and data. Section 5 introduces our baseline estimates and a series of robustness checks. Section 6 discusses the main implications from our results. Section 7 concludes.

2 Integration and productivity: Some key theoretical considerations

Integration is by far one of the most important ideas in economics. Jan Tinbergen, winner of the first Nobel in economics, famously contrasted positive to negative integration. Negative integration meant the removal of trade barriers, while positive the creation of new institutions (Tinbergen, 1954). Later on, Balassa extended this analysis with his famous "integration stages" framework. Today, this distinction is often presented in terms of shallow versus deep integration. Lawrence (1996) associates shallow integration with traditional trade agreements affecting tariffs, and deep integration with trade agreements that go beyond traditional areas and affect policies and regulations. As an increasing number of trade agreements have deep provisions (Hofmann, Osnago, and Ruta, 2017) here we refer to this as "institutional integration" to distinguish it from the political integration process, which is yet another layer of depth.

How does integration drive productivity? And more specifically, what are the productivity effects of deepening integration, that is, of moving further from pure economic to deeper institutional integration? Theoretically, the link between integration and growth remains a subject of intense debate (Melitz and Redding, 2021). Here we put forward three main possible explanations that, in our view, can combine and overlap. The three channels are the trade productivity channel, the political economy channel, and the technology frontier channel.

Focusing on the channels through which 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 integration accelerated productivity growth was through boosting investment in physical capital, induced by efficiency gains brought about by trade integration. This earlier literature focuses on the effects of international trade on growth. 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 favour 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). Using the notion of "border effect," Comerford, Mora, and Javorcik (2019) estimate the trade, GDP and welfare impacts of different degrees of integration. Using Sweden as a benchmark, they find that Norway's GDP and welfare would have increased if Norway had joined the EU. The estimated effects are statistically significant though quantitatively small. They find that the loss from not joining the EU are larger, the smaller is the initial size of GDP, a result that is interesting for our findings on regional variation of productivity effects in Norway and, in particular, on the difference between the effects from the Oslo metropolitan region relative to the rest of the country.

A second important channel is the political economy channel, which basically covers rent-seeking and compensation reasons. Institutional integration, by delegating to supranational institutions the regulation of main economic activities facilitates coordination, sharply limits rent seeking activities of interest groups (Brou and Ruta, 2011), which in this case become less effective at influencing politicians at the EU level (Gutierrez and Philippon, 2018), and augments (interacts positively with) economic integration by further raising transparency and accountability (Liu and Ornelas, 2014). The other aspect of political economy considerations that helps explain how integration increases productivity is what we here call the compensation mechanism. This can be thought in terms of risk-sharing as an argument to raise overall productivity and can be exemplified in the EU context by pointing out structural funds and regional policy as tools for equalisation of economic differences across sectors and regions in the EU.

Thirdly, the argument about a technology frontier channel rests upon the notion that integration generates pressures through technological competition at the frontier by revealing which countries, sectors, regions and technologies are the winners and which ones are the losers at a given moment in time. 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, and possibly on the economic size of the country.

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

3 Identification strategy

The identification strategy we propose in this paper is based on the fact that, at the time of the 1995 EU enlargement, Norway was as ready to join the EU as Austria, Finland, and Sweden, which are the three countries that actually became EU members in 1995. We define readiness as in accordance to the EU official view after accession negotiations. However, because all four countries were given full access to the Single Market starting in January 1994, as part of membership in the then newly created EEA, Norway ended up being economically but not institutionally integrated with the EU. Thus, we argue that differences in terms of productivity between Norwegian regions and sectors (which are only economically integrated) and Austrian, Finnish and Swedish regions and sectors (which are economically and institutionally integrated) capture the additional productivity payoffs from deepening integration.

In the so-called Scandinavian EU enlargement, Austria, Finland and Sweden became full-fledged members of the EU on January 1st 1995. Because this is almost ten years after Spain and Portugal had joined (and almost fifteen years after Greece did), it is natural to ask why it took so long. In terms of political and economic development there is little doubt these countries have been ready to join for quite some time. Although they were able to enjoy gains from integration as members of the European Free Trade Association (EFTA), even the earliest evidence shows that the EU was considerably more successful in this respect than EFTA (Aitken, 1973). Moreover, Andre Sapir (2001) argues that "domino effects" were strong for the 1995 enlargement: increased integration within the EU impacted outsiders negatively, thereby prompting their application for EU membership.

The Cold War is one key reason for this delay. Although Austria was a founding member of EFTA, "its desire, in 1961, to consider applying for the EEC was rejected by the USSR as an infringement of the 1955 State Treaty under which the Soviet Union - as one of the Four Allied Powers - had recognized Austrian independence with its permanent neutrality and prohibition from entering any union with Germany as the main preconditions" (Tatham (2009), pp. 57-58). Austria applied for EU membership in June 1989, Sweden in 1991, Finland and Switzerland did it before the summer of 1992, while Norway applied in November 1992.

A crucial development in the run-up to the 1995 enlargement was the EEA. In the late 1980s, EFTA States in general, and Sweden in particular, were looking for ways of further integrating with the more successful European Communities, with Swedish multinationals particularly keen. This met resistance from Brussels because the European Commission was occupied with the implementation of the Single Market (Grin, 2016). The compromise solution was a parallel structure that would allow EFTA members to participate in the EU's Internal Market (hence adopting all relevant legislation related to market regulation, with the exception of agriculture and fisheries) without participating in negotiations and without the need of applying for full-fledged membership (Miles, 1996). Switzerland rejected EEA membership in a referendum in December 1992 causing the withdrawal of its application for EU membership. EEA membership was approved for Iceland, Norway, Austria, Finland and Sweden and became effective on January 1st 1994.

Norway applied for EU membership twice in the 1960s largely due to its strong trade links with the UK. As France vetoed the UK formal applications to EU membership in 1961 and 1967, Norway's application also did not proceed. A consequential event following the 1968 student protests was De Gaulle's resignation. Pompidou, his successor, had a different view of the process of European integration and encouraged the UK to submit a third official application. A factor in this rapprochement was the growing influence of Germany in European affairs as indicated by the 1969 Werner report on the monetary union. In October 1969, the European Commission published an Opinion recommending accession negotiation with Norway, UK, Ireland, and Denmark.

Accession negotiations with Ireland and Denmark in the early 1970s were relatively smooth compared to those with the UK and Norway. Three items dominated Norway's agenda: agriculture, fisheries and regional policy. The permanent derogations Norway requested were not granted. Having accepted transitional periods for both agriculture (3 years) and fisheries (10 years), Norway signed the Accession Treaty and put it to a referendum in September 1972 (Tatham, 2009). Its unexpected rejection (with 53.5% votes against and 46.5% in favour) became a watershed moment in Norwegian political history. After long periods under Danish (1319-1814) and Swedish (1814-1905) rules, Norwegians placed a high value on their political independence.

The discovery of oil transformed the Norwegian economy (Grytten, 2004) since the early 1970s. Energy became a major export item. The share of fuel exports in total exports increased from about 1% in 1970 to about 50% in 1990 (World Development Indicators). Energy exports also supported an increasing role for the public sector, with the ratio of government expenditures to private consumption rising from about 30% in 1970 to about 40% in the early 1990s (OECD, 2014). One other area considered of national importance was fisheries. Not only are salmon, herring and cod often associated with Norway around the world but domestically fisheries evoke a distinctive Norwegian way of life. The sector plays a very important political role especially compared to its relatively small economic weight (Norwegian fisheries account for about 6% of total exports).

Interestingly, in the 1990s accession negotiations, Norway secured protection for its natural resources but not for its fisheries. Norway negotiated a "Protocol to the Accession Agreement that would protect its sovereignty over its natural energy resources thereby keeping them out of the control of the EC" (Tatham, 2009, p. 68). Yet, the EU did not grant exceptions for the Norwegian demands for equal access to waters and fishing stocks. The compromise reached was a transition period of 3 years. These were the EU membership terms presented to Norwegian voters in 1994. With turnout approaching 90% of the electorate, EU membership was again rejected (52.2% voted against it this time). Only two of the seven more aggregated regions of Norway voted "yes". Oslo had the greatest support for EU membership (65% in favour), while the greatest share of "no" votes were in the northern-most region of Norway (Nord-Norge), which voted 72% against.[4]

In summary, at the time of the 1995 enlargement, Norway was in equal footing to join the EU in comparison to the other three countries that actually joined (Austria, Finland and Sweden). Moreover, because of the EEA, in January 1994 Norway had been granted access to the Single Market, a main source of economic benefits from integration. Yet, the rejection of full-fledged EU membership in the 1994 popular referendum left Norway as a country able to enjoy the benefits from economic integration (through EEA), but not to enjoy the full benefits from institutional integration (through EU membership). This unique situation provides the basis for our econometric identification.

It is important to be upfront about a potentially complicating factor, namely that natural resources would explain both the rejection of institutional integration and the productivity losses. Previous research strongly supports our identification strategy. First, there is little evidence that the productivity losses we estimate after 1994 are due to Dutch disease. Indeed, a large body of econometric evidence on the issue has concluded that Norway has not suffered from Dutch disease (OECD (2014), Holden (2013) and references therein).[5] Second, there is also little evidence from political science showing that natural resources have played a major role in the EU referendum (Archer, 2005, and reference therein). Our analysis in section 6 relating referendum results at the regional level and our estimates of the productivity loss of rejecting deeper integration tend to confirm these results.

It should also be noted that for the first few years after the 1995 Enlargement there was little political pressure from the EU on Norway, but after the 2004 enlargement the EU started to put more political pressure on Norway, for instance, in terms of the adoption of structural reforms (OECD, 2004). It is therefore conceivable that there was more institutional integration between the EU and Norway after 2004. Moreover, various studies identify significant structural breaks in Norwegian GDP trends around 2003-2004 (Cappelen and Eika, 2020; Hagelund, 2009). To address these concerns as well as to avoid the potential confounding role played by the membership in the Euro area of two comparison countries, Austria and Finland, we end the time coverage of our estimates in 2001.

4 Data and methodology

Our strategy to identify the productivity benefits from institutional integration focuses on the 1995 enlargement and employs a panel of NUTS 3 regions from Norway, Austria, Finland, and Sweden.[6] Because these are all high-income countries, productivity provides a better measure of economic performance (Syverson, 2011).

The basic idea is to compare the evolution of productivity in the Norwegian regions, which enjoyed the benefits from the EEA but not from full EU membership, with the evolution of productivity in the regions of the other three countries that enjoyed the benefits from both the EEA and the EU. We estimate what would have been the productivity for Norwegian regions, had Norway joined the EU in 1995.

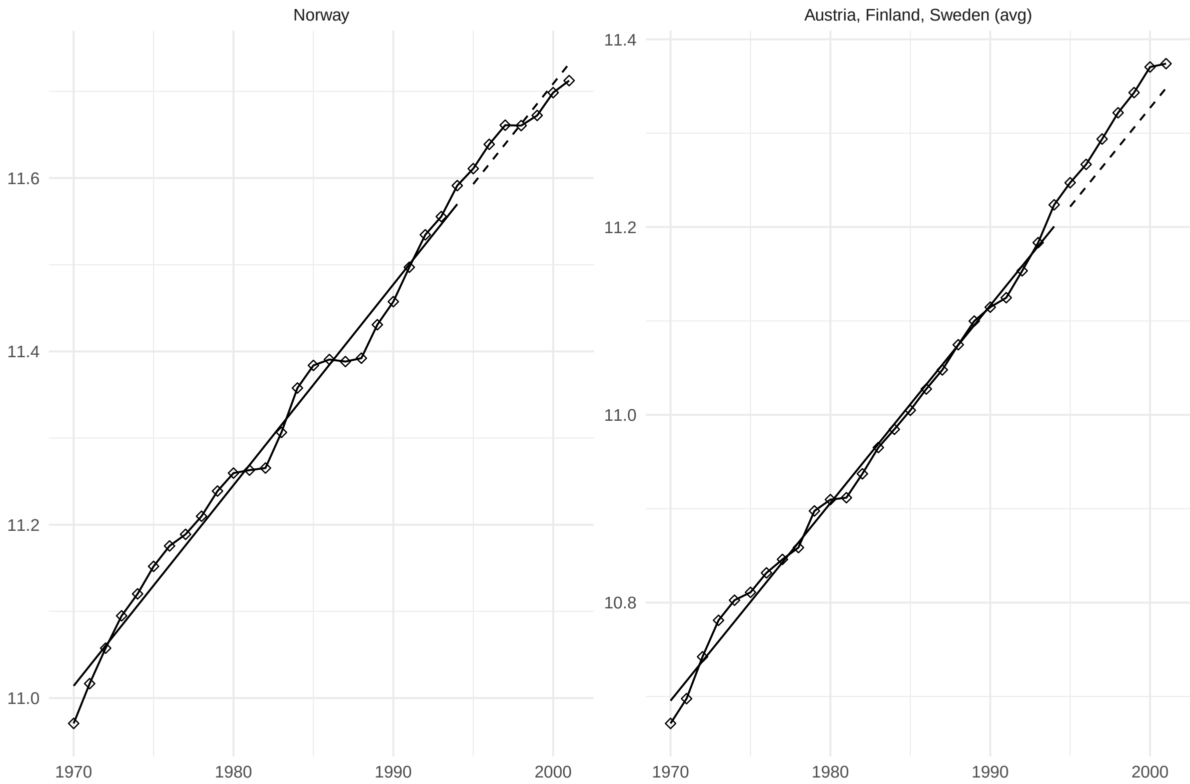
Given this paper's goals, it is important that our results are not due to any abnormal behaviour of productivity in Norway. Thus, before carrying out our analysis, we verify

[4] At a more disaggregated level, only 5 out of 19 sub-regions voted "yes".

[5] It should also be noted that there was no sizable change in the average of oil price from the pre-1994 to the post-1994 periods. The average oil price during the period 1995-2004 was about 30 Norwegian crowns higher than in the 1985-1994 period, a small increase in relation to the standard deviation of oil prices for the whole period, which was about 50 crowns.

[6] For details on Eurostat's Nomenclature of Territorial Units for Statistics (NUTS), see *http : //epp.eurostat.ec.europa.eu/portal/page/portal/nuts$_n$omenclature/introduction*

Figure 1: Actual and predicted productivity at the country level



Vertical axis represents the log of Real GDP per worker (data from Penn World Tables 10.0). Time trends fitted on observations from 1970 to 1994 (solid lines) and extrapolated onto 1995-2001 (dashed). Dotted lines are observed log GDP per worker in Norway (left panel) and yearly averages across Austria, Finland, and Sweden (right panel).

that the behaviour of productivity in Norway post-1995 can be predicted by its pre-1995 trend. This is shown in Figure 1, which reports the actual series of productivity (GDP per worker) and the post-1995 trend projected from an estimate based on data up to 1994. The out-of-sample prediction suggests the absence of a structural break for Norwegian productivity coinciding with the non-entry in the EU. By contrast, the same analysis carried out for the three countries that entered the EU suggests the presence of a break for the post-1995 period: extrapolating productivity from the pre-accession sample underestimates the actual developments of post-intervention average productivity for the sample of Austria, Finland and Sweden.

The simple post-1995 difference in productivity dynamics between Norway and Austria, Finland, and Sweden cannot be interpreted as evidence of the causal effect of Norway's missed deeper institutional integration with the EU. The analysis should be based on accurate counterfactuals for Norwegian productivity, which are built on information deriving from the control group of the other three countries and satisfy the pre-1995 parallel trends between the two comparison groups. Moreover, in addition to the average effects on Norway, we are interested in estimating the effects across Norwegian regions, and sectors. In fact, the missed EU membership of Norway could result in heterogeneous effects on regions with different socio-economic characteristics.

One way of constructing reliable, region-specific counterfactuals is to use the synthetic control method (SCM), pioneered by Abadie, Diamond, and Hainmueller (2010, 2015) and Abadie and Gardeazabal (2003). The method involves identifying the optimal weighted combination of control units (or donor units) to match as closely as possible a unit of interest in the pre-treatment period, for a set of predictors of the outcome variable. More formally, the SCM estimates a synthetic match by minimising the pre-treatment distance between the actual outcome of a unit of interest i (Y_i^{actual}) and the weighted combination of the outcomes of the $j = 2, \ldots, n+1$ donor units ($Y_i^{synthetic} = \sum_{j=2}^{n+1} w_j Y_j$), given a set of predictors. The post-intervention evolution of the outcome for the synthetic control is an estimate of the counterfactual. It shows what the behaviour of the outcome variable would have been for a unit of interest if the intervention had happened in the same way as in the donor pool.

The SCM allows obtaining a better pre-treatment match between a unit of interest and its counterfactual with respect to the traditional difference-in-differences approach.[7] In fact, it does not rely on the simple average of the control units but, by construction, it finds a convex combination of the control units that resembles the behaviour of the outcome of the unit of interest during the pre-treatment period. In the last few years, a growing amount of research in econometrics has focused on further development of the original SCM along several dimensions, including a systematic way to conduct inference (Abadie, 2021). In this paper, we take advantage of one very recent and important development of the SCM, namely, the synthetic difference-in-differences (SDID) by Arkhangelsky et al. (forthcoming).

The SDID complements both the standard SCM and the difference-in-differences approaches. As shown in Arkhangelsky et al. (forthcoming), if we represent the three estimators in the form of a regression problem, the SCM consists of a weighted regression with time fixed effects but no unit fixed effects, the difference-in-differences can be thought of as an unweighted regression with both time and unit fixed effects, while the SDID can be represented as a weighted regression with both time and unit fixed effects.

A first important difference between the SCM and the SDID is that the latter includes unit fixed effects. This allows the construction of reliable counterfactuals also in the case in which there are important differences in the levels of the outcome between treated and control units. This feature is key in our case. The pre-1995 productivity levels for most Norwegian regions are higher than those for the control regions.[8] A second important advantage is that the SDID allows constructing standard errors for the point estimates of the effects and, thus, running systematic inference. Third, it corrects for both unit and time weights, typically assigning larger weights to the years close to the end of the pre-treatment period, reducing the incidence of past shocks for the construction of the counterfactuals. A fourth important advantage is related to the fact we can use the SDID method to estimate the treatment effects in case of multiple treated units (like in a typical difference-in-differences where treated units are all jointly pooled on the treatment sample) as well as in case of a single treated unit to gauge the heterogeneous effects (like in a standard SCM where a single treated unit is compared to a weighted combination of the donor units).

In our application of the SDID, we use data from Cambridge Econometrics European Regional Database (2017), which has been widely used in economic studies of European regions (for instance by Becker, Egger, and Ehrlich (2010) and Tabellini (2010)). This database offers comparable information across regions, sectors and time over a sufficiently long pre-1995 period. Our analysis uses a ten-year pre-1995 period and terminates in 2001 to exclude confounding factors such as those that arise from Austria and Finland adopting the single currency. The Cambridge Econometrics European Regional Database (2017) covers NUTS 2 and NUTS 3 regions for EU-28 countries plus Norway. It includes measures of GDP, Gross Value Added (GVA), population, employment (at both NUTS 2 and NUTS 3 level), gross fixed capital formation (GFCF) and hours worked at the NUTS 2 level.

[7] As argued in a recent authoritative review of empirical methods "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).

[8] Although the 1995 EU enlargement involves countries that are all high-income and hence relatively similar in terms of degree of development (thus reducing the potential risk of identifying spurious correlations), only 4 (2) NUTS 3 (NUTS 2) regions belonging to Austria, Finland and Sweden have pre-1995 average productivity (measured in terms of GVA per worker) larger than the Norwegian region with the smallest average.

Information is available for the total regional economy (all sectors aggregated, abbreviated with *Total* in the tables and figures throughout the paper) and for six broad sectors (NACE Rev. 2) as follows: A: Agriculture, forestry and fishing (abbreviated with *Agriculture*); B-E: industry less construction (*Industry*); F: construction (*Construction*); G-J: wholesale, retail, transport, accommodation & food services, information and communication (*WRTAFIC*); K-N: financial & business services (*FBS*); O-U: non-market services, which we exclude from our analysis.

We focus here on NUTS 3 regions and employ the GVA per worker as the main outcome variable. Our choice of predictors includes the share of employment in each sector, the productivity gap of each region with respect to the national leader (similar to Gennaioli et al. (2014)), population growth rate, population density, the investment share defined as GFCF over GVA (all from Cambridge Econometrics),[9] and years of education (from Gennaioli et al. (2014)).[10]

5 Synthetic difference-in-differences estimation results

The objective of this section is to present our estimates of the possible economic benefits from deepening integration, exploiting the fact that Norway is a country which chose to be economically but not institutionally integrated. We assess the productivity effects of non-EU entry from 1995, the year Austria, Finland and Sweden joined the EU, until 2001, which is the year before the euro was introduced and adopted by Austria, Finland and other member states. In Section 5.1 we present the main results from the SDID estimator at the regional and at the regional-sectoral level. In Section 5.2, we discuss various robustness checks that show our main estimates are robust to changes to the dependent variable, level of regional aggregation, and composition of the donor pool, among others.

5.1 Main estimates

We start our analysis by constructing a counterfactual series of productivity, by sector, in the case with multiple treated regions. This means that, by sector, all the 19 NUTS 3 Norwegian regions are jointly pooled in the treatment group and compared to the counterfactual obtained by the donor pool of all the 75 NUTS 3 regions of Austria, Finland, and Sweden using the set of predictors described above.

About the estimates on the level of GVA per worker with the sample of multiple treated regions, Table 1 reports, by sector, the estimated effect of non-EU membership on Norwegian regions (*TE*) and the percentage ratio of the estimated effect to the average outcome over the treatment period (*TE/PAVG*). The result for the total regional economy indicates that Norwegian regions experienced an average loss in terms of GVA per worker of about 2,355 euro. Yet this estimate is not statistically significant. In the light of the heterogeneity across sectors shown in the table, the fact that the overall effect is not statistically different from zero may not be that surprising. In fact, what seems to be the driving force behind this result is that the agricultural, industrial and construction sectors experienced negative effects, while positive effects are displayed by the service sectors.

Our estimates indicate that Norwegian regions experienced a loss also in terms of growth rates of GVA per worker of the total regional economy. At the sectoral level, the direction of estimated growth effects is again heterogenous and follows that of level effects. In particular, the industrial sector shows a large and statistically significant loss respect to the counterfactual, both in terms of productivity levels and growth rates.

[9] In the analysis at the NUTS 3 level, we use corresponding NUTS 2 values of GFCF over GVA. Note that all monetary variables are deflated to 2005 constant prices (euros).

[10] Results for SDID estimates without covariates are broadly in line with those presented here, but given the macroeconomic perspective we take and the not long period of time covered by our application, estimates with covariates are more appropriate. Results for those without covariates are nevertheless available upon request.

To shed further light on the nature and extent of this heterogeneity, we produce further results, which look at the effects, by sector, on each single Norwegian region (single treated unit case). Here, a given sector of each of the 19 Norwegian NUTS 3 regions is compared to its counterfactual, which is obtained by using data for the same sector for all Austrian, Finnish and Swedish NUTS 3 regions. In Table 1, we show, by sector, weighted average of the estimated effects on the single Norwegian regions (*Weighted TE*) and, for the estimates on the levels of GVA per worker, the weighted average across regions of the ratio of the estimated effect to the average outcome over the treatment period (*Weighted TE/PAVG*).

The direction of the results is in line with those previously obtained in the case with multiple treated units. In fact, estimates for the total regional economies indicate a (weighted) average loss of 627 euro in terms of levels of GVA per worker, and 0.61 percentage points in terms of yearly productivity growth. This effect is large, considering the long-run yearly average productivity growth in advance economies is about 2% (Syverson, 2011). Also for different sectors the weighted average measures of the effects obtained with the estimations on the single regions are rather in line with those previously obtained in the case with multiple treated regions: estimates confirm average losses for the industrial sector both in terms of productivity levels and growth rates.

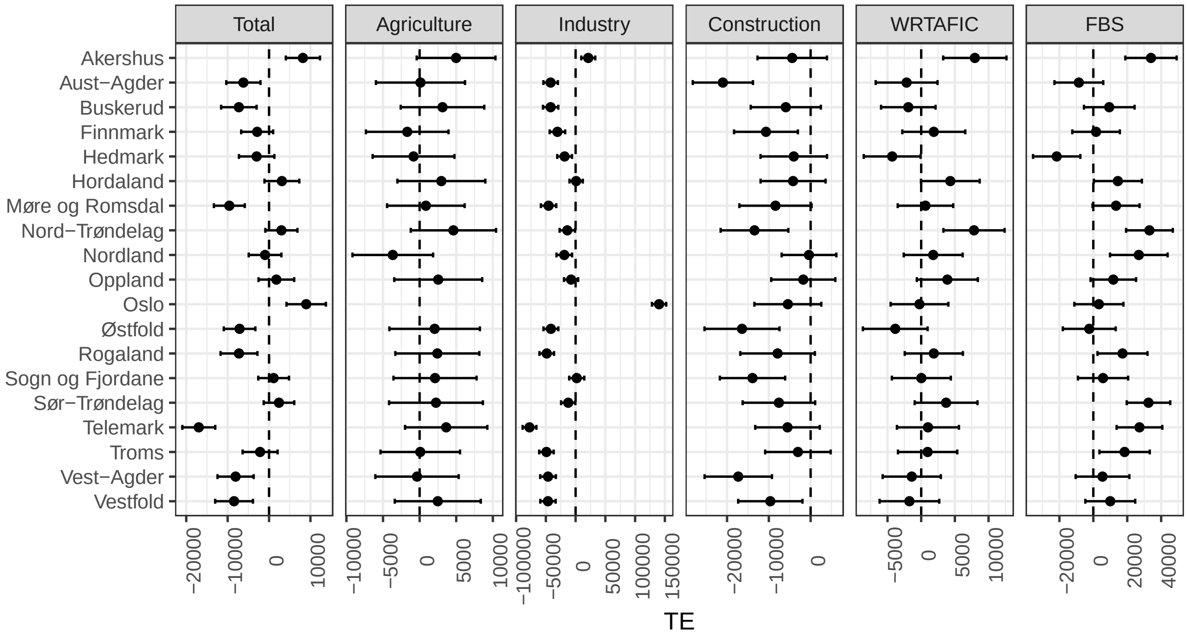
Table 1: Main estimates by sector

Estimation	Effects	Total	Agriculture	Industry	Construction	WRTAFIC	FBS
				GVA per Worker			
Multiple Treated	TE	-2354.51	-229.34	-24210.32	-5223.26	2138.41	13383.83
		(2064.64)	*(1072.73)*	*(11543.07)*	*(1711.28)*	*(1000.67)*	*(4934.86)*
	TE/PAVG	-2.95	-0.81	-11.53	-7.22	4.69	8.46
Single Treated	Weighted TE	-627.02	1509.04	-8947.81	-7313.13	1761.86	11985.55
	Weighted TE/PAVG	-0.95	4.86	-8.24	-10.10	2.71	7.79
			GVA per worker – Oslo Excluded from the Sample				
Multiple Treated	TE	-3243.33	-229.34	-33350.42	-5711.79	2099.16	13160.01
		(2026.53)	*(925.69)*	*(7735.35)*	*(1621.78)*	*(1049.49)*	*(4450.79)*
	TE/PAVG	-4.06	-0.81	-15.89	-7.89	4.60	8.31
Single Treated	Weighted TE	-3283.95	1509.04	-35322.73	-7674.15	2434.08	17151.47
	Weighted TE/PAVG	-3.55	4.86	-15.23	-10.51	3.79	11.26
			Growth Rate of GVA per Worker				
Multiple Treated	TE	-1.56	-13.02	-4.57	-3.52	0.23	1.63
		(0.80)	*(2.30)*	*(1.33)*	*(1.08)*	*(0.90)*	*(1.29)*
Single Treated	Weighted TE	-0.61	-10.81	-1.75	3.19	1.35	2.06
			Growth Rate of GVA per Worker – Oslo Excluded from the Sample				
Multiple Treated	TE	-1.80	-13.02	-5.46	-3.42	0.20	1.82
		(0.76)	*(3.22)*	*(1.24)*	*(1.90)*	*(0.96)*	*(1.25)*
Single Treated	Weighted TE	-1.38	-10.81	-4.85	4.47	1.76	3.98

Dependent variable is reported in the title of each panel of the table (note that growth rates of GVA per worker are yearly percentage changes). Units of analysis: NUTS 3 regions. Estimation methods: SDID on multiple treated units, or SDID on single treated unit. Sample period: 1985-2001 (treatment from 1995). Results for SDID estimates, multiple treated units case, consist in: TE is the estimated effect over the treatment period on the group of Norwegian regions (SE= standard error); TE/PAVG = percentage ratio of the estimated effect to the average of the outcome variable over the treatment period in the group of Norwegian regions. Results for SDID, single treated unit case, consist in: Weighed TE = weighted average of the estimated effects over the treatment period in single Norwegian regions; Weighted TE/PAVG = weighted average of the percentage ratio of the estimated effect to the average of the outcome variable over the treatment period in single Norwegian regions. For the latter two measures, the weight of each Norwegian region is equal to its 1993 share of national GVA in the sector.

In Figure 2, we explore the full heterogeneity of the effects by reporting, for all sectors and regions, the estimated effects and their confidence intervals. Concerning the total economy, 12 out of 19 regions display a negative impact and this is statistically significant for 8 of them. For the remaining 7 regions, we find a positive impact, which is statistically significant only in Oslo and Akershus. Again, the mixed results for the total regional economies may not be that surprising given how heterogeneous the estimated effects are across sectors: a mix of positive and negative but mostly statistically non-significant impacts are obtained for both the agriculture and wholesale and retail sectors, mostly positive (and in part significant) for the financial and business service sector, negative but mostly non-significant for the construction sector, while for industry we obtain mostly negative and statistically significant results (with Akershus and Oslo displaying instead positive and significant impacts).

Figure 2: Estimated effects by region and sector



Dependent variable: GVA per worker. Units of analysis: NUTS 3 regions. Estimation method: SDID, single treated unit case. Sample period: 1985-2001 (treatment from 1995). Points represent estimated effects (euros) over the treatment period (TE), and error bars around the point estimates are 95% confidence intervals.

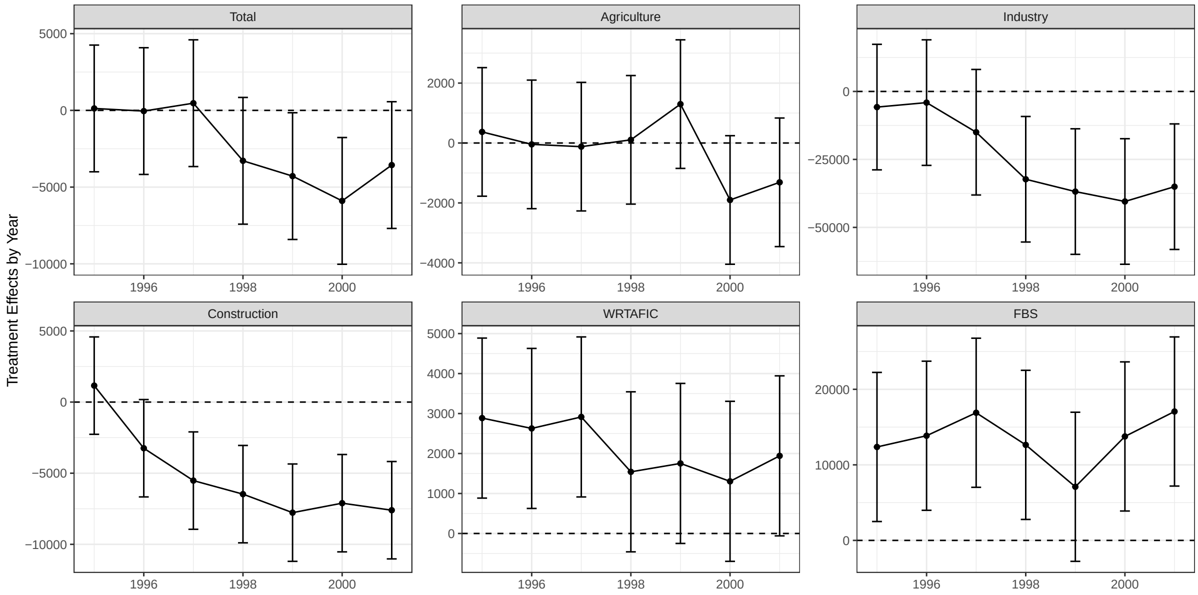
In summary, results from SDID estimations indicate that staying out of the EU generated negative productivity effects for Norway and that those negative effects were particularly large in the industrial sector. Oslo seems to represent an exception as its post-1995 productivity in the industrial sector largely outperforms its counterfactual. Further discussion and our tentative interpretation of the effects associated to Oslo are offered below.[11]

Additional evidence supporting our interpretation of the role played by the non-EU membership for the post-1995 productivity effects on Norway is shown in Figure 3. It displays, by sector, the year-by-year effects (and related confidence intervals) obtained with SDID estimations in the case of multiple treated regions. For the construction and industrial sectors, the effects gradually move towards negative over time and remain statistically significant (with the latter sector showing larger effects), while for the other sectors estimated impacts do not show a so clear pattern and statistical significance over time. This evidence is in line with the expectation that, if the non-membership in 1995 in Norway had an effect, this effect should be mostly observed for the industrial sector (because of the spectrum of intervention of the EU regulations and policies at the time) and gradually revealed over time (as institutional and regulatory changes typically require time to be adopted and implemented).

Here it is important to mention that previous econometric evidence does not support the occurrence of Dutch disease in Norway and hence the observed slowdown in Norway should not be attributed to it (see Holden (2013) and references therein). We argue for an

[11] Results from SDID estimations in the case with multiple treated regions and excluding Oslo from the estimated samples are reported in Table 1.

Figure 3: Estimated effects by year and sector



Dependent variable: GVA per worker. Units of analysis: NUTS 3 regions. Estimation method: SDID, multiple treated units case. Sample period: 1985-2001 (treatment from 1995). Points represent estimated effects (euros) on the group of Norwegian regions for the year, and error bars around the point estimates are 95% confidence intervals.

alternative explanation based on the missed productivity gains from foregone institutional integration. Our SDID estimations control for region and time effects. Therefore, they can account for the potential effects of changes in the global oil prices and for the structural dependence on natural resources of different regions.

Oslo appears to be an outlier, especially in terms of industry (Figure 2): after 1995 it significantly outperformed its counterfactual. Oslo seems to have benefited from agglomeration effects, being the largest and richest metropolitan region in Norway. Moreover, Oslo displays a higher level of labour productivity than the rest of the country. Our results indicate that not joining the EU did not reduce the scope for agglomeration effects on productivity, in fact it strengthened them along the lines suggested by Comerford, Mora, and Javorcik (2019). Furthermore, consistent with this border effect view, smaller and more peripheral regions have suffered deeper losses of potential positive effects on productivity that joining the EU could have brought.

5.2 Robustness Checks

It is important to check whether our main results are sensitive to a series of decisions regarding alternative dependent variables, levels of territorial aggregation and different composition of the donor pools to estimate the counterfactuals. Table 2 summarises the results from these various tests used as robustness checks.[12]

We first run "placebos over time" to assess whether moving the treatment to periods prior to 1995 leads to the estimation of different productivity effects on Norwegian regions. Typically, the absence of effects in the pre-treatment period would support the causal interpretation of the estimated effects over the post-1995 period for at least two reasons. First,

[12]For more detailed results on each robustness check, see figures and tables in the Online Appendix. We should also mention that it is somehow reassuring that a previous version of this paper (Campos, Coricelli, and Moretti, 2020) used the (now standard) synthetic control approach (SCM) but focusing on a productivity index and the central results remain. In fact, the preferred estimate still suggested the non-membership in the EU induced for the average Norwegian region a loss in yearly average productivity growth of about half a percentage point for the total regional economies, with the largest loss for the industrial sector.

Table 2: Summary of robustness checks by sector

Estimation	Effects	Total	Agriculture	Industry	Construction	WRTAFIC	FBS
				Placebo in 1990			
Multiple Treated	TE	5858.36	4637.12	19405.55	14572.10	474.74	2918.85
		(914.06)	*(838.89)*	*(2236.46)*	*(2864.48)*	*(518.04)*	*(2928.33)*
	TE/PAVG	8.27	22.15	10.89	20.23	1.17	1.91
Single Treated	Weighted TE	5834.94	5863.07	29832.99	8055.58	569.98	5802.77
	Weighted TE/PAVG	7.94	23.63	14.08	11.47	1.15	3.94
				Placebo in 1985			
Multiple Treated	TE	-543.41	-2199.90	35754.69	751.13	-3216.29	-10468.73
		(2138.84)	*(864.53)*	*(12350.37)*	*(1668.41)*	*(975.99)*	*(5087.78)*
	TE/PAVG	-0.91	-15.10	27.35	1.35	-8.51	-7.09
Single Treated	Weighted TE	-2959.38	-3467.95	30480.38	357.50	-4029.68	-10422.04
	Weighted TE/PAVG	-4.02	-17.13	20.28	1.04	-9.27	-6.79
				Index (100 = GVA per Worker in 1980)			
Multiple Treated	TE	-5.40	-11.85	-39.50	-10.39	4.56	13.99
		(3.60)	*(22.93)*	*(13.32)*	*(3.59)*	*(2.61)*	*(4.18)*
	TE/PAVG	-3.17	-3.26	-13.78	-6.07	3.28	11.58
Single Treated	Weighted TE	-4.11	-20.11	-32.30	-12.20	4.01	9.28
	Weighted TE/PAVG	-1.58	-9.22	-12.70	-8.11	2.55	6.82
				NUTS 2 Regions			
Multiple Treated	TE	-1462.32	-925.73	-14037.73	-4127.38	1415.89	11916.28
		(4298.74)	*(1704.93)*	*(20558.30)*	*(2066.82)*	*(1647.54)*	*(6925.77)*
	TE/PAVG	-1.82	-3.18	-6.54	-5.88	2.99	7.35
Single Treated	Weighted TE	-740.35	141.10	-10389.58	-6865.21	1241.67	14240.42
	Weighted TE/PAVG	-1.29	1.12	-8.70	-9.73	1.99	8.95
				GVA per Hour Worked – NUTS 2 Regions			
Multiple Treated	TE	-0.59	-0.05	-8.91	-1.88	3.63	-0.21
		(2.78)	*(0.64)*	*(9.55)*	*(1.44)*	*(3.25)*	*(1.42)*
	TE/PAVG	-1.36	-0.44	-8.03	-5.24	3.92	-1.12
Single Treated	Weighted TE	-0.18	0.45	-7.29	-3.47	7.47	0.70
	Weighted TE/PAVG	-0.76	4.13	-10.06	-9.63	10.94	2.36
				Austrian Regions Omitted from Donor Pool			
Multiple Treated	TE	-3891.77	-1821.92	-25703.86	-4682.21	-276.46	6752.39
		(1800.23)	*(1572.62)*	*(10356.98)*	*(1958.41)*	*(930.90)*	*(4145.08)*
	TE/PAVG	-4.87	-6.45	-12.24	-6.47	-0.61	4.27
Single Treated	Weighted TE	-1251.20	1053.61	-5920.95	-6664.51	685.61	7601.54
	Weighted TE/PAVG	-1.71	3.38	-7.01	-9.19	0.78	5.15

Dependent variable: GVA per worker, except when otherwise indicated in the title of the panel in the table. Units of analysis: NUTS 3 regions, except when otherwise indicated in the title of the panel in the table. Estimation methods: SDID on multiple treated units, or SDID on single treated unit. Sample period: 1985-2001 (treatment from 1995), except in the estimates for: Placebo in 1990, where sample period is 1984-1994 (treatment from 1990); Placebo in 1985, where sample period is 1981-1990 (treatment from 1985). Results for SDID estimates, multiple treated units case, consist in: TE = estimated effect over the treatment period on the group of Norwegian regions in euros (standard error in parenthesis); TE/PAVG = percentage ratio of the estimated effect to the average of the outcome variable over the treatment period in the group of Norwegian regions. Results for SDID, single treated unit case, consist in: Weighed TE = weighted average of the estimated effects (euros) over the treatment period on single Norwegian regions; Weighted TE/PAVG = weighted average of the percentage ratio of the estimated effect to the average of the outcome variable over the treatment period in single Norwegian regions. For the latter two measures, the weight of each Norwegian region is equal to its 1993 share of national GVA in the sector.

the outcomes in the treatment and control groups would be more likely to remain on parallel trends during the pre-1995 period, and this would limit the bias of the post-1995 estimates. Second, the 1995 intervention would appear as an extreme event over a longer period of analysis, and claiming of an actual treatment from 1995 would become more credible.

In our analysis, the pre-treatment period spans from 1985 to 1994 and we decided to assess the "placebo effects" over two sub-periods of 5-years. First, we move the intervention year to 1990 and estimate the effects over the period 1990-1994 (using the period 1984-1989 as the pre-treatment). Estimates are reported in the upper panel of Table 2 and show positive effects for all sectors with a mixed statistical significance.

Second, we move the treatment year to 1985 and estimate the effects over the period 1985-1990 (using period 1981-1984 as the pre-treatment). Results show positive effects on the industrial sector and mixed for the other sectors.

Our context is not a control trial and it seems realistic that additional shocks on macroeconomic outcomes (such as sectoral productivity) took place over a decade. Nevertheless, we believe the evidence of such pre-treatment shocks does not invalidate our interpretation of the 1995 intervention. First, the SDID approach assigns a larger weight to the years just before the treatment (i.e., close to 1995), forcing the parallel trends and weighting down the influence of events in earlier periods for the construction of the post-1995 counterfactuals. Second, the evidence presented so far indicates that Norwegian industrial sector increasingly outperforms its counterfactual over the pre-1995 periods while in the post-1995 period the relationship reverses, and this supports our interpretation that a significant negative shock in the post-1995 took place on that sector.

Then, we introduce a robustness check that aims at further testing whether our main results change once we use an index series of the outcome instead of the actual levels of GVA per worker. As discussed in the methodological section, the SDID allows to construct reliable counterfactuals even when the levels of the outcome are different between the treatment and the control samples. However, to check the robustness of our main choice, here we re-scale the GVA per worker such that the 1980 value for each region (or region-sector) is equal to 100. Table 2 indicates that treatment effect in case of multiple treated units is negative and statistically non-significant for the total economy and, once again, shows mixed effects for different sectors, with the industrial sector showing negative and strongly statistically significant effects. The results obtained using the indexed series on the single Norwegian regions by sector are also in line with our main estimates.

We also analyse the effects at a higher level of territorial aggregation, using data for regions at NUTS 2 level. For these regions, we have information on working hours and we can thus look at productivity per hour worked as well. Estimation results show that these counterfactuals for the 7 NUTS 2 Norwegian regions yield similar results. Both in terms of GVA per worker and GVA per hour worked, the effect on the productivity of the industrial sector is negative and mainly statistically significant for the estimates on the single NUTS 2 Norwegian regions (again with the exception of Oslo; see Figures 1 and 1 in the Online Appendix), while it is negative but statistically non-significant for the case of multiple treated regions (see Table 2). For the other sectors, effects have mixed signs and are mainly statistically non-significant.

An additional robustness check relates to the sensitivity of our results to the composition of the donor pool. Notice that our research design does not imply any form of arbitrary choice of the regions included in the donor pool. Only the four countries we consider joined the EEA in 1994 and, among them, only Norway did not join the EU. These four countries thus define naturally the donor sample and the sample of units affected by the event under analysis (i.e., Norway's non-membership in the EU).[13] Yet, one may suspect that say because of their location closer to the core of the EU, Austrian regions would have benefited more from membership vis-à-vis Norwegian regions. When Austrian regions take positive weights for the construction of the synthetic Norwegian regions, this could lead to an overestimation (underestimation) of the negative (positive) effects on Norway.[14] The bottom part of Table 2 reports results once we restrict the donor pool accordingly. Estimates

[13] This is an important advantage of our identification strategy. In other contexts, the definition of the donor pool requires somehow arbitrary choices. In such a case, researchers need to adopt systematic ways to show that their main results are robust to different compositions of the donor samples.

[14] Campos, Coricelli, and Moretti (2019) find that, at the country level, Austria gained about 13% in GDP per worker from the EU membership, Finland about 4%, and Sweden about 3%.

indicate a productivity level for Norwegian regions statistically significantly lower than their counterfactuals for the total economy, construction, and industrial sector, while for the other sectors effects are mixed and non-significant, in line with the previous estimates.

These sensitivity checks show that not only the industrial sector seems to have suffered the most, but also the statistical significance of our estimates does not seem to vary much, suggesting that the decision to embark only on economic instead of institutional integration has slowed down productivity dynamics in Norway.

As a final robustness check, we also tried SDID preliminary analyses for the total economies of Iceland and Switzerland, countries that have also not joined the EU, using Austria, Finland and Sweden as donor countries.[15] Our results at the country-level (reported in Table 1 in the Online Appendix) indicate that both Iceland and Switzerland experienced a lower productivity than their counterfactuals, although this effect is statistical significant in Iceland only. These results are somehow reassuring as they indicate the same direction of the effects as for Norway, having the three countries opted out from full membership in the EU. However, some caveats should be kept in mind. First, the analysis at the country level constrains the search for the weighted synthetic counterfactual to three donor units (countries) only. Second, in both Iceland and Switzerland the non-membership in the EU was decided well in advance (in a 1992 referendum in Switzerland, while Iceland did not apply until 2009) and the presence of anticipation effects may be much more relevant (than in the Norwegian case). Third, the type of integration with the EU of these two countries is not fully comparable to that of Norway.

6 Discussion

The analysis above suggests that deepening institutional integration would have brought considerable productivity gains to Norway. Recent work on the characteristics of trade agreements argues that institutional integration of the type achieved by the EU is conducive to deeper agreements. In turn, such deeper trade agreements tend to lead to larger trade creation and larger trade diversion for the countries outside the union (Hofmann, Osnago, and Ruta, 2017). For Norway, this channel is relevant because it does not belong to the EU customs union and hence it has its own trade policy with respect to non-EU countries. Consequently, trade agreements with the rest of the world may not be as effective as for EU members, which enjoy a common external policy. We believe the results of the sectoral analysis above support this trade channel because they show that the largest losses of non-EU membership are related to industrial sector. By contrast, in the area of services, the degree of integration in the EU is still incomplete and much more so during the second half of the 1990s, which is the period of our analysis.

A second line of interpretation is based on political economy considerations and argues that delegating the regulation of main economic activities to supranational institutions sharply reduces the scope for rent-seeking by local interest groups, which are less powerful in influencing politicians at the EU level (Brou and Ruta, 2011; Gutierrez and Philippon, 2018). The case of fisheries and traditional small-scale manufacturing activities in Norway seems to fit well this interpretation. Notice, however, that the best available regional-level data across countries is at broader levels of sectoral aggregation, so we unfortunately cannot estimate the specific effects for these sub-sectors.

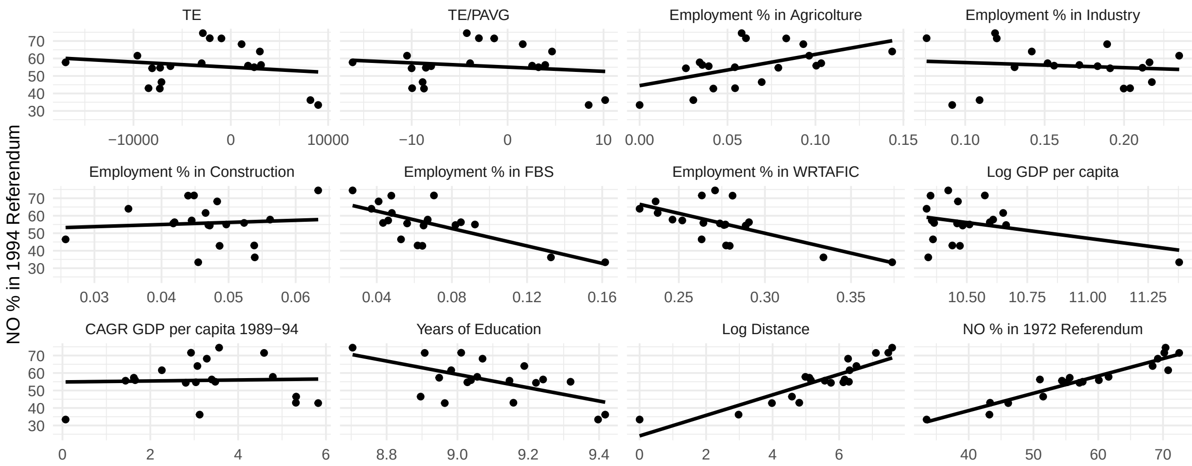
Finally, a relevant question in light of our results is why people voted against EU entry despite the likelihood of overall economic gains at the country level. Figure 4 suggests that forward-looking assessment of potential economic gains or losses did not seem to have played a major role in determining voting behaviour across regions. If anything, there appears to be a negative correlation between potential gains from non-membership in the EU and percentage of "no" vote.

One may argue that the absence of correlation between voting and point estimates of the productivity benefits of institutional integration suggests that voters were only able to ap-

[15] We are thankful to an anonymous referee for suggesting this exercise.

proximately guess the future losses. Given the small sample (19 NUTS 3 regions), it is hard to implement a rigorous empirical analysis of the relationship between voting behaviour and the economic effects of the referendum results. However, the simple correlations we show suggest that, disregarding potential economic gains or losses, voters in regions dominated by less traditional sectors showed a larger pro-membership support. These simple results support the political science literature that argues that the main factors explaining the rejection of EU membership both in 1972 and in 1994 were essentially of a political and not of an economic nature (Archer, 2005; Sogner and Archer, 1995).

Figure 4: Correlates of "No" vote in the 1994 referendum



Simple correlations between the percentage of "No" vote in the 1994 referendum on EU membership in Norway and: TE = estimated effects on GVA per worker over the treatment period; TE/PAVG = percentage ratio of the estimated effect to the average of the outcome variable over the treatment period; Employment % in sector = percentage share of the region's employment over the national employment in the sector in 1994; Log GDP per capita = log of GDP per capita in 1994; CAGR GDP per capita 1989-94 = Compound average growth rate of GDP per capita between 1989 and 1994; Years of Education = years of education in 1994; Log Distance = log of Kilometres from the region of Oslo; NO % in 1972 Referendum = percentage share of "No" vote in the 1972 referendum on EU membership. Units of analysis: 19 Norwegian NUTS 3 regions.

Three additional observations are worth making. First, similarly to forward-looking, backward–looking economic considerations do not seem to play a key role. Indeed, if we exclude the Oslo metropolitan region, there is no correlation between income per capita in 1994, on the one hand, and voting behaviour on the other. Second, there is a strong negative correlation between voting against the EU membership and education and proximity to the capital region. This may suggest that people who are less educated or live in peripheral regions tended to distrust more the proposed further integration of Norway in the EU project. Third, the high correlation between the voting results of the 1972 and the 1994 referenda suggests the presence of strong persistence in political sentiment. Therefore, slow-moving structural, political and cultural traits may play a large role in explaining the voting behaviour in Norway's EU referenda, despite the productivity losses we uncover.

7 Conclusion

The 1994 Norwegian referendum on EU membership provides a unique opportunity to identify the effects of institutional integration (EU) versus purely economic integration (EEA). Of the four candidate countries (all belonging to the EEA), one, Norway, chose to stay out of the EU, whereas Sweden, Finland and Austria opted for EU membership. Using regional and sectoral data, we are able to construct robust counterfactuals for Norwegian regions to evaluate actual post-1995 outcomes. The fact that all these four countries were ready to join the EU suggests that they were similar from an economic and institutional point of view at the date of the referendum. This minimises one of the main criticisms often raised against the use of the synthetic control methods, namely the potentially large difference between the unit under analysis and the pool of comparison units.

Our results robustly indicate that by choosing not to follow the institutional integration route seems to have led Norway to incur a significant loss of productivity, especially in industry, in the seven years after the referendum. We calculate that productivity in the average Norwegian region grew 0.6 percentage points per year slower than what it would have grown had Norway joined the EU in 1995.

The Norwegian experience may shed important light on attitudes towards the EU and the relevance of economic versus non-economic considerations. Indeed, the decision by Norwegian citizens to stay out of the EU does not seem to be associated to purely rational economic considerations. One may be tempted to argue that the vast gas and oil reserves explain this decision but the political science evidence suggests political and cultural factors played larger roles, chiefly among these heterogeneous preferences and attachment to community values (Sogner and Archer, 1995).

The experience of Norway is also particularly relevant for understanding more general forces behind the process of EU integration or dis-integration. As recently stressed by Rajan (2019), economists have traditionally focused on the state and the market as the two main pillars of an economy. However, there is a third pillar, what he defines as community, which may be as important as the others. The centrality of such pillar may explain the decision of Norwegians to stay out of the EU, in spite of being part of the Single Market and contributing to the European budget. Stressing this third pillar may have induced costs in terms of productivity growth for Norway, but it also may have pointed out a crucial issue for the future of European integration, namely the importance to implement policies and create institutions that permit community and efficiency to be complements rather than substitutes.

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Online Appendix for: ”Institutional Integration and Productivity Growth: Evidence from the 1995 Enlargement of the European Union”

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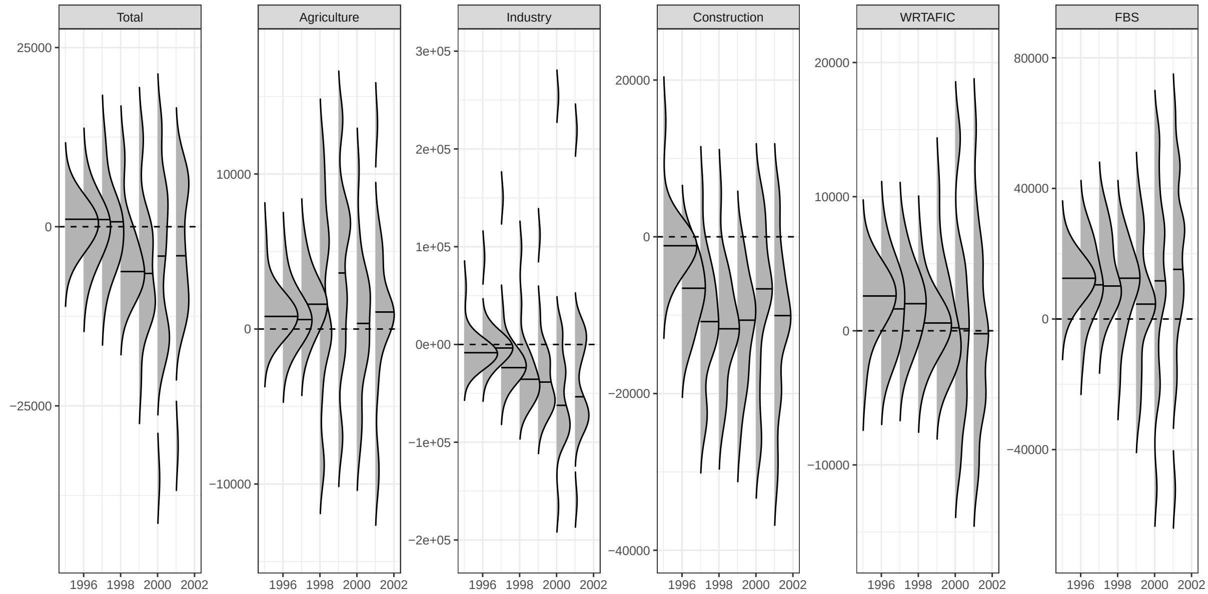
A Additional Plot for Main Estimates

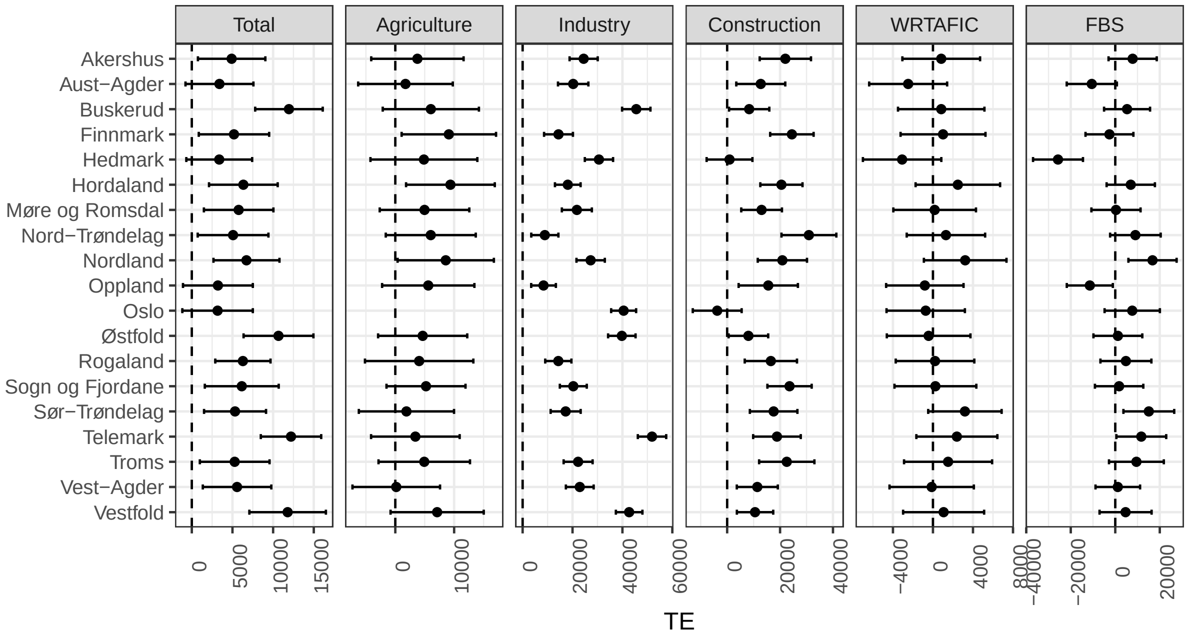
Figure 1: SDID estimates on single treated units - Kernel distributions of estimated effects on regions, by sector and year



Dependent variable: GVA per worker. Units of analysis: NUTS 3 regions. Estimation method: SDID, single treated unit case. Sample period: 1985-2001 (treatment from 1995). Distributions are kernel estimates of the estimated effects on Norwegian regions by year and sector. Black solid line marks the median of the yearly distribution.

B Additional Plot for Placebo in 1990

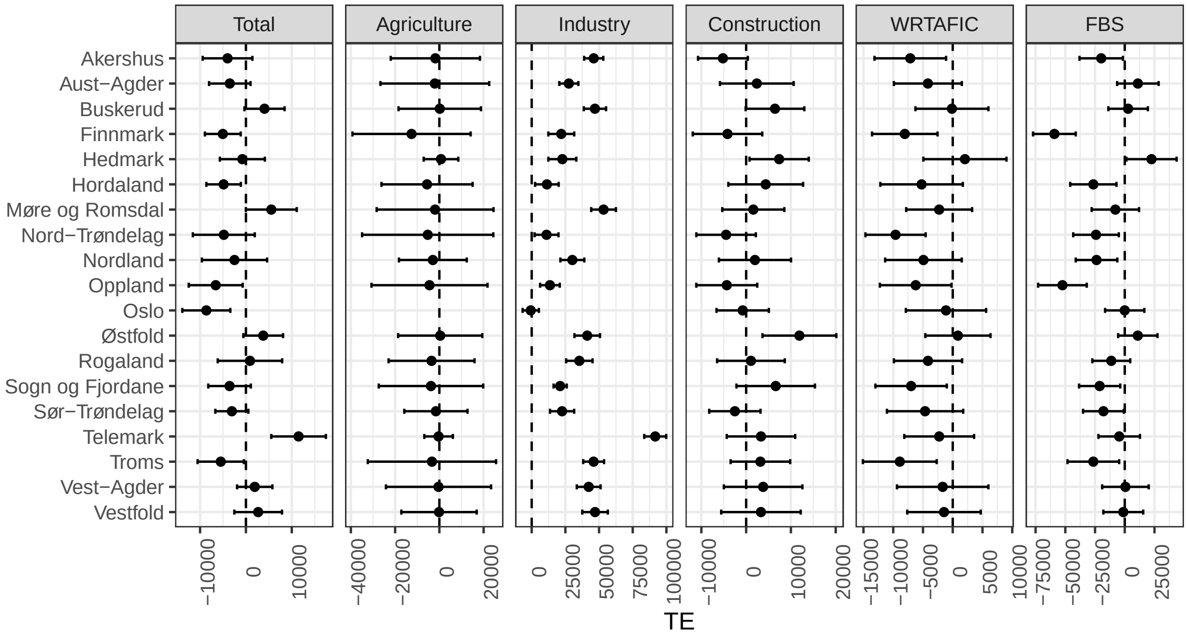
Figure 1: SDID estimates on single treated units - Estimated effects on GVA per worker by NUTS 3 region and sector



Dependent variable: GVA per worker. Units of analysis: NUTS 3 regions. Estimation method: SDID, single treated unit case. Sample period: 1984-1994 (treatment from 1990). Points represent estimated effects over the treatment period (Effect), and error bars around the point estimates are 95% confidence intervals.

C Additional Plot for Placebo in 1985

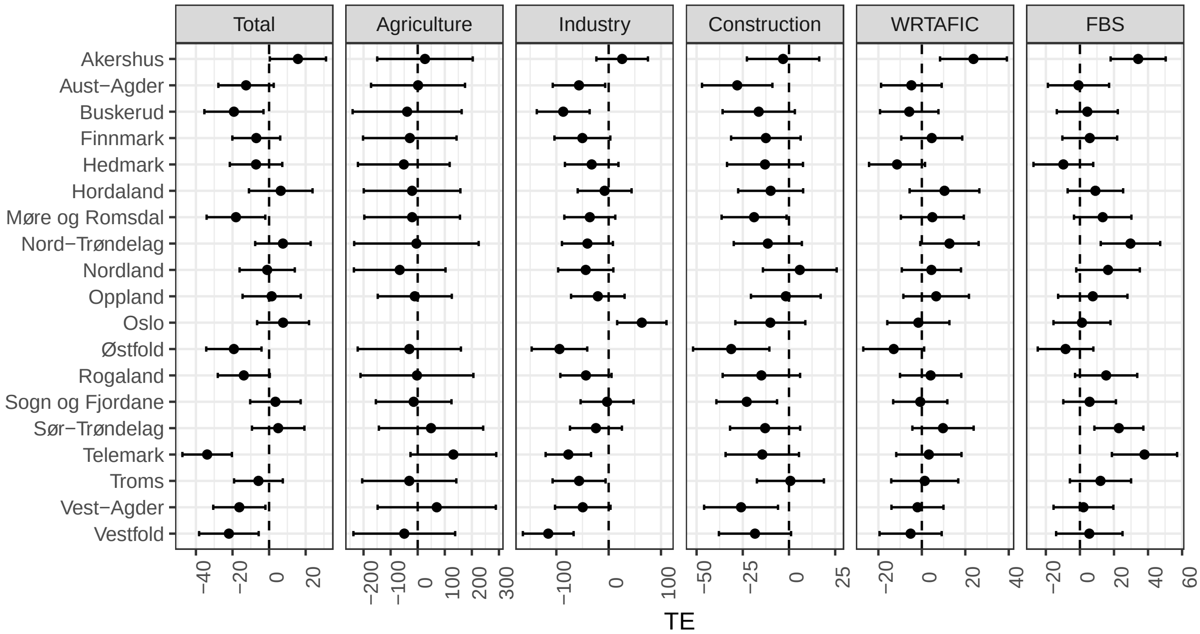
Figure 1: SDID estimates on single treated units - Estimated effects on GVA per worker by NUTS 3 region and sector



Dependent variable: GVA per worker. Units of analysis: NUTS 3 regions. Estimation method: SDID, single treated unit case. Sample period: 1981-1990 (treatment from 1985). Points represent estimated effects over the treatment period (Effect), and error bars around the point estimates are 95% confidence intervals.

D Additional Plot for Index (100 = GVA per Worker in 1980)

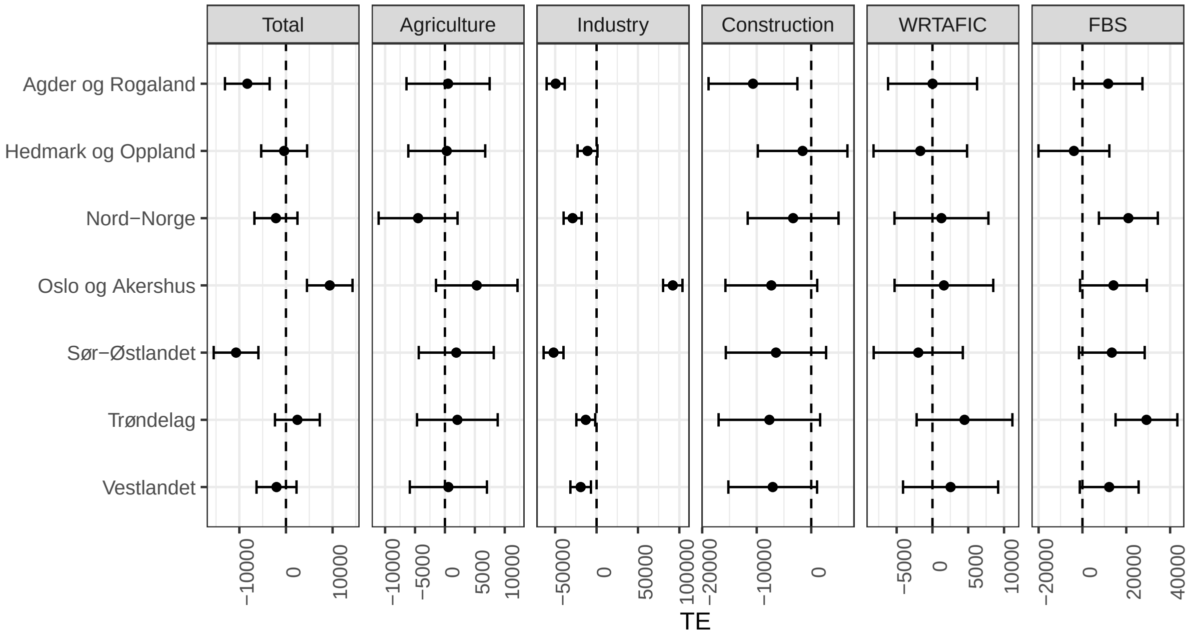
Figure 1: SDID estimates on single treated units - Estimated effects on Index (100 = GVA per worker in 1980) by NUTS 3 region and sector



Dependent variable: Index (100 = GVA per worker in 1980). Units of analysis: NUTS 3 regions. Estimation method: SDID, single treated unit case. Sample period: 1985-2001 (treatment from 1995). Points represent estimated effects over the treatment period (Effect), and error bars around the point estimates are 95% confidence intervals.

E Additional Plot for GVA per Worker at NUTS 2 Level

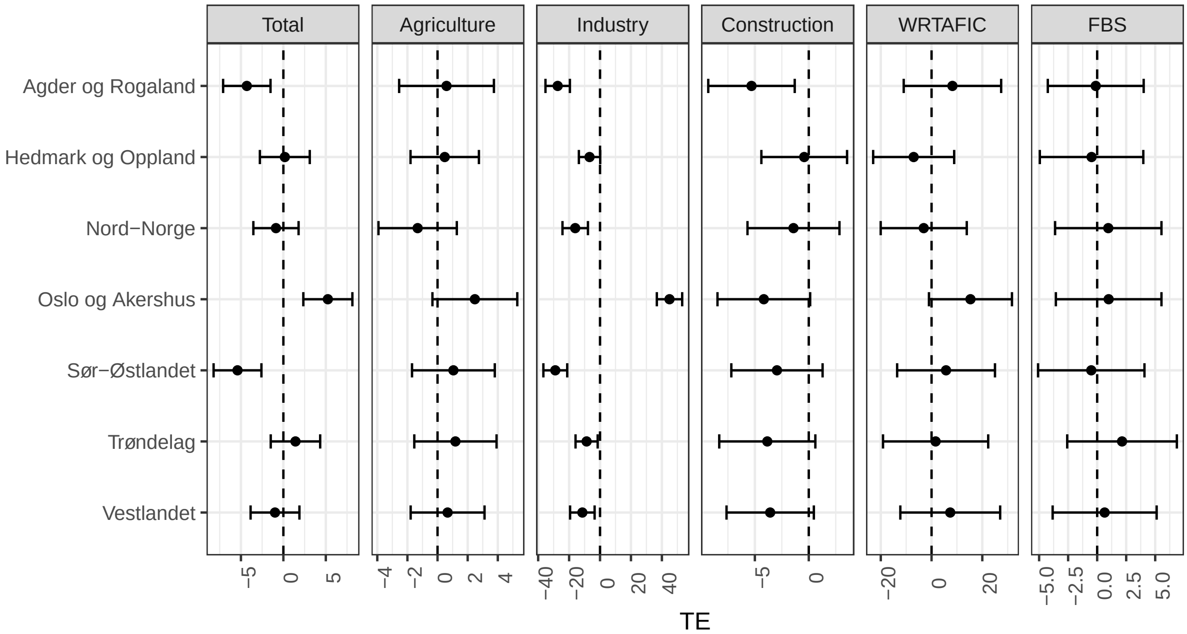
Figure 1: SDID estimates on single treated units - Estimated effects on GVA per worker by NUTS 2 region and sector



Dependent variable: GVA per worker. Units of analysis: NUTS 2 regions. Estimation method: SDID, single treated unit case. Sample period: 1985-2001 (treatment from 1995). Points represent estimated effects over the treatment period (Effect), and error bars around the point estimates are 95% confidence intervals.

F Additional Plots for GVA per Hour Worked at NUTS 2 Level

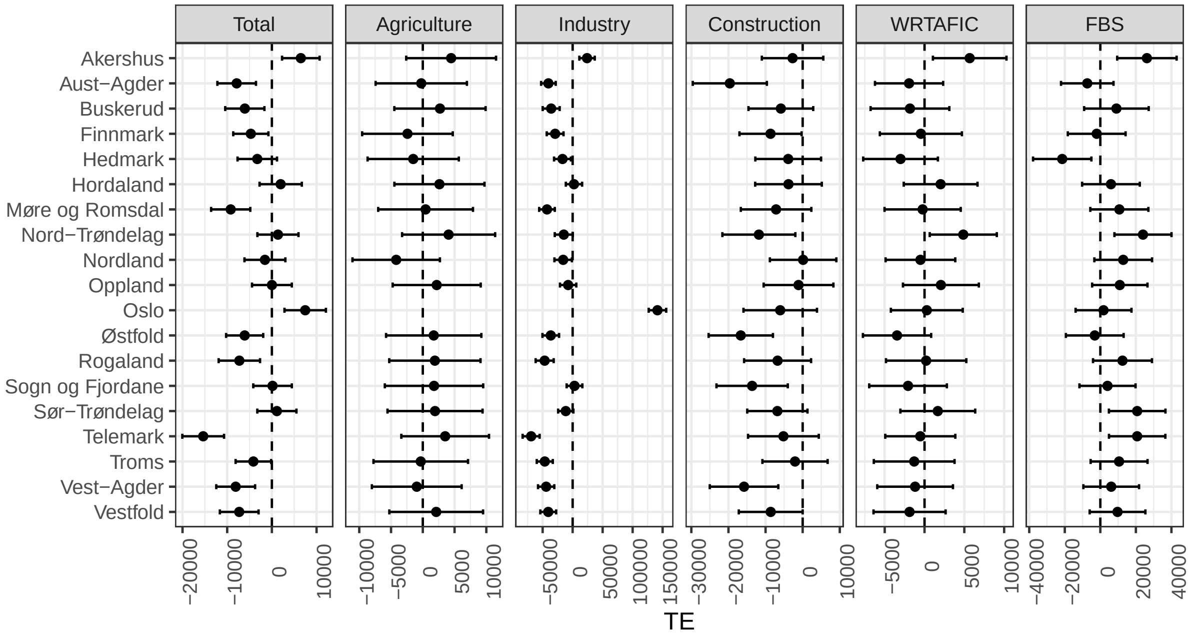
Figure 1: SDID estimates on single treated units - Estimated effects on GVA per hour worked by NUTS 2 region and sector



Dependent variable: GVA per hour worked. Units of analysis: NUTS 2 regions. Estimation method: SDID, single treated unit case. Sample period: 1985-2001 (treatment from 1995). Points represent estimated effects over the treatment period (Effect), and error bars around the point estimates are 95% confidence intervals.

G Additional Plots when Austria is Excluded from Donor Pool

Figure 1: SDID estimates on single treated units - Estimated effects on GVA per worker by NUTS 3 region and sector



Dependent variable: GVA per worker. Units of analysis: NUTS 3 regions (excluding Austrian regions). Estimation method: SDID, single treated unit case. Sample period: 1985-2001 (treatment from 1995). Points represent estimated effects over the treatment period (Effect), and error bars around the point estimates are 95% confidence intervals.

H Results for Switzerland and Iceland

Table 1: SDID estimates on single treated units - Country level - GVA per worker - Total economy

	Switzerland		Iceland	
TE		-2845.96		-4729.45
SE		1491.06		1480.19
Donors	Country	Weight	Country	Weight
	Sweden	1	Sweden	0.66
			Austria	0.34

Dependent variable: GVA per worker for the total national economy. Units of analysis: country level. Estimation method: SDID, single treated unit case. Sample period: 1985-2001 (treatment from 1995). Effect = estimated effect on the country over the treatment period (standard error in parenthesis).