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Abstract

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Keywords: Institutional integration, economic integration, European Union

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Choosing Institutional over Economic Integration: Are There Growth Effects?*

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1. Introduction

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). Today, this distinction is often framed in terms of shallow versus deep integration. Lawrence (1996) associates shallow integration with traditional trade agreements affecting tariffs and related measures, and deep integration with trade agreements that go beyond traditional areas and affect competition policies and regulations.[1] In this paper, we go further and study "institutional integration" (Campos et al. 2019). Institutional integration means that member countries delegate to super-national institutions (at least partially) political control over selected policies that go beyond those traditionally affected by trade agreements and related competition policies.[2]

The distinction between economic and institutional integration is very important. Brexit provides a recent example. In the history of the European Union (EU),[3] this is the first case of a country exiting the EU. In doing so, the UK decided to forfeit institutional integration while simultaneously trying to maintain economic integration. In view of the theoretical and conceptual difficulties in capturing the effects of deepening integration, i.e. progressing from economic to institutional integration, further empirical analysis remains crucial.

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[1] Important contributions to this literature are, among others, Baldwin and Jaimovich (2012), Brou and Ruta (2011), Hoffman et al. (2017), Laget et al. (forthcoming), Liu and Ornelas (2014), Maggi and Rodríguez-Clare (2007), Mansfield et al. (2008), Martin et al. (2012) and Sapir (2011).

[2] See, Guiso et al. (2016) for the relevance of political and institutional integration over pure economic integration in contexts characterized by a large cultural heterogeneity.

[3] 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).

In order to disentangle the productivity gains of moving from economic to institutional integration, we employ an identification strategy based on the 1995 enlargement of the EU. As of January 1995, four countries (Austria, Finland, Norway and Sweden) had successfully completed accession negotiations, fulfilled all requirements for entry and accepted membership in the European Economic Area (EEA). EEA membership meant unrestricted access to the European Single Market. They were all deemed ready to join the EU, but only three countries (Austria, Finland and Sweden) actually joined because one (Norway) decided to reject full-fledged EU membership in a national referendum in November 1994.[4]

What are the productivity effects of moving from just economic to institutional integration? In other words, what would the productivity dynamics be in each of the regions of Norway if it had actually joined the EU in January 1995? To answer this question, we use sectoral and regional data from Austria, Finland, Norway and Sweden and employ the synthetic control method (SCM) to construct counterfactuals and study the effects of non-membership in the EU on Norwegian regions.

We find significant net benefits in terms of productivity growth from choosing institutional over economic integration. Our estimates indicate that had Norway chosen institutional integration in 1995, instead of choosing to pursue only economic integration, the

[4] 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) to guarantee a fair functioning of the economic integration of European countries through the Single Market. EU full-fledged member states are further institutionally integrated among each other as they share additional common policies and institutions 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. See https://www.efta.int/eea/eea-agreement/eea-basic-features.

average Norwegian region would have experienced an additional half a percentage point in yearly average productivity growth. These effects are large given average productivity growth is normally between 1.5 and 2 percent. Moreover, the effects of not joining vary across sectors, with larger negative effects estimated for industrial sectors. Our estimates are robust to various sensitivity checks, including changes to the set of predictors, the definition of the dependent variable, the level of territorial aggregation, and the composition of the comparison sample.

Our results indicate that institutional integration delivers larger benefits than pure economic integration. There are various possible underlying channels through which institutional integration may affect economic performance but a key one is the "productivity channel". Institutional integration facilitates coordination, limits rent seeking activities of interest groups, and augments (interacts positively with) economic integration (Brou and Ruta, 2011, Gutierrez and Phillippon, 2018).

Our analysis is the first to estimate the economic gains that institutional integration may induce in addition to those brought about by pure economic integration at regional and sectoral levels. Campos et al. (2019) use country-level data to assess the effects of EU membership, by using as counterfactual countries that do not belong either to the EU or to the EEA. Here we complement their evidence focusing on the additional net benefits of institutional over economic integration, by contrasting full-fledged membership with participation in the EEA.

One key concern in our identification strategy is 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 inferior productivity performance of the Norwegian economy? We address this concern mainly in various ways. First, we carry out our econometric analysis at a more disaggregated level so as to "isolate" the natural resources sector as much as possible. Secondly, we call attention to the econometric evidence showing that Norway has not suffered from Dutch disease (IMF 2013, Holden 2013). Thirdly, 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 (Sogner, and Archer 1995, Archer 2005). 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.

The paper is organized as follows. Section 2 presents our identification strategy. Section 3 discusses the methodology and data. Section 4 introduces our baseline estimates and discusses various robustness checks. Section 5 discusses our main results and links them to political support for institutional integration. Section 6 concludes.

2. 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 official view of the EU 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 (which are only economically integrated) and Austrian, Finnish and Swedish regions (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, 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. 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 (Barnes, 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, p. 22). 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 percent in 1970 to about 50 percent in early 1990 (World Development Indicators). Energy also supported an increasing role for the public sector, with the ratio of government expenditures to private consumption rising from 30% in 1970 to 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 percent 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 (52.5% voted against it this time versus 53.5% in 1972). Only two of the seven major 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, which voted 72% against.[5]

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.

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

We have been upfront about a key factor we believe could complicate our strategy, namely the possibility that natural resources 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).[6] 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 references therein). Our analysis in section 5 of the correlations between referendum results at the regional level and potential determinants confirms 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 (Hagelund, 2009, Cappelen and Eika, forthcoming). Therefore, we end the time coverage of our estimates in 2004 so as to try to address these concerns.

3. Methodology

Our strategy to identify the productivity benefits from institutional integration focuses on the

[6] 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.

1995 enlargement and employs a panel of NUTS3 regions from Norway, Austria, Finland, and Sweden.[7] Because these are all high-income countries, productivity provides a better measure of economic performance.[8]

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 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 productivity post-entry for Austria, Finland and Sweden.

[Figure 1 about here]

[7] For details on Eurostat's Nomenclature of Territorial Units for Statistics (NUTS), see http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction

[8] Another important factor for focusing on productivity rather than GDP or GDP per capita is that Norway has a sizable natural resource sector, which affects overall GDP of the country.

A standard difference-in-differences comparison of productivity before and after 1995, reveals that Norwegian regions had significantly smaller growth rates and trend growth rates (Table 1, columns 4 to 9) than the regions of Austria, Finland, and Sweden.[9] This is preliminary evidence that the deeper institutional integration Norway renounced had negative effects on productivity growth. It is robust to the inclusion of region, time fixed-effects and time-varying control variables, which reduce omitted variable problems. Yet, results from difference-in-difference estimates do not seem robust. For instance, if we focus on productivity levels (Table 1, columns 1 to 3) instead of growth, the results reverse: Norwegian regions display higher levels of productivity in the post-1995 period.

The extent of the discrepancy between the difference-in-differences results for levels and growth rates together with the potential heterogeneous effects experienced by Norwegian regions cast doubts on the appropriateness of this approach. One way of constructing more reliable, region-specific counterfactuals (also attentive to the pre-1995 parallel trends) is to use the synthetic control method (SCM), pioneered by Abadie and Gardeazabal (2003) and Abadie et al. (2010, 2015).[10]

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[9] We measure productivity as gross value added (GVA) per worker. The analysis is based on regional data from Cambridge Econometrics European Regional Database (2017). Results indicating negative impact on productivity growth for all sectors except financial and business services are shown in Table A.1 in the Online Appendix.

[10] See Imbens and Wooldridge (2009) for a discussion of how SCM compares to other recent developments in the econometrics of program evaluation. There is a growing literature applying the SCM to macroeconomic and political economy issues. Examples of the various recent applications of SCM are Abadie et al. (2015) on German reunification, Campos and Kinoshita (2010) on foreign direct investment, Lee (2011) on inflation targeting, Billmeier and Nannicini (2013) on trade liberalization, Acemoglu et al. (2016) on political connections, Campos et al. (2019) on EU membership, and Saia (2017) on the trade effects of non-Euro for the UK.

Our implementation of the SCM consists in the construction of a "synthetic" or "artificial" control for each Norwegian region. This allows us to compare the evolution of an aggregate outcome variable (productivity) for a given Norwegian region that has not joined the EU vis-à-vis the evolution of the same aggregate outcome for a "synthetic region" that has joined the EU. Therefore, the SCM allows us to answer the question: "what would have been the evolution of productivity in *each* region after 1995 if Norway had become a full-fledged member of the EU?"

The method involves identifying the optimal weighted combination of control units, (or "donor units", in this case regions of Austria, Finland and Sweden) to match as closely as possible a Norwegian region in the pre-1995 period, for a set of predictors of the outcome variable.

More formally, the SCM estimates a synthetic match by minimizing the pre-1995 distance between the actual outcome of a Norwegian region *i* (Y_i^{actual}) and the weighted combination of the outcomes of the *j*=2,…*n*+1 donor units ($Y_i^{synthetic} = \sum_{j=2}^{n+1} w_j Y_j$), given a set of predictors. The post-1995 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 Norwegian region if the intervention had happened in the same way as in the donor pool.

There are various advantages of the SCM over the difference-in-differences approach for applying it to the analysis of regional and sectoral data in the context of 1995 European enlargement. First, the SCM can provide a better pre-1995 match between Norwegian and control regions. Second, it better controls for the presence of time-variant unobserved heterogeneity (Abadie et al., 2010). As argued in a recent authoritative review of empirical methods "the synthetic control approach developed by Abadie et al., 2010, Abadie et al., 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). Third, it is explicit about the individual weight of each donor region in the construction of the counterfactual for each unit under analysis. Fourth, it allows a more detailed assessment of the dynamics of the effects from the event (missed EU membership for Norway) over time by examining it for each of the analysed regions and sectors. Finally, 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, which may arise when applying the SCM to units that are highly heterogeneous.

In our application of the SCM, 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 et al., 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 ten-year post-1995 period for the reasons explained above. The Cambridge Econometrics European regional database covers NUTS2 and NUTS3 regions for EU27 countries plus Norway and Switzerland. It includes measures of GDP, GVA, population, employment (at both NUTS2 and NUTS3 level), and gross fixed capital formation (GFCF) and hours worked at the NUTS2 level.[11]

We focus here on NUTS3 regions and employ the GVA per worker as the main outcome

[11] This information is available for the regional economy (all sectors, abbreviated with *total* in the tables throughout the paper) and for broad sectors (NACE Rev. 2, 6 sectors) as follows: A: Agriculture, forestry and fishing (abbreviated with *agr*); B-E: industry less construction (*ind*); F: construction (*const*); K-N: financial & business services (*fbs*); G-J: wholesale, retail, transport, accommodation & food services, information and communication (*wrtafic*); O-U: non-market services, which we exclude from our analysis.

variable. We use an index series, rescaled such that the 1980 value for each region (or region-sector) is equal to 100, because the GVA per worker values of Norwegian regions are usually higher with respect to the values of the comparison group and the SCM could be unduly constrained to find a weighted combination of the donor units to mimic Norwegian regions.

Our choice of predictors includes the share of employment in each sector, population growth rate, population density, the investment share (GFCF over GVA), pre-1994 annual values of GVA per worker (all from Cambridge Econometrics)[12], years of education (from Gennaioli et al., 2014) and distance from the NUTS3 region to the capital region of the country (from Eurostat).

4. SCM estimation results

The objective of this section is to present our estimates of the possible economic benefits from deepening integration in the EU, exploiting the fact that Norway is a country that chose to be economically but not institutionally integrated. We assess the productivity effects of non-EU entry from 1995 until 2004. In Section 4.1 we present the results from the SCM at the regional and at the regional-sectoral level. In Section 4.2, we discuss various robustness checks establishing our main estimates are robust to changes to the set of predictors, dependent variable, level of regional aggregation, and composition of the donor pool. Finally, in Section 4.3, we run a series of analyses to assess the reliability of our main results.

4.1. Main estimates

We start our analysis by constructing a counterfactual series of productivity for each of the 19

[12] In the analysis at the NUTS3 level, we use corresponding NUTS2 values of GFCF per worker. Note that all monetary variables are deflated to 2005 constant prices.

NUTS3 Norwegian regions, using as donor pool the 75 NUTS3 regions of Austria, Finland, and Sweden and the set of predictors described above. Panel A in Table 2 shows the post-1995 difference between each actual Norwegian region and its synthetic control in terms of annual growth rates of the productivity.[13]

[Table 2 about here]

The results in column 1 of Table 2 refer to the total regional economies. Note that 12 out of 19 regions have a negative difference, that is, the average annual growth rates of productivity of the actual Norwegian regions are lower than the average growth rates of the counterfactual productivity series we estimate. Our results indicate that, between 1995 and 2004, the average (median) Norwegian region had an annual productivity growth rate 0.51 (0.66) percentage points lower than its counterfactual.[14]

In columns 2 to 6, we report the same differences in post-1995 average annual growth of the actual and synthetic series for five sectors. The results show substantial heterogeneity, with the industrial sector and construction experiencing the most negative effects: an average negative difference in the post-1995 average growth of about 2 percentage points.

Panel B in Table 2 shows average and median figures across regions by sectors in terms of difference between the productivity levels of the actual Norwegian region and its synthetic control. Our estimates show that, in the post-1995 period, productivity levels of the average Norwegian region are about 1.6 percent smaller than the counterfactuals. Looking at individual

[13] We compute the compound annual growth rates on both the actual and on its estimated synthetic control series of GVA per worker (index, 1980=100).

[14] Table B.1 in the Online Appendix shows detailed statistics about the pre-intervention predictors balance between each Norwegian region and its synthetic control. Figures A.1 in the Online Appendix show the dynamics of each Norwegian region and its synthetic control, both at the regional and regional-sector level.

sectors, industry, with about -18 percent, displays the largest negative gap.[15]

In summary, results from the SCM indicate that staying out of the EU brought negative productivity effects for Norway and that those negative effects were particularly large in the industrial sector.

4.2 Robustness checks

It is important to check whether our main results are sensitive to a series of decisions regarding different set of predictors used to estimate the counterfactuals, alternative dependent variables, levels of territorial aggregation and different composition of the donor pools. Table 3 summarizes the results from these robustness checks by reporting the average effects across regions by sector.

[Table 3 about here]

We first show that our results are robust to the exclusion from the model specification of the pre-1994 annual values of the outcome variable. Specifically, we re-estimate the counterfactual for each Norwegian region including only the pre-1995 average value of the outcome and the other predictors. Relative to our main estimates, results with this specification indicate even stronger negative effects of non-EU membership on Norwegian regions. During the post-1995 period, the average Norwegian region shows an annual productivity growth 0.9 percentage points slower than its counterfactual. The results at the sectoral level are also in line with the main estimates, with the industrial sector showing again the largest negative difference both for growth rates and levels of productivity.[16]

[15] See Table A.2 in the Online Appendix for detailed effects on productivity levels at the regional and sectoral level.

[16] For the detailed results obtained excluding the pre-1994 annual outcomes from the predictors, see Tables A.3.A

Although our results indicate that the exclusion of the annual values of the outcome does not affect our main conclusions, it reduces the precision of the pre-1995 match between the actual Norwegian regions and their synthetic counterfactuals. Indeed, the pre-1995 root mean square prediction error (RMSPE) almost double for all sectors once the annual values of the outcome are excluded.[17]

Second, we test whether our results are robust to a different definition of productivity dynamics. So far, the results referring to the growth rates of the productivity are given by the differences in the annual compound growth rates of the actual and synthetic Norwegian regions. We thus test whether our results are robust to use as dependent variable in the SCM analysis the trend growth rates of GVA per worker instead.[18] These results show that the trend productivity growth rates in the actual Norwegian regions are smaller with respect to counterfactuals in the post-1995 period and the industry sector is again the one mostly negatively affected by this slower growth. The average Norwegian region shows a difference in productivity growth of about -0.6 percentage points with respect to its counterfactual. Again, industry displays a much stronger negative effect, of about -1.9 percentage points.[19]

As an additional robustness check in the definition of the outcome variable, we use the

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and A.3.B in the Online Appendix.

[17] For the results about the RMSPE with the model specifications including and excluding the pre-1994 annual outcomes among the predictors, please see Tables A.4 and A.5 in the Online Appendix, respectively.

[18] Trend growth rates of GVA per worker are obtained using the Hodrick-Prescott filter (applied over the period 1981 to 2008). Note that the original growth rates of GVA per worker series are too volatile to allow a reasonably good match during the pre-event period.

[19] See Table A.6.A in the Online Appendix for detailed results for each region and sector and Table A.6.B for the related RMSPE.

GVA per hour worked instead of the GVA per worker as a measure of productivity because the former takes into account across countries differences in typical working hours arrangements. As this information on hours worked is available only at the NUTS2 level, we re-run our SCM analysis at this higher level of territorial aggregation. Estimation results show that these synthetic counterfactuals for the 7 NUTS2 Norwegian regions yield very similar results both in terms of GVA per worker and per hour worked. Again, the negative effect on productivity, both for GVA per hour worked and GVA per worker, is larger for industry.[20]

A final set of robustness checks concern 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., the non-membership in the EU).[21] Yet, one may suspect for instance that, 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.[22] A second concern is about

[20] For detailed results at the NUTS2 region and sector level, see Tables A.7.A, A.7.B, A.8.A, and A.8.B in the Online Appendix. Note that model specification for the NUTS2 analysis does not include the distance from the region to the capital.

[21] 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.

[22] Campos et al. (2019) find that, at the country level, Austria gained about 13 percent in GDP per worker from

single currency effects in regions of both Austria and Finland as they became members of Euro area and this could have further affected their performance. The last four rows of Table 3 report results once we restrict the donor pool to Finnish and Swedish regions and Swedish regions only. Results are in line with the previous estimates.[23]

Another important robustness check regards whether our estimated counterfactuals are highly dependent on some particular donor regions. To do so, we implement the so-called leave-one-out procedure proposed by Abadie et al. (2010, 2015). We re-estimate for each region (and region-sector) several synthetic counterfactuals by excluding each time from the donor pool a region that originally took a positive weight in the construction of the main synthetic counterfactual. The results show that our preferred counterfactuals are very similar to these alternative specifications.[24]

These sensitivity checks show that not only the industrial sector seems to have suffered the most, but also the economic significance of our estimates does not seem to vary, repeatedly suggesting that the decision to embark only on economic instead of institutional integration has slowed down productivity growth in Norway by about half a percentage point. Economically, this is a very substantial effect considering that the annual average productivity growth rate in Norwegian regions was about 1.6% between 1995 and 2004.

4.3 Evidence on the reliability of the estimates

One of the main limitations of the SCM is that "does not allow assessing the significance of the results using standard (large-sample) inferential techniques, because the number of

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the EU membership, Finland about 4 percent, and Sweden about 3 percent.

[23] For detailed results at the region and sector level, see Tables A.9.A, A.9.B, A.10.A and A.10.B in the Online Appendix.

[24] See Figures A.1 in the Online Appendix.

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). The way to deal with this is to compare the estimated effects on the units under analysis with the estimated effects on the units in the donor pool, obtained with a similar donor pool across all the estimations (Abadie et al. 2010, 2015). This allows us to assess the exceptionality of the effects on Norwegian regions with respect to the idiosyncratic effects estimated in the donor regions. If Norwegian regions' effects are somehow extreme, we can attach more confidence to the validity of our results.

For each region of Austria, Finland and Sweden we construct a counterfactual using the same model specification of our main analysis and a donor pool including the regions of the other two countries. Figure 2 shows for each sector and the total economy, the distributions of the post-1995 differences in the compound annual productivity growth rates between Norwegian regions and their counterfactuals (black line) and between Austrian, Finnish and Swedish regions and their counterfactuals (grey line). These results also again suggest that the negative effects on Norwegian regions are larger for industry and construction than the effects estimated for the donor regions.[25]

[Figure 2 about here]

A final, intuitive exercise to assess whether our results are statistically significant is based on the estimation of simple difference-in-differences regressions using the synthetic

[25] This evidence also holds once we weight the effects with pre-1995 RMSPE. See Figure A.2 in Online Appendix. Similarly, when we examine the distributions of the ratios of the post-1995 over pre-1995 root mean squared error (RMSE), we notice that for most of Norwegian regions and Norwegian region-industry observations these are larger than for the regions of the other three countries. See Figure A.3 in the Online Appendix. Notice that, given the setting characterized by a small number of observations, computing a p-value for each region may be misleading, but graphically one can easily see that the effects on Norway are indeed substantially stronger.

Norwegian regions (instead of the actual regions of Austria, Finland, and Sweden) in the comparison group.

Difference-in-differences estimates in Table 4 indicate that both the level and growth rates of Norwegian regions post-1995 are smaller than those for comparison groups. In line with results from the baseline specifications, the effects are larger and statistically significant for industry.

[Table 4 about here]

Here it is important to mention again 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. We argue for an alternative explanation based on the missed productivity gains from foregone institutional integration. Indeed, results in Table 4 hold when we control for region and time effects. Both sets of dummies control for the potential effects of changes in the global oil prices and for the different structural dependence of specific regions on natural resources.[26]

5. Discussion

The analysis above suggests that deepening institutional integration would have brought large productivity gains to Norway. Recent work on the characteristics of trade agreements and their impact on trade argues that institutional integration of the type achieved by the EU is conducive to deeper trade agreements (Hoffman et al. 2017). In turn, such deeper trade agreements tend to lead to larger trade creation and larger trade diversion for the countries outside the union.

[26] One could argue that the effects of oil prices on specific regions may change over time. To control for this effect, we introduce in the regression specification the interaction between time dummies and a dummy for each NUTS2 level (taking value 1 for each related NUTS3 actual and synthetic Norwegian region). As shown in Table A.11 in the Online Appendix, the inclusion of these fixed effects does not affect our main results.

For Norway, this channel is relevant because it does not belong to the EU customs union as it has its own trade policy with respect to non-EU countries. As a result, 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 industry. By contrast, in the area of services, the degree of integration in the EU is still incomplete, and in other areas, such as agriculture, staying outside the EU may actually be beneficial given the drawbacks of the EU agricultural policy.

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

Finally, a relevant question is why people voted against EU entry despite the likelihood of overall economic gains at the country level. Our results above throw light on whether voting behavior was associated with a forward-looking assessment of the potential benefits of EU entry.

[Figure 3 about here]

Figure 3 suggests that forward-looking assessment of potential economic gains or losses did not seem to have played a major role in determining voting behavior across regions. If anything, there appears to be a negative correlation between potential gains from EU entry and percentage of "yes" vote. One may argue that the absence of correlation between voting and point estimates of the benefits suggests that voters were only able to approximately guess the

future losses. Given the small sample (19 NUTS3 regions), it is hard to implement a rigorous empirical analysis of the relationship between voting behavior and the economic effects of the referendum results. However, these simple correlations suggest that, disregarding potential economic gains or losses, voters in regions dominated by less traditional sectors showed a larger pro-membership support. These lend further support to the political science literature arguing 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 (Sogner, and Archer 1995, Archer 2005).

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 outlier Oslo, there is no correlation between incomes per capita in 1994 or pre-referendum economic growth, and voting behavior. Second, there is a strong negative correlation between voting against the EU membership and both education and distance from the capital region. This may suggest that people who are less educated and live in peripheral regions tended to distrust further integration of Norway in the EU project. Third, the high correlation between the voting results of the 1972 and the 1994 referendum suggests the presence of strong persistence in voting. Therefore, slow-moving structural, political and cultural traits may explain well the voting behavior in Norway's EU referenda.

6. Conclusions

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 minimizes one of the main criticisms often raised against the use of the synthetic control method, 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 cost Norway a significant loss of productivity, especially in industry, in the ten years after the referendum. We calculate that on average Norwegian regions productivity grew half a percentage point slower than what they would have had if they had joined the EU in 1995.

In light of Brexit and the rise of populism, empirical analyses of the economic impact of the EU have become extremely relevant. Furthermore, the Norwegian experience may shed some 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 suggest political and cultural factors played much larger roles. Heterogeneous preferences and attachment to community values seem to have played a key role in the Norway-EU relationship (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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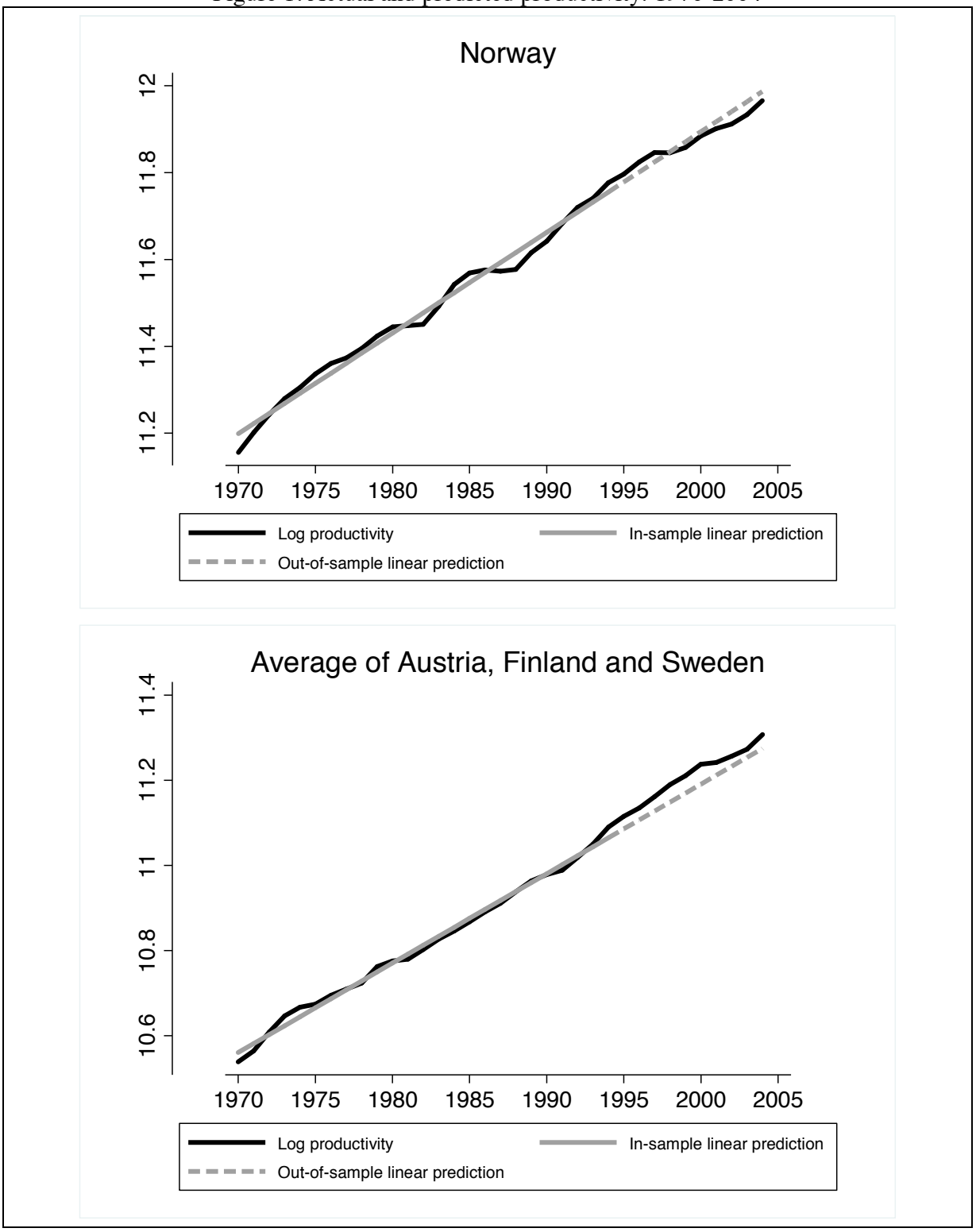
Figure 1. Actual and predicted productivity: 1970-2004



Notes: Productivity is defined as Real GDP at constant 2011 prices over employment, from Penn World Tables 9.1. Trend estimated for 1970-1994, projected for the post-1995 period.

Table 1. Difference-in-differences estimates

Dependent variable:	GVA per worker (index, 1980=100)			Growth rate of GVA per worker			Trend growth rate of GVA per worker		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post 1995	35.16***			-0.68***			-0.27*		
	(2.07)			(0.17)			(0.15)		
Norway	7.46			0.53			0.80**		
	(5.98)			(0.47)			(0.40)		
Post 1995 * Norway	3.68	3.68	12.41***	-1.10*	-1.10*	-2.31***	-1.44***	-1.44***	-2.20***
	(5.02)	(5.04)	(4.57)	(0.60)	(0.60)	(0.67)	(0.47)	(0.47)	(0.42)
Observations	1,880	1,880	1,880	1,880	1,880	1,880	1,880	1,880	1,880
R-squared	0.21	0.75	0.80	0.02	0.11	0.13	0.09	0.19	0.30
Region FE		YES	YES		YES	YES		YES	YES
Year FE		YES	YES		YES	YES		YES	YES
Region-Year controls			YES			YES			YES

Notes: Robust standard errors clustered at the regional (NUTS 3) level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Region-Year controls include the investment share, the share of employment of the sectors, population growth rate, population density, years of education and distance between the region and the capital region of the country.

Table 2. Main SCM results

PANEL A:
Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100) between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	0.03		1.17	-3.80	1.01	0.82
Akershus	1.11	1.06	0.36	-3.06	4.93	2.97
Hedmark	-0.62	-4.08	-1.22	-2.85	-3.00	-3.71
Oppland	-0.21	-0.99	-1.97	-1.47	1.27	0.87
Østfold	-0.66	3.91	-2.76	-3.69	-0.33	-2.68
Buskerud	-0.67	4.56	-2.92	-0.86	1.10	-0.52
Vestfold	-1.14	2.00	-5.82	-2.83	2.26	-0.87
Telemark	-2.43	6.36	-4.89	0.00	2.08	-0.52
Aust-Agder	-1.93	2.31	-2.77	-5.62	-0.66	-3.07
Vest-Agder	-1.06	7.21	-2.56	-5.10	1.43	-1.78
Rogaland	-0.90	0.58	-3.53	-2.31	2.57	0.23
Hordaland	0.77	-3.24	2.86	-0.28	0.37	-0.24
Sogn og Fjordane	1.12	-0.76	1.33	-3.08	0.90	-1.64
Møre og Romsdal	-2.00	-0.38	-4.00	-2.45	2.16	-0.25
Sør-Trøndelag	0.29	2.03	-1.51	-2.27	3.11	0.32
Nord-Trøndelag	0.67	-0.10	-4.10	-3.79	4.25	0.08
Nordland	0.74	-2.29	1.82	0.03	0.53	-1.34
Troms	-1.35	0.29	-4.88	0.46	1.66	-1.40
Finnmark	-1.40	-1.18	-3.95	-3.50	0.11	-0.38
MEAN	-0.51	0.96	-2.07	-2.45	1.36	-0.69
MEDIAN	-0.66	0.43	-2.76	-2.83	1.27	-0.52

PANEL B:
Post-1995 average percentage difference in GVA per worker (index, 1980=100) between actual and synthetic region

	total	agr	ind	const	fbs	wrtafic
MEAN	-1.62	5.23	-17.76	-3.76	12.10	-0.32
MEDIAN	-2.58	3.60	-23.72	-7.25	9.65	-1.53

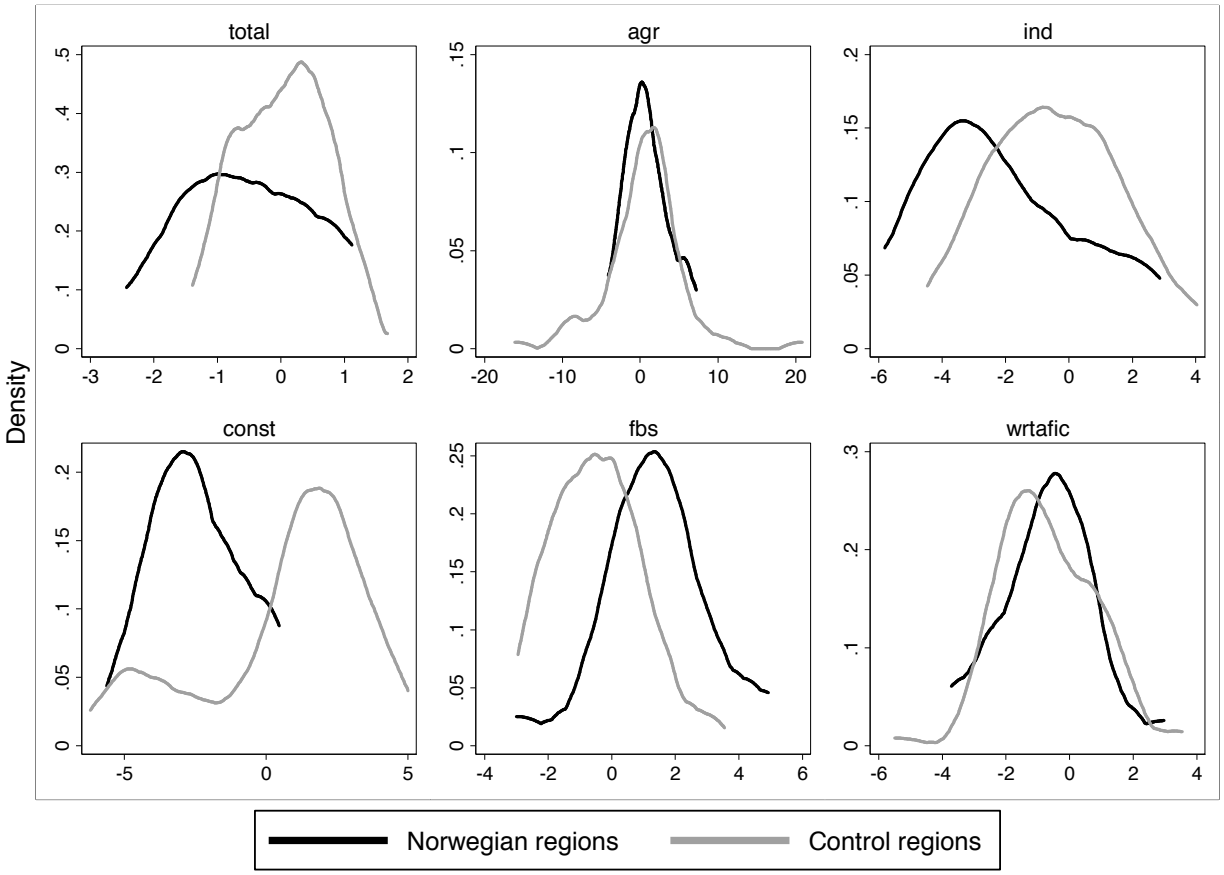
Notes: *total* refers to the regional economy (all sectors); *agr* to the agriculture, forestry and fishing ; *ind* to industry less construction; *const* to construction; *fbs* to financial & business services; *wrtafic* to wholesale, retail, transport, accommodation & food services, information and communication.

Table 3. Robustness checks

	Average values					
	total	agr	ind	const	fbs	wrtafic
Excluding annual values of the GVA per worker (index, 1980=100) from the model specification: Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100) between actual and synthetic region	-0.86	-0.39	-3.45	-2.19	1.27	-1.52
Excluding annual values of the GVA per worker (index, 1980=100) from the model specification: Post-1995 average percentage difference in GVA per worker (index, 1980=100) between actual and synthetic region	-2.80	35.20	-22.43	-7.40	9.75	-3.40
Pre-1995 RMSPE in the estimation of synthetic GVA per worker (index, 1980=100)	3.00	8.49	9.69	8.66	2.67	2.40
Excluding annual values of the GVA per worker (index, 1980=100) from the model specification: Pre-1995 RMSPE in the estimation of the synthetic GVA per worker (index, 1980=100)	6.91	36.40	15.93	13.59	5.14	4.77
Post-1995 difference in the average trend growth rate of GVA per worker between actual and synthetic region	-0.58	-0.90	-1.88	-0.41	0.05	-0.33
NUTS2: Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100) between actual and synthetic region	-0.30	-0.20	-1.87	-1.10	1.44	-0.14
NUTS2: Post-1995 average percentage difference in GVA per worker (index, 1980=100) between actual and synthetic region	-1.05	4.83	-14.68	2.31	8.49	2.19
NUTS2: Post-1995 difference in compound annual growth rates of GVA per hour worked (index, 1980=100) between actual and synthetic region	0.31	0.39	-2.00	-0.93	1.28	-0.28
NUTS2: Post-1995 average percentage difference in GVA per hour worked (index, 1980=100) between actual and synthetic region	0.49	11.55	-16.18	2.77	10.01	3.60
Excluding Austrian regions from the donor pool: Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100) between actual and synthetic region	-0.75	1.25	-2.56	-0.53	1.55	-1.03
Excluding Austrian regions from the donor pool: Post-1995 average percentage difference in GVA per worker (index, 1980=100) between actual and synthetic region	-4.60	9.72	-18.22	2.99	12.38	-4.04
Excluding Austrian and Finnish regions from the donor pool: Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100) between actual and synthetic region	-0.99	-0.70	-3.32	-2.24	1.84	-1.37
Excluding Austrian and Finnish regions from the donor pool: Post-1995 average percentage difference in GVA per worker (index, 1980=100) between actual and synthetic region	8.64	27.83	-8.67	-4.60	16.05	-4.13

Notes: *total* refers to the regional economy (all sectors); *agr* to the agriculture, forestry and fishing ; *ind* to industry less construction; *const* to construction; *fbs* to financial & business services; *wrtafic* to wholesale, retail, transport, accommodation & food services, information and communication.

Figure 2. Distributions of post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100) between actual and synthetic region



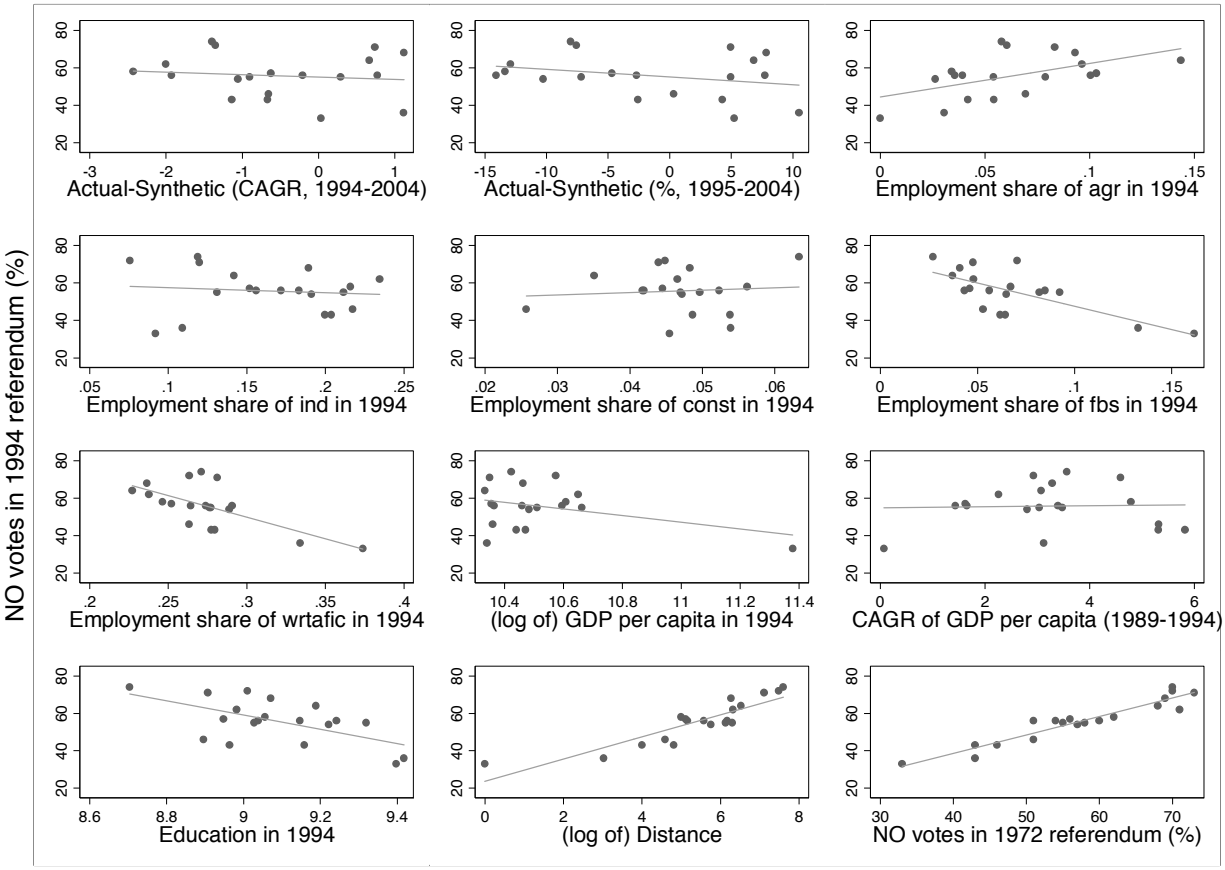
Notes: *total* refers to the regional economy (all sectors); *agr* to the agriculture, forestry and fishing ; *ind* to industry less construction; *const* to construction; *fbs* to financial & business services; *wrtafic* to wholesale, retail, transport, accommodation & food services, information and communication.

Table 4. Difference-in-differences estimates using actual and synthetic control series

	(1) total	(2) agr	(3) ind	(4) const	(5) fbs	(6) wrtafic
PANEL A						
Dependent variable:	GVA per worker (index, 1980=100)					
Post 1995 * Norway	-4.07	45.78	-70.27***	-5.40	13.84***	-1.00
	(3.34)	(26.46)	(15.70)	(4.86)	(3.29)	(2.27)
Observations	760	720	760	760	760	760
R-squared	0.80	0.49	0.72	0.68	0.23	0.65
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
PANEL B						
Dependent variable:	Growth rate of GVA per worker (index, 1980=100)					
Post 1995 * Norway	-0.57	1.34*	-1.48**	-2.12***	1.12*	-0.65
	(0.34)	(0.74)	(0.68)	(0.51)	(0.59)	(0.49)
Observations	722	684	722	722	722	722
R-squared	0.25	0.22	0.19	0.33	0.26	0.22
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
PANEL C						
Dependent variable:	Trend growth rate of GVA per worker					
Post 1995 * Norway	-0.66***	-0.89	-1.94***	-0.56*	0.01	-0.35
	(0.20)	(0.54)	(0.41)	(0.27)	(0.20)	(0.21)
Observations	760	720	760	760	760	760
R-squared	0.40	0.23	0.63	0.85	0.43	0.04
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors clustered at the regional level in parentheses. *** p<0.01, **p<0.05, * p<0.1. *Total* refers to the regional economy (all sectors); *agr* to the agriculture, forestry and fishing ; *ind* to industry less construction; *const* to construction; *fbs* to financial & business services; *wrtafic* to wholesale, retail, transport, accommodation & food services, information and communication.

Figure 3. Correlates of 1994 EU membership referendum vote in Norwegian regions



Notes: *Total* refers to the regional economy (all sectors); *Agr* to the agriculture, forestry and fishing ; *ind* to industry less construction; *const* to construction; *fbs* to financial & business services; *wrtafic* to wholesale, retail, transport, accommodation & food services, information and communication.

Online Appendix

Abbreviations and definitions

total = Regional economy (all sectors).

agr = Agriculture, forestry and fishing sector.

ind = Industry less construction sector.

const = Construction sector.

fbs = Financial & business services sector.

wrtafic = Wholesale, retail, transport, accommodation & food services, information and communication sector.

gva_emp100 = GVA (gross value added) per worker (index, 1980=100).

gfcf_gva = Investment share, i.e. GFCF (gross fixed capital formation) over GVA.

sh_emp_agr = Share of sector *agr* employment on region's employment.

sh_emp_ind = Share of sector *ind* employment on region's employment.

sh_emp_const = Share of sector *const* employment on region's employment.

sh_emp_fbs = Share of sector *fbs* employment on region's employment.

sh_emp_wrtafic = Share of sector *wrtafic* employment on region's employment.

edu = Year of schooling.

GR_pop = Growth rate of population.

pop_dens = Population density.

distance = Distance from the capital region.

APPENDIX A.

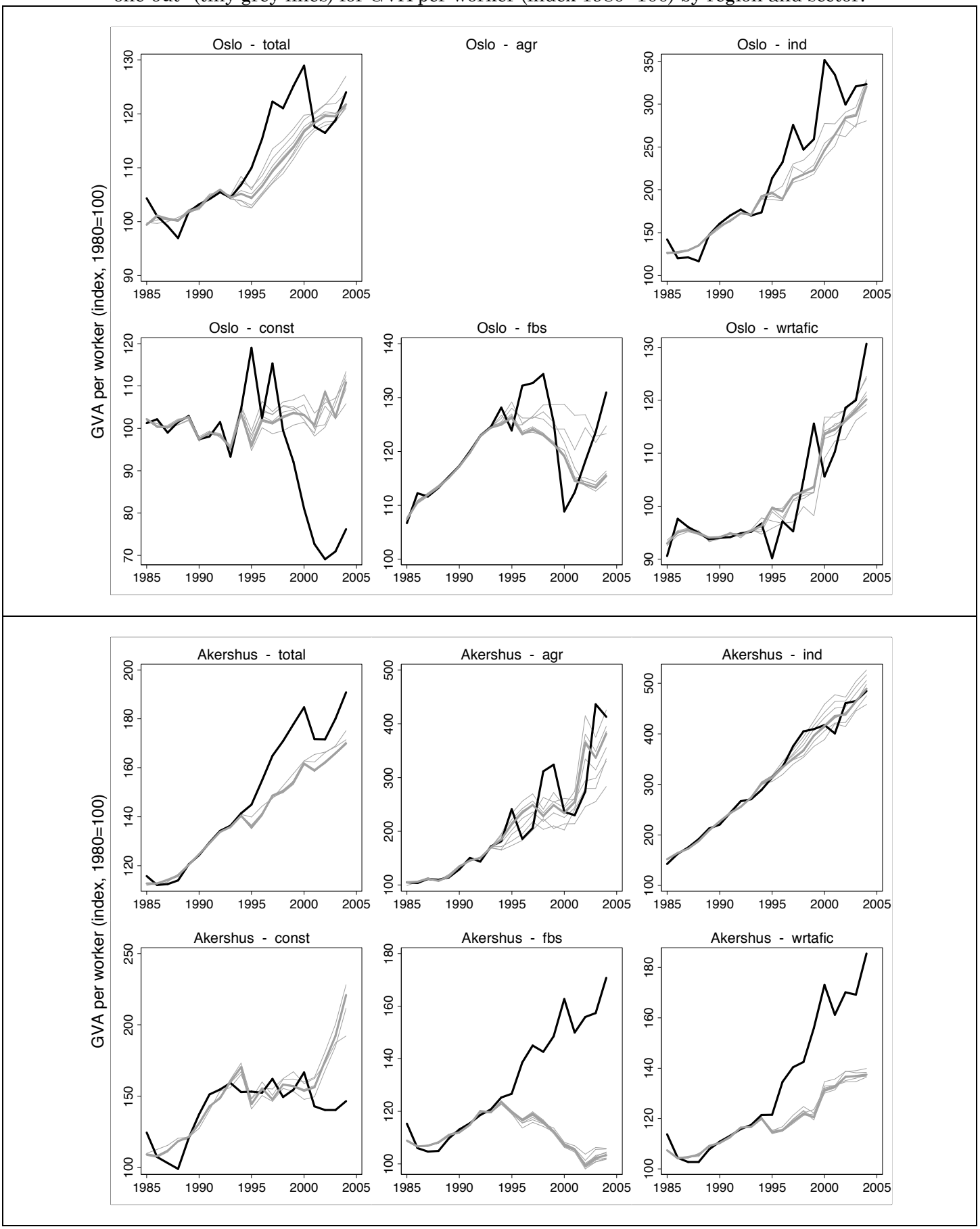
Further empirical evidence

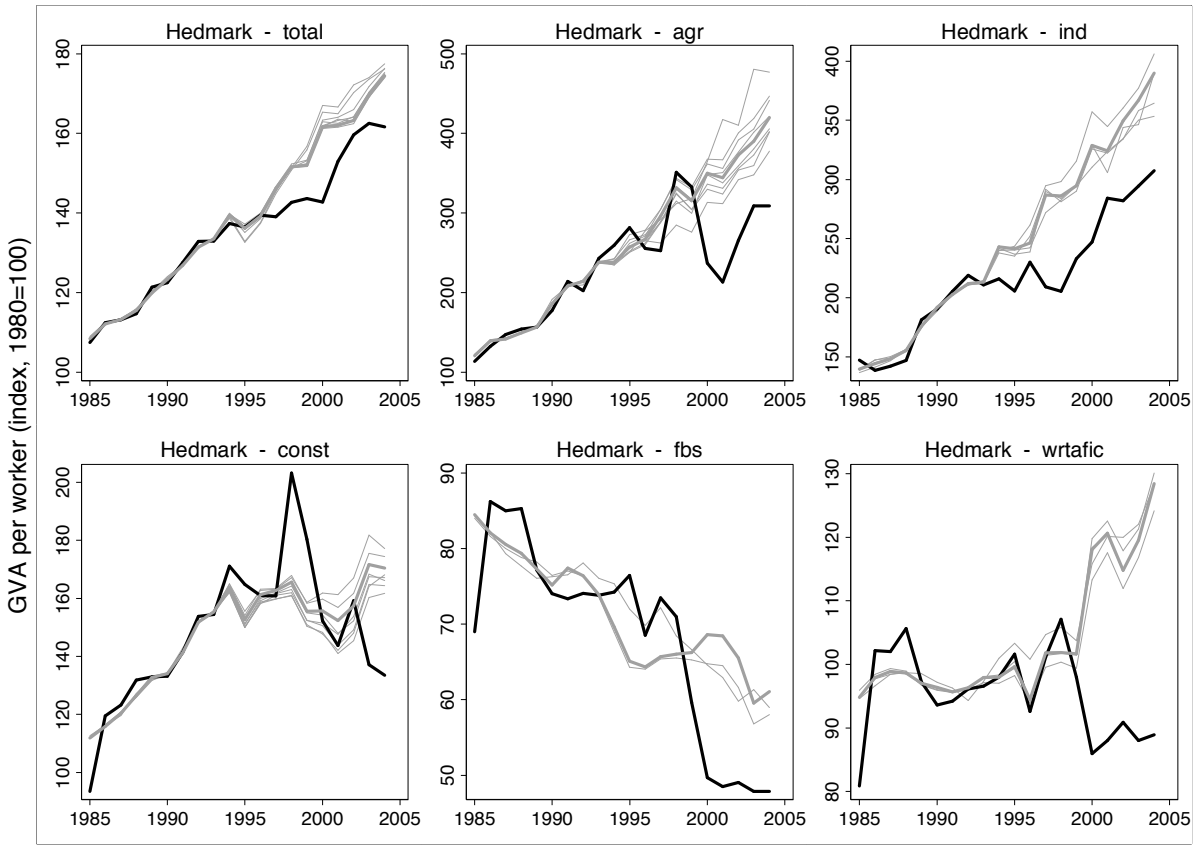
Table A.1.
Further difference-in-differences estimates

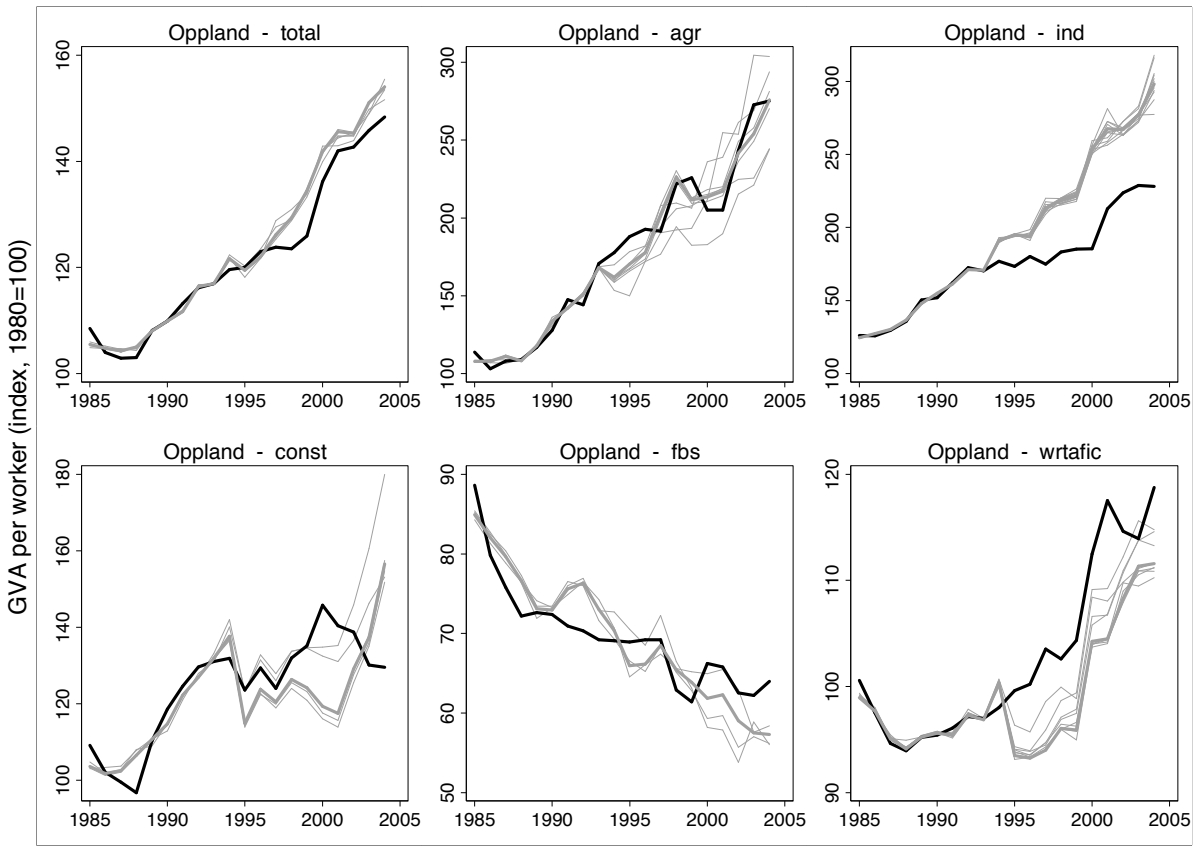
	(1) agr	(2) agr	(3) agr	(4) ind	(5) ind	(6) ind	(7) const	(8) const	(9) const	(10) fbs	(11) fbs	(12) fbs	(13) wrtafic	(14) wrtafic	(15) wrtafic
Post 1995 * Norway	95.22**	-6.62***	-7.48**	30.56	-3.13***	-4.17***	-14.58**	-5.57***	-4.24***	19.82***	0.39	0.37	2.76	-0.47	-0.69*
	(44.22)	(1.45)	(3.73)	(20.35)	(1.11)	(0.59)	(5.58)	(0.66)	(0.40)	(5.13)	(0.65)	(0.39)	(4.99)	(0.54)	(0.35)
Observations	1,860	1,860	1,860	1,880	1,880	1,880	1,880	1,880	1,880	1,880	1,880	1,880	1,880	1,880	1,880
R-squared	0.44	0.05	0.06	0.67	0.10	0.39	0.56	0.17	0.43	0.29	0.15	0.53	0.62	0.13	0.17
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Year controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

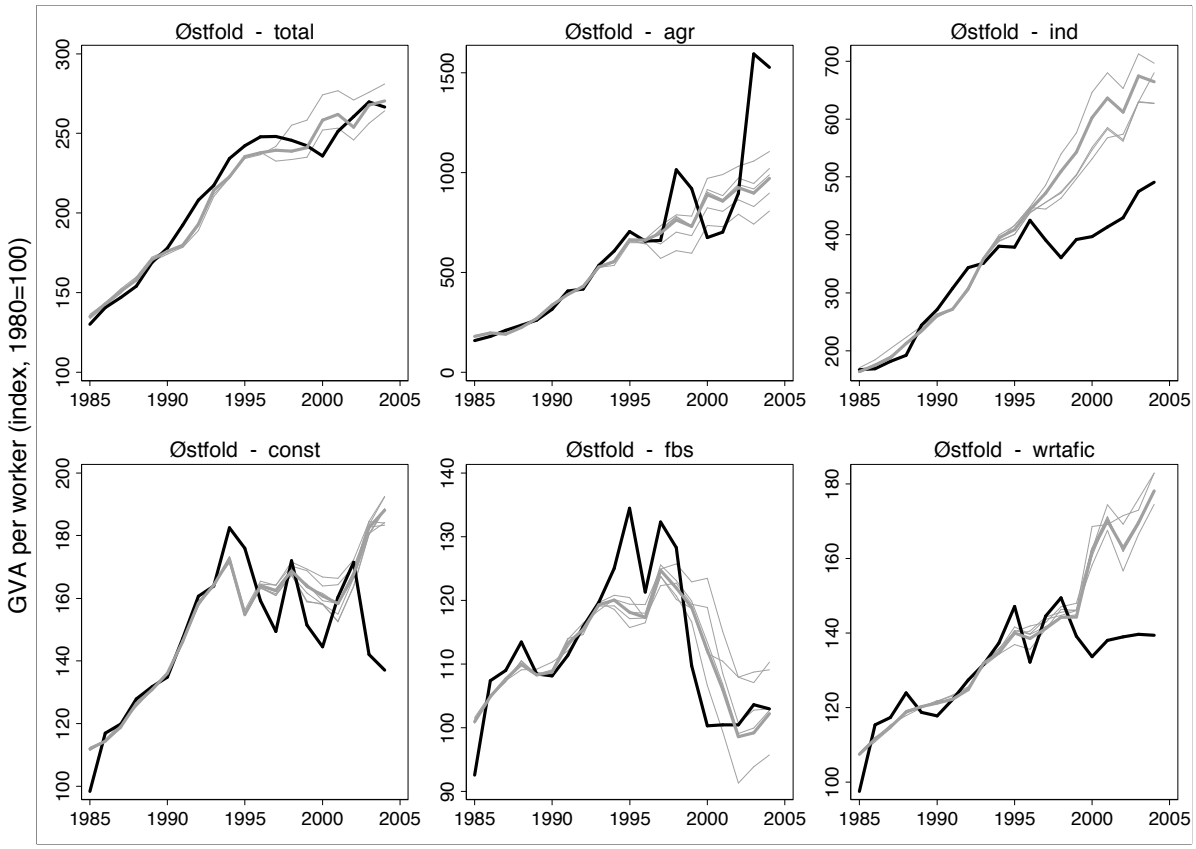
NOTES: Robust standard errors clustered at the regional level (NUTS 3) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variable in columns 1, 4, 7, 10, 13 is the GVA per worker (index, 1980=100), in columns 2, 5, 8, 11, 14 is the growth rate of the GVA per worker, and in columns 3, 6, 9, 12, 15 is the trend growth rate of GVA per worker. Region-Year controls include the investment share, the employment shares for the sectors, population growth rate, population density, years of education and distance between the region and the capital region of the country.

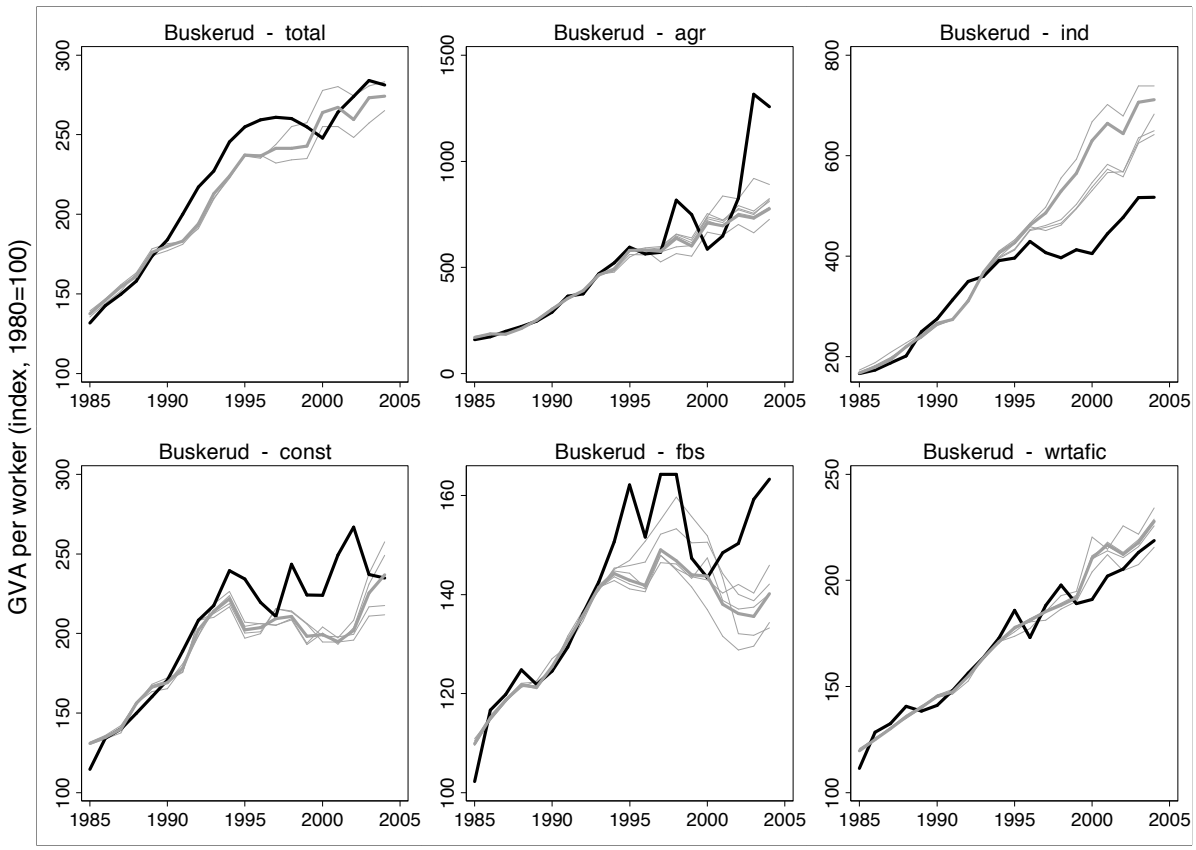
Figure A.1. Actual (bold black line), synthetic (bold grey line) and alternative synthetic series in the "leave-one-out" (tiny grey lines) for GVA per worker (index 1980=100) by region and sector.

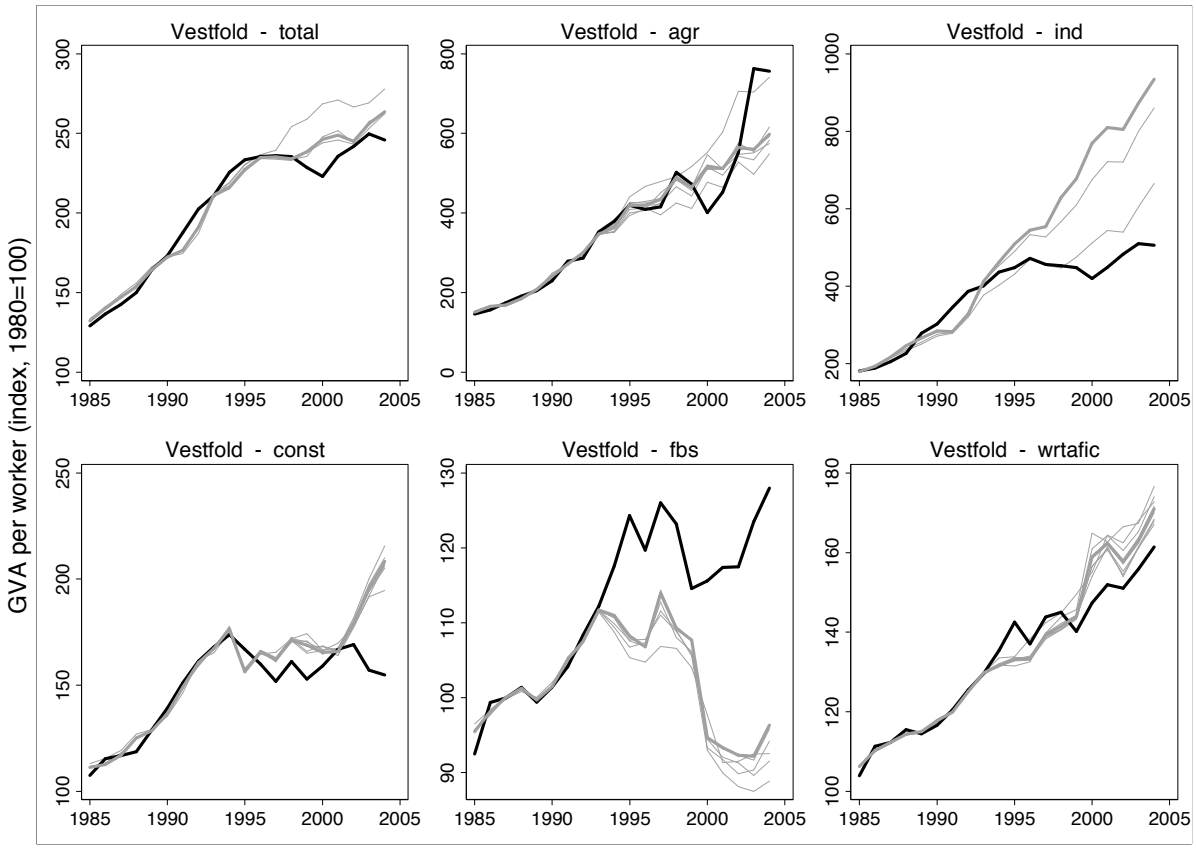


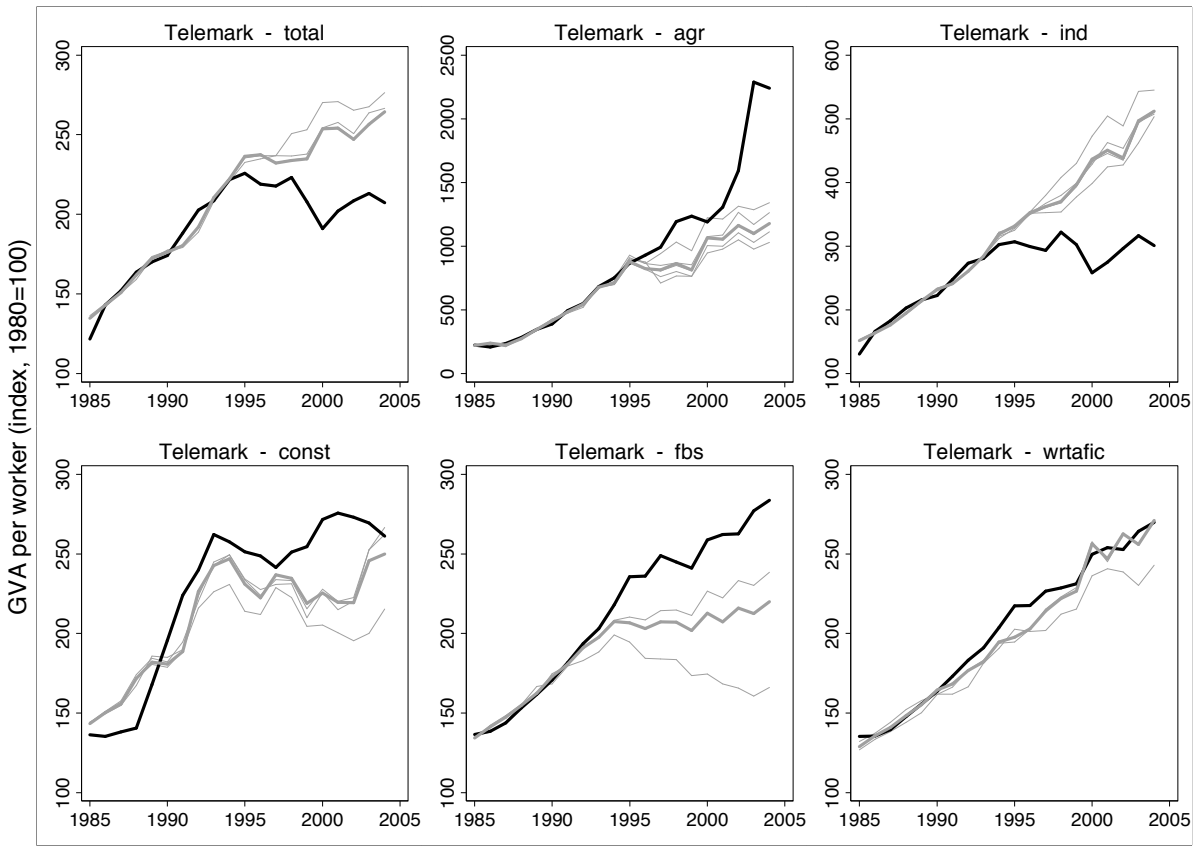

Hedmark - total
Hedmark - agr
Hedmark - ind
Hedmark - const
Hedmark - fbs
Hedmark - wrtafic
GVA per worker (index, 1980=100)

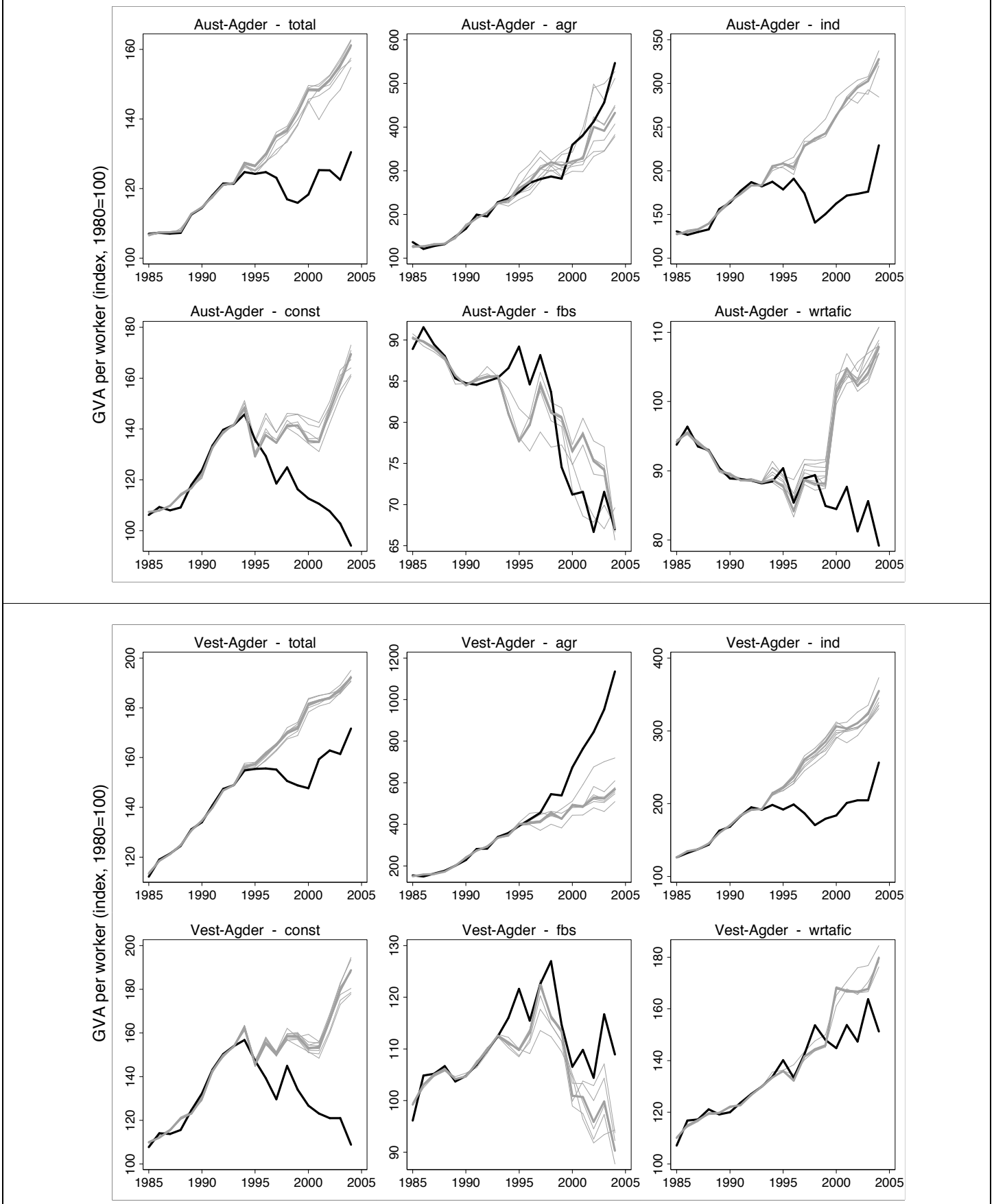

Oppland - total
Oppland - agr
Oppland - ind
Oppland - const
Oppland - fbs
Oppland - wrtafic
GVA per worker (index, 1980=100)

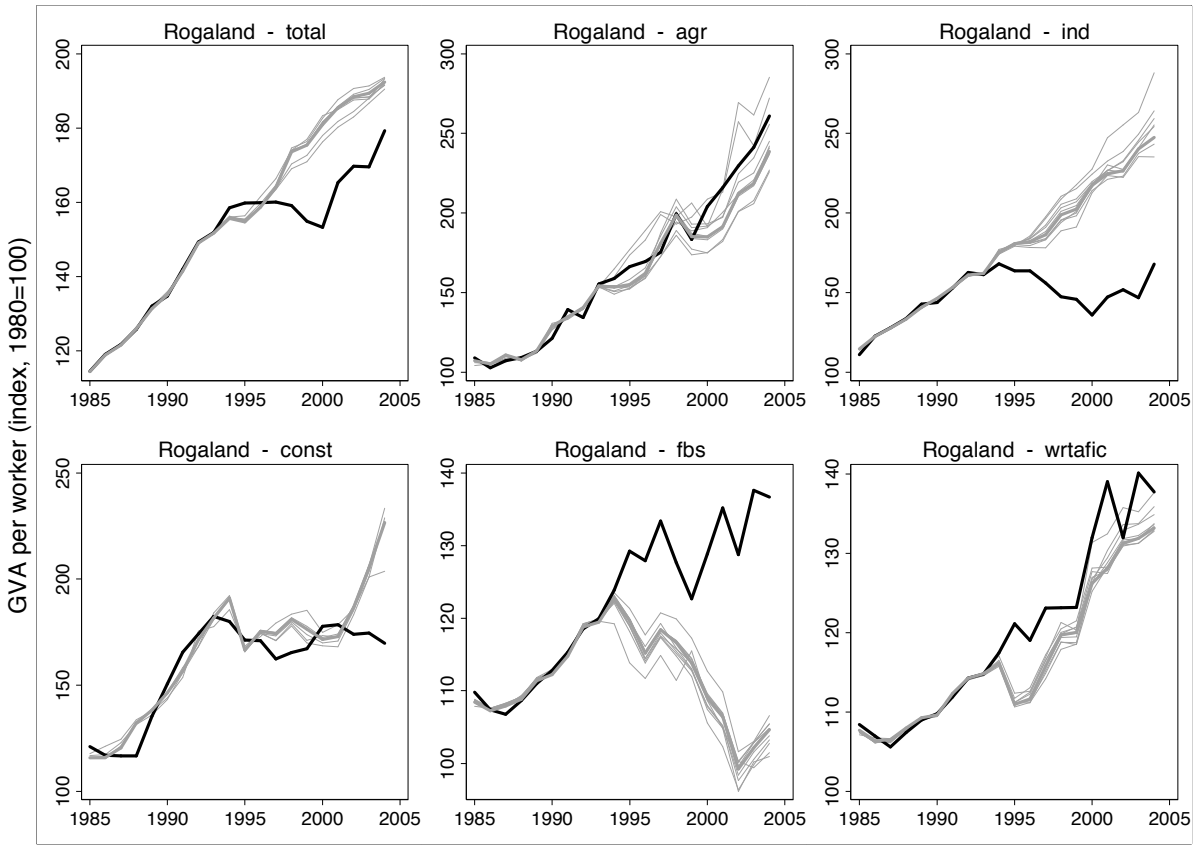

Østfold - total
Østfold - agr
Østfold - ind
Østfold - const
Østfold - fbs
Østfold - wrtafic
GVA per worker (index, 1980=100)

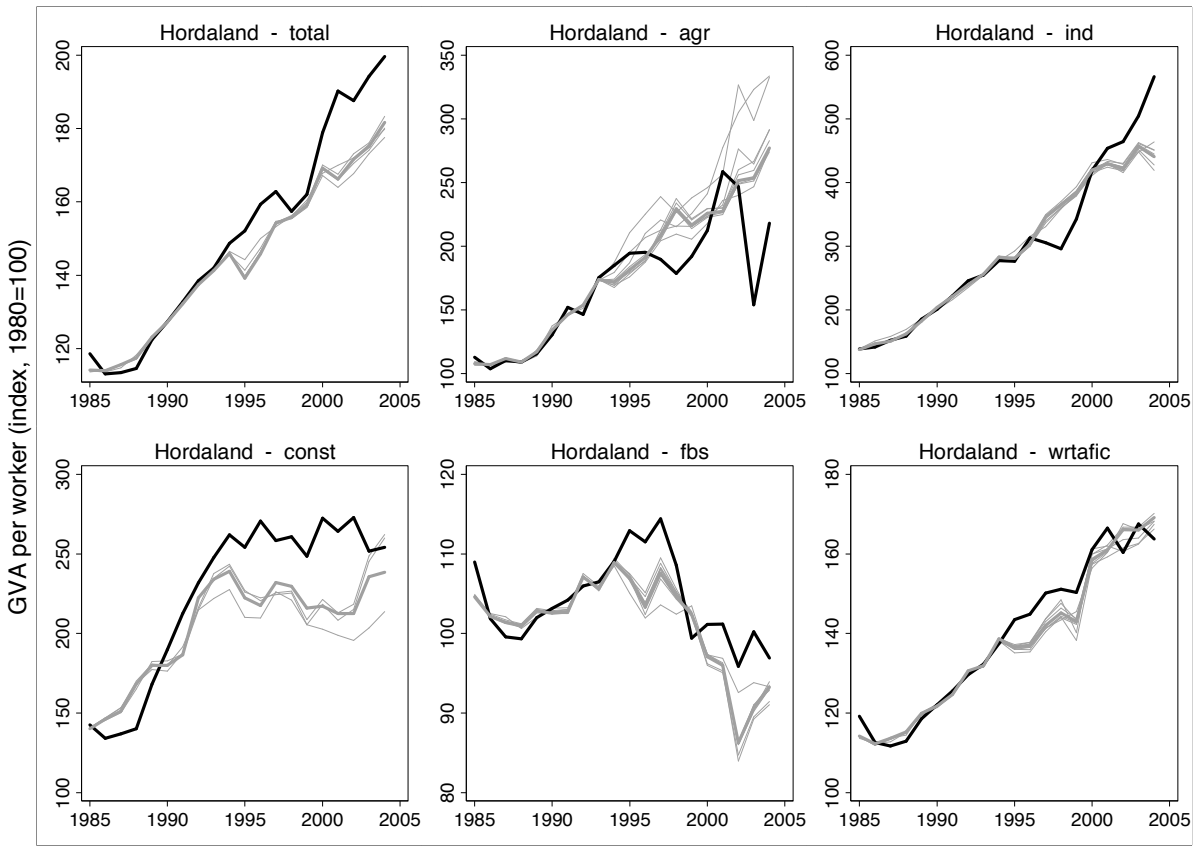

Buskerud - total
Buskerud - agr
Buskerud - ind
Buskerud - const
Buskerud - fbs
Buskerud - wrtafic
GVA per worker (index, 1980=100)

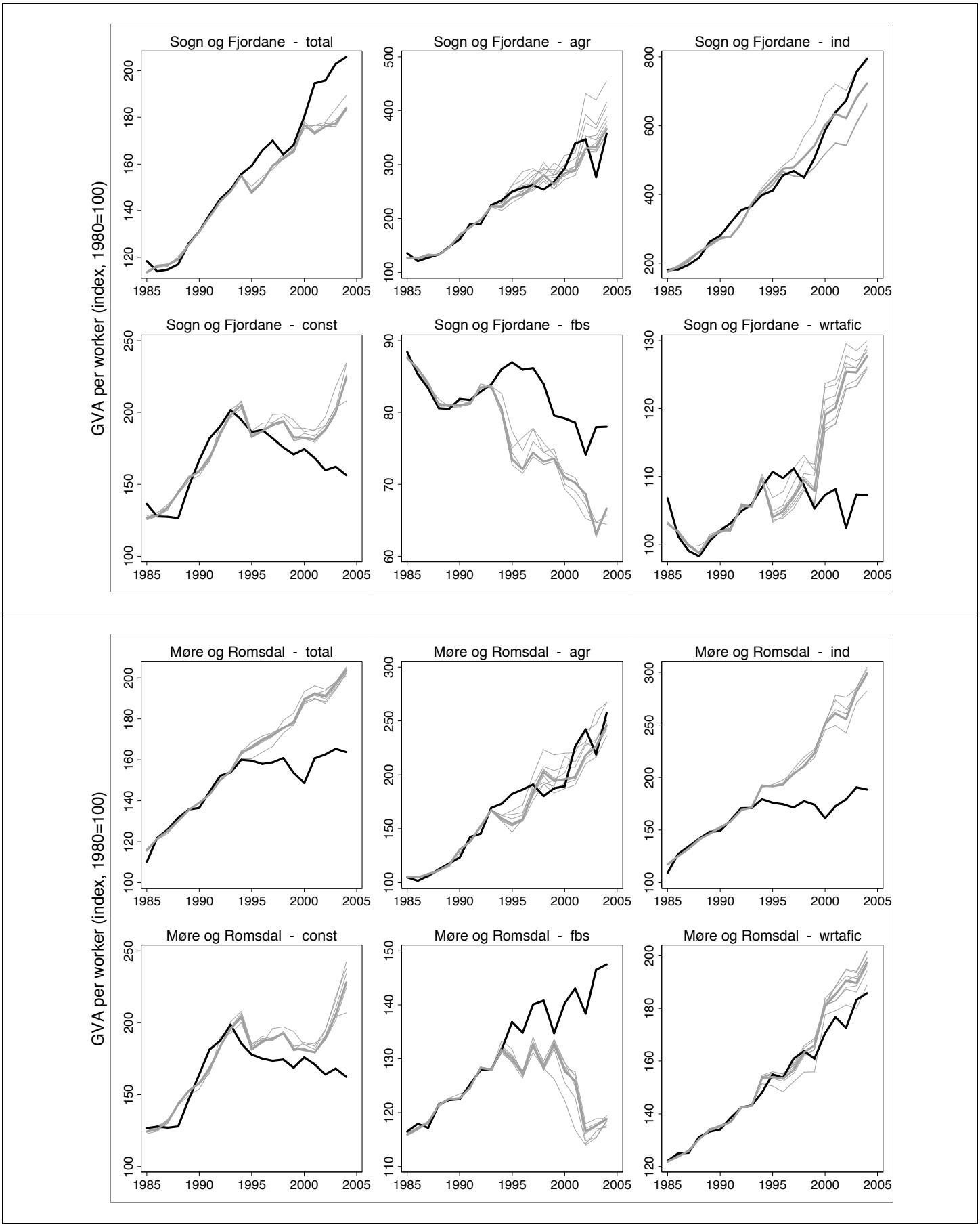

Vestfold - total
Vestfold - agr
Vestfold - ind
Vestfold - const
Vestfold - fbs
Vestfold - wrtafic
GVA per worker (index, 1980=100)

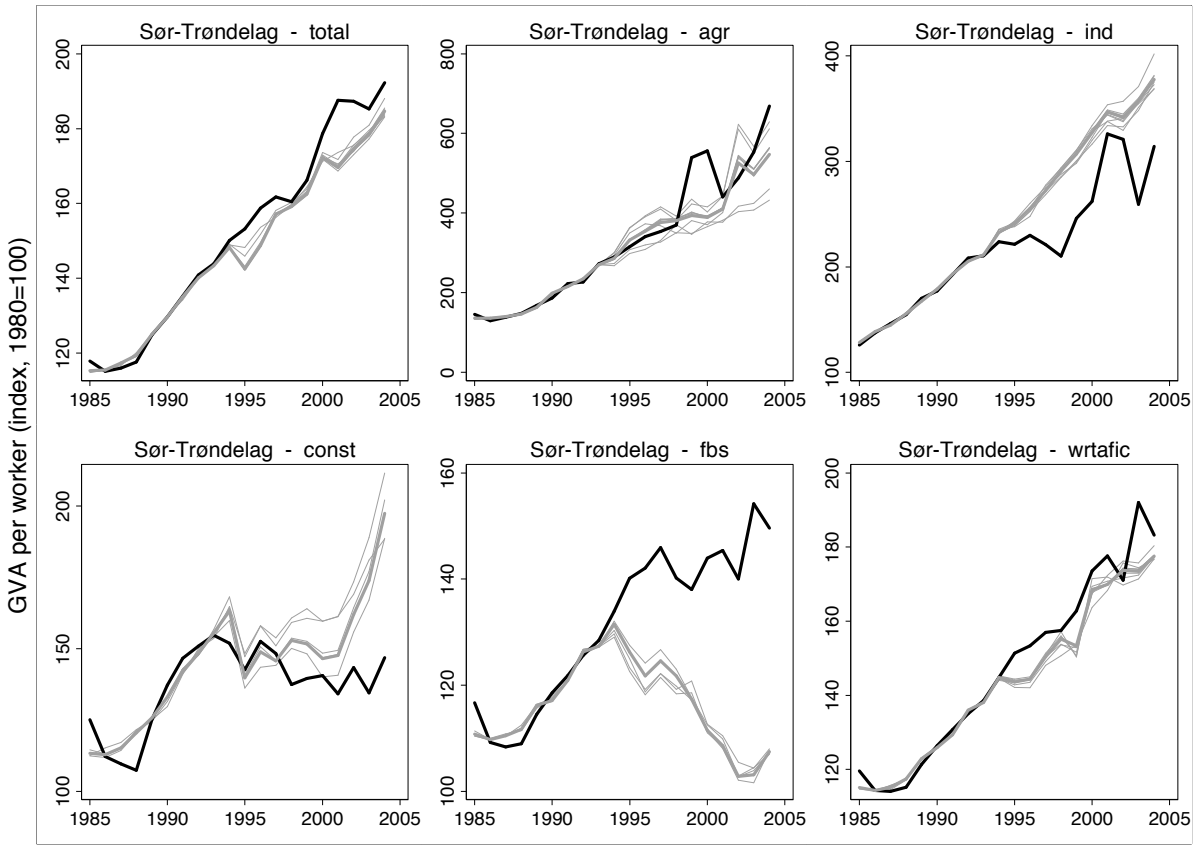

Telemark - total
Telemark - agr
Telemark - ind
Telemark - const
Telemark - fbs
Telemark - wrtafic
GVA per worker (index, 1980=100)

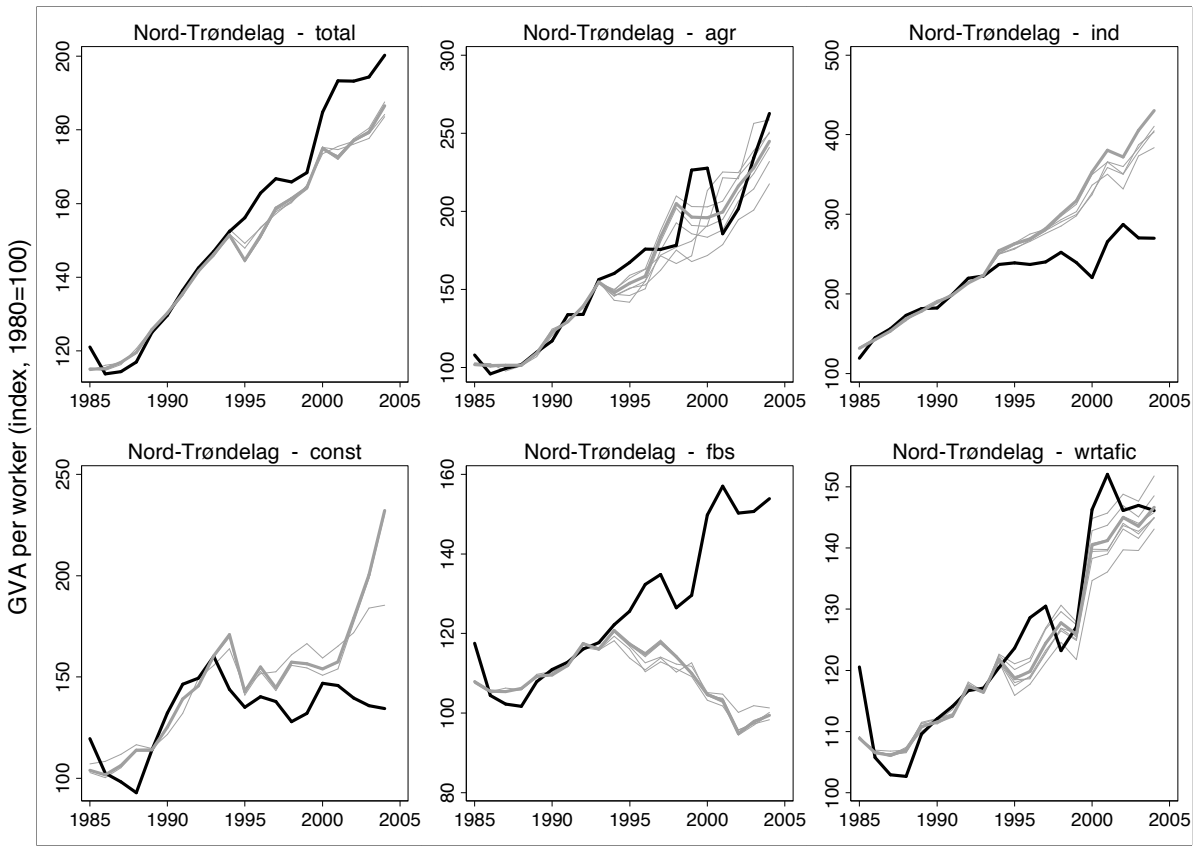

Aust-Agder - total
Aust-Agder - agr
Aust-Agder - ind
Aust-Agder - const
Aust-Agder - fbs
Aust-Agder - wrtafic
Vest-Agder - total
Vest-Agder - agr
Vest-Agder - ind
Vest-Agder - const
Vest-Agder - fbs
Vest-Agder - wrtafic
GVA per worker (index, 1980=100)
1985
1990
1995
2000
2005

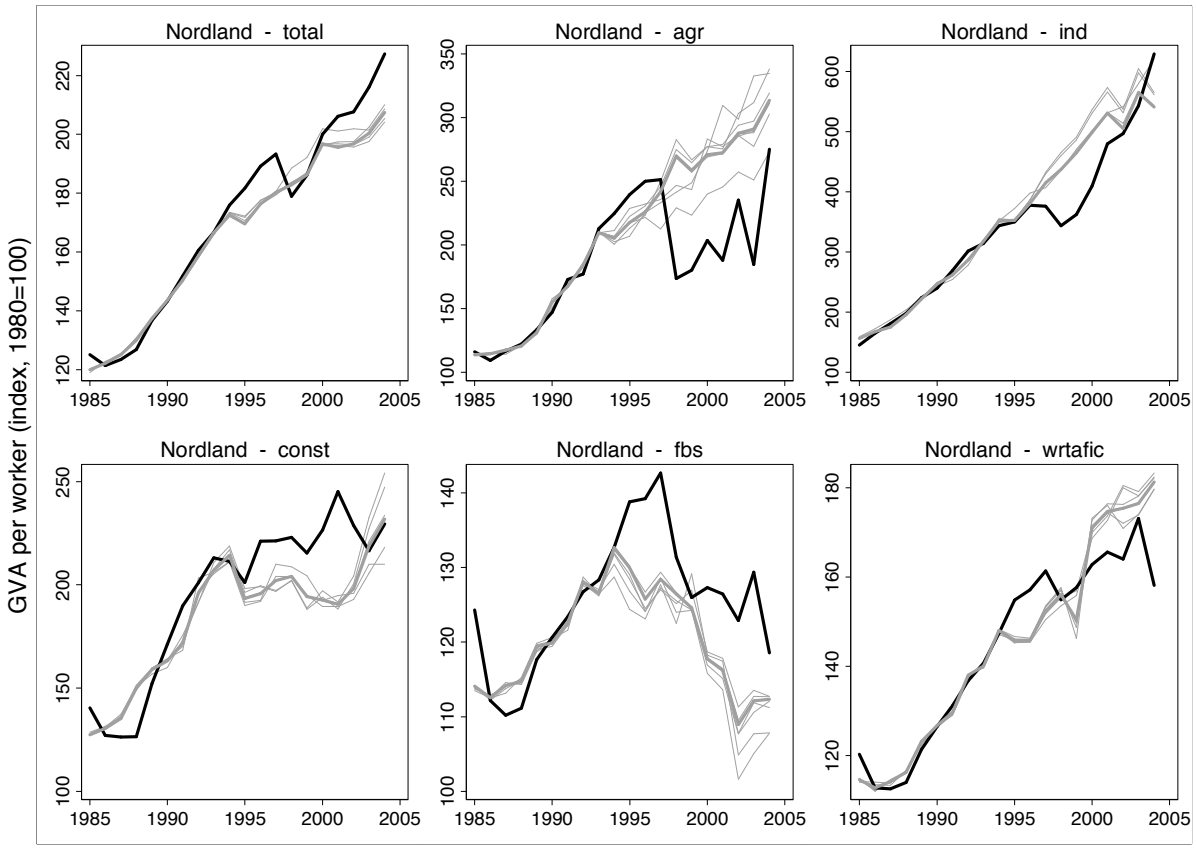

Rogaland - total
Rogaland - agr
Rogaland - ind
Rogaland - const
Rogaland - fbs
Rogaland - wrtafic
GVA per worker (index, 1980=100)

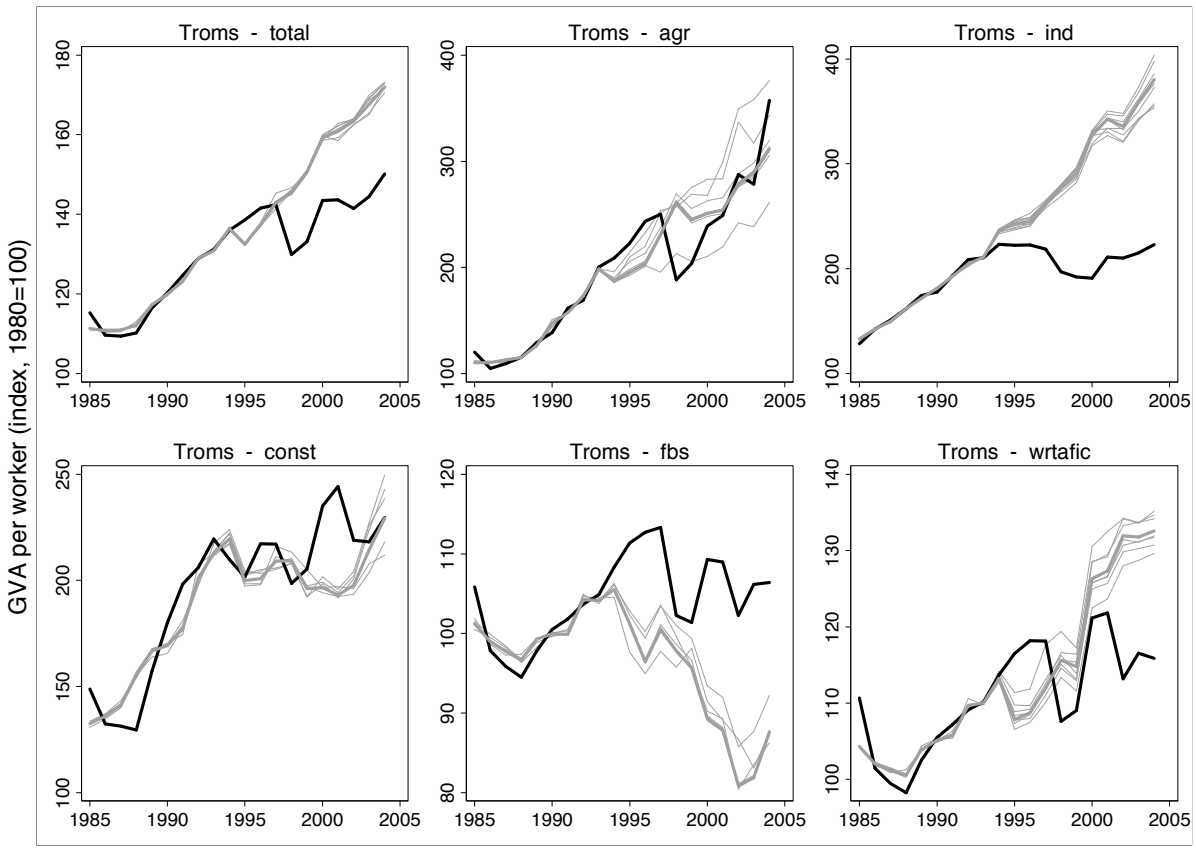

Hordaland - total
Hordaland - agr
Hordaland - ind
Hordaland - const
Hordaland - fbs
Hordaland - wrtafic
GVA per worker (index, 1980=100)


Sogn og Fjordane - total
Sogn og Fjordane - agr
Sogn og Fjordane - ind
Sogn og Fjordane - const
Sogn og Fjordane - fbs
Sogn og Fjordane - wrtafic
Møre og Romsdal - total
Møre og Romsdal - agr
Møre og Romsdal - ind
Møre og Romsdal - const
Møre og Romsdal - fbs
Møre og Romsdal - wrtafic
GVA per worker (index, 1980=100)
1985
1990
1995
2000
2005


Sør-Trøndelag - total
Sør-Trøndelag - agr
Sør-Trøndelag - ind
Sør-Trøndelag - const
Sør-Trøndelag - fbs
Sør-Trøndelag - wrtafic
GVA per worker (index, 1980=100)


Nord-Trøndelag - total
Nord-Trøndelag - agr
Nord-Trøndelag - ind
Nord-Trøndelag - const
Nord-Trøndelag - fbs
Nord-Trøndelag - wrtafic
GVA per worker (index, 1980=100)


Nordland - total
Nordland - agr
Nordland - ind
Nordland - const
Nordland - fbs
Nordland - wrtafic
GVA per worker (index, 1980=100)


Troms - total
Troms - agr
Troms - ind
Troms - const
Troms - fbs
Troms - wrtafic
GVA per worker (index, 1980=100)

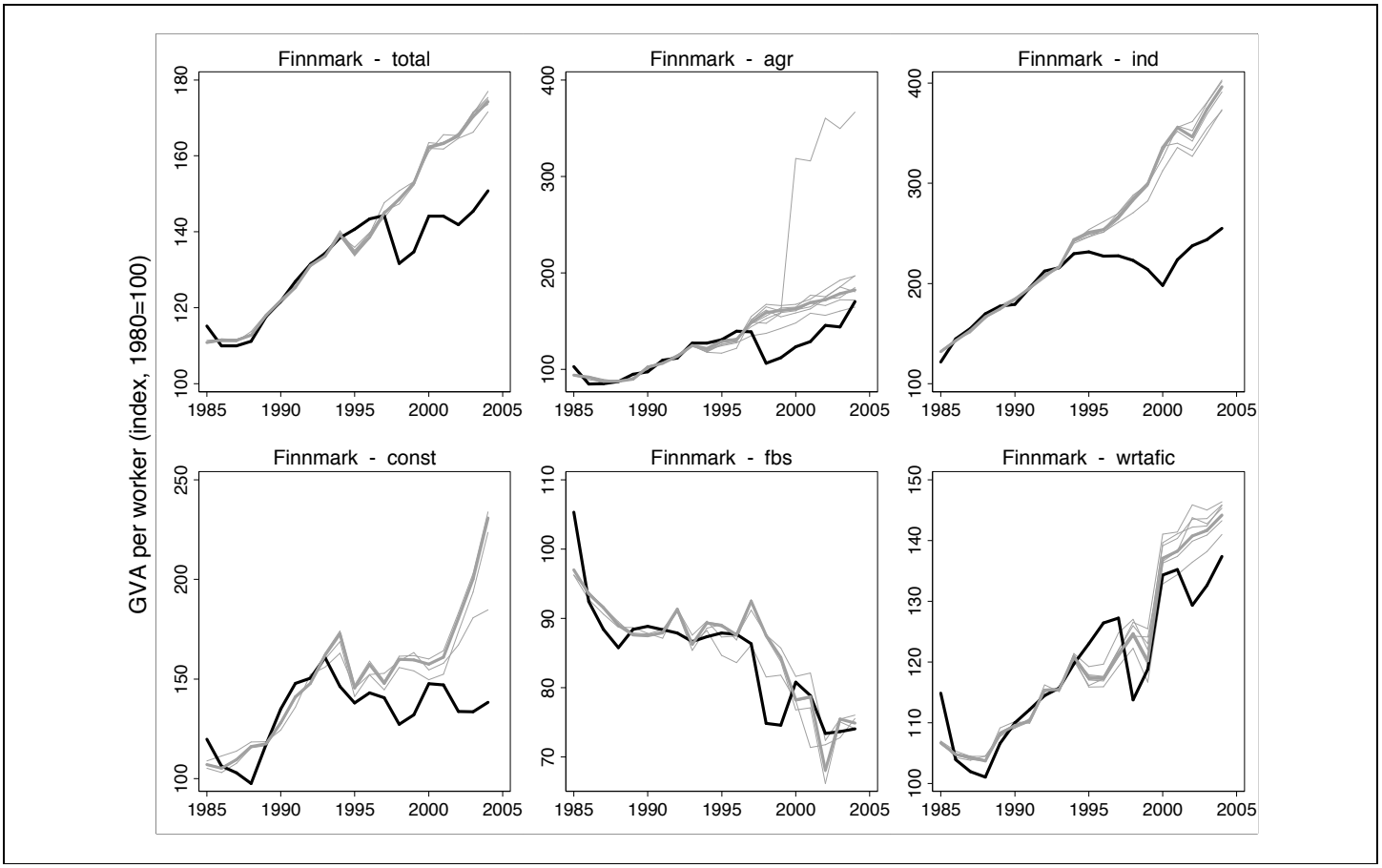

Finnmark - total
Finnmark - agr
Finnmark - ind
Finnmark - const
Finnmark - fbs
Finnmark - wrtafic
GVA per worker (index, 1980=100)
1985
1990
1995
2000
2005

Table A.2.
Post-1995 average percentage difference in GVA per worker (index, 1980=100) between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	5.24		17.80	-12.40	4.09	-0.22
Akershus	10.50	4.55	1.77	-7.37	37.15	22.36
Hedmark	-4.69	-14.45	-19.50	-0.34	-8.98	-13.13
Oppland	-2.69	1.65	-17.35	5.49	4.09	7.47
Østfold	0.33	14.89	-24.01	-5.89	1.20	-8.75
Buskerud	4.28	17.86	-23.12	12.96	9.65	-1.99
Vestfold	-2.58	2.37	-32.22	-7.25	19.86	-1.53
Telemark	-13.37	39.34	-26.80	13.05	21.70	2.73
Aust-Agder	-14.09	4.19	-31.36	-18.31	-0.97	-9.55
Vest-Agder	-10.26	39.42	-30.42	-18.61	8.45	-3.89
Rogaland	-7.18	5.93	-26.55	-6.05	18.90	5.09
Hordaland	7.72	-8.78	1.51	17.02	5.61	2.51
Sogn og Fjordane	7.84	0.91	-0.44	-9.46	14.83	-5.65
Møre og Romsdal	-12.92	4.83	-23.98	-10.13	11.89	-2.82
Sør-Trøndelag	4.97	9.53	-16.10	-8.50	26.53	4.35
Nord-Trøndelag	6.84	3.02	-23.72	-16.22	32.79	2.83
Nordland	4.95	-16.42	-7.14	10.60	8.42	-0.74
Troms	-7.57	0.40	-29.56	7.11	17.39	-3.64
Finnmark	-8.04	-15.17	-26.27	-17.09	-2.62	-1.57
MEAN	-1.62	5.23	-17.76	-3.76	12.10	-0.32
MEDIAN	-2.58	3.60	-23.72	-7.25	9.65	-1.53

Table A.3.A.
Excluding annual values of the GVA per worker (index, 1980=100) from the model specification:
Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100)
between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	Wrtafic
Oslo	-0.53		-0.30	-3.03	1.02	-0.10
Akershus	0.70	0.85	-2.33	1.07	4.42	0.59
Hedmark	-1.10	-7.25	-2.73	-3.93	-1.96	-3.70
Oppland	-0.08	-1.26	-2.47	-1.42	1.37	-0.96
Østfold	-1.00	1.27	-4.90	-4.08	0.37	-2.68
Buskerud	-0.77	1.18	-4.85	-1.41	2.27	-0.27
Vestfold	-1.44	-3.54	-5.82	-2.46	1.87	-0.97
Telemark	-3.05	4.92	-7.70	-0.51	2.25	-0.52
Aust-Agder	-1.79	1.42	-2.70	-5.24	-0.83	-3.70
Vest-Agder	-1.58	4.17	-1.98	-4.58	0.75	-1.90
Rogaland	-1.18	1.18	-3.66	-2.41	2.20	-1.73
Hordaland	0.33	-2.05	0.39	-1.32	0.29	-1.54
Sogn og Fjordane	0.35	-3.48	0.26	-3.59	1.47	-2.86
Møre og Romsdal	-2.51	-1.12	-4.58	-2.70	1.69	-0.41
Sør-Trøndelag	-0.12	4.67	-3.16	-1.17	2.02	-1.03
Nord-Trøndelag	0.75	-0.93	-5.51	-2.14	3.97	-0.95
Nordland	0.34	-4.70	-1.43	-0.22	-0.89	-2.44
Troms	-1.47	-0.14	-7.26	-0.07	1.60	-2.36
Finnmark	-2.12	-2.23	-4.77	-2.47	0.19	-1.31
MEAN	-0.86	-0.39	-3.45	-2.19	1.27	-1.52
MEDIAN	-1.00	-0.54	-3.16	-2.41	1.47	-1.31

Table A.3.B.
Excluding annual values of the GVA per worker (index, 1980=100) from the model specification:
Post-1995 average percentage difference in GVA per worker (index, 1980=100)
between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	-4.95		0.37	-14.82	-2.30	-7.68
Akershus	2.58	53.46	-20.16	7.64	28.07	2.81
Hedmark	-7.88	14.34	-22.80	-8.50	-6.83	-11.85
Oppland	-2.57	60.87	-18.58	-7.58	5.02	-1.41
Østfold	3.02	6.63	-30.93	-12.93	5.51	-9.26
Buskerud	4.10	0.17	-31.50	4.56	14.63	-0.72
Vestfold	-1.15	-8.99	-34.16	-10.62	14.22	2.13
Telemark	-12.53	26.75	-37.14	10.68	23.30	9.84
Aust-Agder	-13.34	33.98	-27.98	-22.06	-4.84	-15.32
Vest-Agder	-14.54	58.35	-21.62	-20.43	7.92	-5.62
Rogaland	-7.09	57.54	-22.70	-11.94	16.53	-7.05
Hordaland	7.46	52.69	-2.69	10.34	4.20	0.18
Sogn og Fjordane	4.92	25.51	-9.31	-18.40	17.48	-9.64
Møre og Romsdal	-13.66	49.82	-24.50	-16.15	6.03	-3.89
Sør-Trøndelag	6.02	100.10	-16.60	-13.09	20.90	1.94
Nord-Trøndelag	8.83	51.29	-25.53	-9.98	19.18	2.20
Nordland	5.51	2.85	-20.22	2.83	0.98	1.15
Troms	-6.20	35.64	-35.71	3.51	17.09	-8.91
Finnmark	-11.65	12.68	-24.51	-13.57	-1.92	-3.57
MEAN	-2.80	35.20	-22.43	-7.40	9.75	-3.40
MEDIAN	-2.57	34.81	-22.80	-10.62	7.92	-3.57

Table A.4.
Pre-1995 RMSPE in the estimation of synthetic GVA per worker (index, 1980=100)

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	2.01		10.56	1.47	1.13	1.15
Akershus	1.37	3.52	6.78	10.64	2.61	2.40
Hedmark	1.10	9.41	10.21	6.69	5.98	5.30
Oppland	1.49	6.62	4.66	4.44	3.58	0.96
Østfold	7.73	22.27	18.84	5.49	3.45	4.17
Buskerud	12.54	14.01	19.56	8.99	3.40	3.73
Vestfold	6.28	9.34	30.30	2.91	2.37	1.55
Telemark	6.06	19.24	10.71	19.80	4.30	5.21
Aust-Agder	0.85	6.02	6.51	2.06	1.91	0.40
Vest-Agder	0.77	7.15	5.35	2.83	1.92	1.44
Rogaland	0.89	4.21	2.74	7.18	0.71	0.67
Hordaland	2.08	5.69	3.46	16.93	1.74	1.98
Sogn og Fjordane	1.98	6.49	20.05	9.30	1.85	1.38
Møre og Romsdal	2.40	5.80	5.09	9.41	0.51	1.93
Sør-Trøndelag	1.26	6.59	3.23	7.14	2.44	1.77
Nord-Trøndelag	2.35	5.56	7.63	12.61	3.66	4.15
Nordland	2.38	7.50	7.54	11.46	3.78	2.19
Troms	1.63	8.67	4.80	13.57	2.13	2.32
Finnmark	1.73	4.80	6.10	11.59	3.30	2.99
MEAN	3.00	8.49	9.69	8.66	2.67	2.40
MEDIAN	1.98	6.60	6.78	8.99	2.44	1.98

Table A.5.
Excluding annual values of the GVA per worker (index, 1980=100) from the model specification:
Pre-1995 RMSPE in the estimation of the synthetic GVA per worker (index, 1980=100)

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	4.49		16.86	4.14	1.51	2.91
Akershus	3.66	25.53	20.74	13.55	4.78	4.53
Hedmark	2.69	41.15	13.36	12.21	6.49	6.09
Oppland	3.49	33.94	7.24	10.88	3.60	2.59
Østfold	16.30	53.58	26.68	12.26	6.76	6.33
Buskerud	17.41	28.87	27.49	13.33	5.36	5.50
Vestfold	13.59	31.31	33.23	10.81	4.88	5.60
Telemark	12.16	63.58	18.63	23.15	17.39	14.69
Aust-Agder	2.82	29.97	9.70	8.09	3.62	1.83
Vest-Agder	3.92	38.84	8.32	8.30	2.75	3.28
Rogaland	3.47	29.38	6.22	14.95	2.84	1.77
Hordaland	6.38	38.29	14.29	18.76	3.57	4.31
Sogn og Fjordane	5.28	36.53	25.03	14.07	2.63	2.52
Møre og Romsdal	5.03	32.06	8.77	14.65	3.06	3.25
Sør-Trøndelag	6.32	50.96	12.14	10.56	5.34	4.50
Nord-Trøndelag	7.37	27.33	14.98	18.12	7.01	6.70
Nordland	8.61	36.07	17.50	15.07	5.53	6.72
Troms	4.32	36.96	11.02	18.63	3.97	3.37
Finnmark	3.97	20.81	10.41	16.69	6.57	4.15
MEAN	6.91	36.40	15.93	13.59	5.14	4.77
MEDIAN	5.03	35.00	14.29	13.55	4.78	4.31

Table A.6.A.
Post-1995 difference in the average trend growth rate of GVA per worker between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	-0.74		-1.86	-0.95	0.21	1.12
Akershus	0.44	-2.79	-1.37	0.82	1.22	1.19
Hedmark	-0.74	-4.65	-1.24	-0.99	-1.46	0.33
Oppland	0.11	-0.64	-1.70	-0.76	1.42	0.41
Østfold	-0.75	1.78	-3.39	-2.73	-0.41	-0.29
Buskerud	-0.61	-0.29	-3.48	-0.56	1.13	0.06
Vestfold	-1.15	-3.11	-4.62	-1.50	0.16	0.48
Telemark	-2.90	-2.43	-4.90	-1.03	1.09	-0.45
Aust-Agder	-1.17	2.01	0.14	-1.30	-0.91	-1.83
Vest-Agder	-0.53	-0.54	-0.39	-1.04	-0.72	-1.52
Rogaland	-0.76	-0.43	-2.48	0.02	0.40	-0.34
Hordaland	0.37	-1.40	1.00	-1.11	-0.99	-0.70
Sogn og Fjordane	0.27	-0.58	0.11	-0.76	-0.25	-1.15
Møre og Romsdal	-1.42	-1.66	-2.84	0.01	0.86	0.39
Sør-Trøndelag	-0.05	2.20	-1.40	1.14	-0.45	-0.13
Nord-Trøndelag	0.15	1.17	-2.64	0.49	1.12	-0.36
Nordland	0.24	-0.89	0.61	0.34	-1.39	-1.87
Troms	-0.82	1.77	-2.80	1.09	-0.14	-1.04
Finnmark	-0.88	-5.68	-2.46	0.98	0.14	-0.53
MEAN	-0.58	-0.90	-1.88	-0.41	0.05	-0.33
MEDIAN	-0.74	-0.61	-1.86	-0.76	0.14	-0.34

Table A.6.B.
Pre-1995 RMSPE in the estimation of the synthetic trend growth rates of GVA per worker

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	0.01		0.10	0.02	0.00	0.01
Akershus	0.05	0.02	0.03	0.13	0.11	0.03
Hedmark	0.00	0.04	0.06	0.27	0.39	0.45
Oppland	0.01	0.02	0.01	0.05	0.27	0.00
Østfold	0.57	0.02	0.67	0.24	0.15	0.12
Buskerud	0.88	0.02	0.68	0.79	0.19	0.17
Vestfold	0.31	0.03	1.10	0.08	0.14	0.01
Telemark	0.64	0.04	0.69	1.22	1.08	0.42
Aust-Agder	0.08	0.04	0.25	0.17	0.02	0.03
Vest-Agder	0.09	0.03	0.15	0.13	0.03	0.01
Rogaland	0.04	0.02	0.32	0.10	0.00	0.01
Hordaland	0.04	0.03	0.02	1.07	0.02	0.02
Sogn og Fjordane	0.04	0.04	0.20	0.11	0.03	0.02
Møre og Romsdal	0.13	0.03	0.22	0.09	0.00	0.01
Sør-Trøndelag	0.02	0.03	0.01	0.08	0.03	0.02
Nord-Trøndelag	0.04	0.05	0.21	0.14	0.10	0.07
Nordland	0.03	0.05	0.34	0.10	0.05	0.04
Troms	0.04	0.06	0.16	0.13	0.02	0.03
Finnmark	0.04	0.05	0.19	0.13	0.11	0.03
MEAN	0.16	0.03	0.29	0.27	0.14	0.08
MEDIAN	0.04	0.03	0.20	0.13	0.05	0.03

Table A.7.A.
Estimations at NUTS2 level:
Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100) between actual and synthetic region

NUTS 2 region	total	agr	ind	const	fbs	wrtafic
Oslo og Akershus	-0.19	5.48	1.06	-2.04	1.89	1.23
Hedmark og Oppland	-0.20	-1.30	-0.71	-2.22	0.13	-1.24
Sør-Østlandet	-1.71	2.19	-4.66	-0.63	1.41	-0.94
Agder og Rogaland	-0.88	-0.24	-3.54	-2.31	1.57	-0.70
Vestlandet	-0.02	-3.66	-1.70	-0.26	1.02	0.27
Trøndelag	0.85	-0.95	-2.09	-1.09	3.09	1.01
Nord-Norge	0.02	-2.94	-1.43	0.84	0.95	-0.58
MEAN	-0.30	-0.20	-1.87	-1.10	1.44	-0.14
MEDIAN	-0.19	-0.95	-1.70	-1.09	1.41	-0.58

Table A.7.B.
Estimations at NUTS2 level:
Post-1995 average percentage difference in GVA per worker (index, 1980=100) between actual and synthetic region

NUTS 2 region	total	agr	ind	const	fbs	wrtafic
Oslo og Akershus	1.24	42.10	17.15	-10.54	7.67	4.76
Hedmark og Oppland	-1.32	-3.74	-12.84	-1.50	-15.33	-6.31
Sør-Østlandet	-4.27	14.67	-28.27	13.33	7.87	-3.49
Agder og Rogaland	-7.48	-2.01	-27.48	-10.11	13.08	-0.35
Vestlandet	-1.97	-5.23	-16.88	22.17	6.86	5.62
Trøndelag	6.21	2.92	-16.00	-9.03	26.79	10.55
Nord-Norge	0.22	-14.89	-18.45	11.84	12.48	4.53
MEAN	-1.05	4.83	-14.68	2.31	8.49	2.19
MEDIAN	-1.32	-2.01	-16.88	-1.50	7.87	4.53

Table A.8.A.
Estimations at NUTS2 level:
Post-1995 difference in compound annual growth rates of GVA per hour worked (index, 1980=100) between actual and synthetic region

NUTS 2 region	total	agr	ind	const	fbs	wrtafic
Oslo og Akershus	-0.02	5.66	0.90	-2.26	-0.62	4.44
Hedmark og Oppland	0.80	-1.63	-0.87	-1.07	1.40	-3.57
Sør-Østlandet	-1.29	3.19	-4.70	-0.85	2.20	-1.13
Agder og Rogaland	-0.41	1.37	-3.65	-1.53	0.86	-0.13
Vestlandet	0.81	-2.60	-1.99	-0.60	1.04	0.46
Trøndelag	1.43	-0.35	-2.38	-0.71	2.44	-0.53
Nord-Norge	0.89	-2.91	-1.31	0.52	1.64	-1.49
MEAN	0.31	0.39	-2.00	-0.93	1.28	-0.28
MEDIAN	0.80	-0.35	-1.99	-0.85	1.40	-0.53

Table A.8.B.
Estimations at NUTS2 level:
Post-1995 average percentage difference in GVA per hour worked (index, 1980=100) between actual and synthetic region

NUTS 2 region	total	agr	ind	const	fbs	wrtafic
Oslo og Akershus	3.96	48.64	15.71	-13.67	-7.21	25.48
Hedmark og Oppland	3.56	1.07	-15.16	6.67	0.87	-13.63
Sør-Østlandet	-7.91	22.92	-26.94	11.12	21.29	-1.26
Agder og Rogaland	-7.36	13.27	-29.22	-6.30	8.35	8.52
Vestlandet	1.09	-1.22	-19.88	18.32	8.99	8.24
Trøndelag	7.66	7.09	-18.76	-5.43	24.05	-1.66
Nord-Norge	2.43	-10.90	-18.97	8.68	13.70	-0.48
MEAN	0.49	11.55	-16.18	2.77	10.01	3.60
MEDIAN	2.43	7.09	-18.97	6.67	8.99	-0.48

Table A.9.A.
Excluding Austrian regions from the donor pool:
Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100)
between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	-0.78		-0.95	-2.69	1.22	0.29
Akershus	0.50	4.05	-0.21	0.93	4.25	1.72
Hedmark	-0.66	-2.29	-2.75	-1.84	-1.80	-3.67
Oppland	-0.33	-0.27	-2.89	0.67	1.77	0.10
Østfold	-0.65	4.17	-3.14	-1.97	0.06	-2.52
Buskerud	-0.66	4.69	-3.05	0.24	2.39	0.21
Vestfold	-0.99	3.67	-5.82	0.10	2.86	-0.96
Telemark	-2.43	6.28	-5.04	0.07	2.13	0.39
Aust-Agder	-2.22	2.47	-2.64	-3.48	-0.30	-2.74
Vest-Agder	-1.23	7.00	-2.12	-2.76	1.47	-1.66
Rogaland	-1.05	0.91	-4.12	0.75	2.81	-0.83
Hordaland	0.54	-4.85	1.68	-0.19	0.21	-0.82
Sogn og Fjordane	0.66	-0.61	1.63	-1.87	1.46	-2.30
Møre og Romsdal	-1.99	0.47	-4.31	-0.64	2.47	-0.59
Sør-Trøndelag	-0.10	4.10	-1.29	0.78	2.49	-0.10
Nord-Trøndelag	0.40	-2.68	-4.22	-0.14	4.08	-0.73
Nordland	0.25	-1.96	0.37	1.02	0.52	-1.77
Troms	-1.71	0.37	-5.43	1.18	1.31	-2.37
Finnmark	-1.74	-3.06	-4.22	-0.26	0.11	-1.20
MEAN	-0.75	1.25	-2.56	-0.53	1.55	-1.03
MEDIAN	-0.66	0.69	-2.89	-0.14	1.47	-0.83

Table A.9.B.
Excluding Austrian regions from the donor pool:
Post-1995 average percentage difference in GVA per worker (index, 1980=100) between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	-2.85		-0.57	-13.33	0.43	-1.89
Akershus	2.54	27.98	-2.05	5.28	24.95	8.50
Hedmark	-5.36	-5.31	-26.32	10.63	-9.20	-12.34
Oppland	-4.52	1.48	-22.09	11.53	7.17	-0.40
Østfold	0.46	16.78	-20.27	5.07	4.21	-8.14
Buskerud	4.40	18.87	-18.82	15.79	14.50	0.34
Vestfold	-1.98	4.83	-32.25	8.83	28.13	-3.51
Telemark	-13.10	37.63	-24.09	13.28	21.88	8.52
Aust-Agder	-16.33	16.55	-28.97	-11.64	4.67	-7.74
Vest-Agder	-10.95	39.12	-24.97	-8.74	9.80	-4.61
Rogaland	-7.90	5.94	-23.13	7.22	22.51	-2.72
Hordaland	2.30	-3.70	1.24	17.76	5.41	-3.14
Sogn og Fjordane	3.36	2.10	5.64	-7.95	15.32	-11.97
Møre og Romsdal	-13.66	6.28	-24.19	-5.06	12.10	-5.79
Sør-Trøndelag	-2.10	32.04	-10.60	1.23	19.90	0.48
Nord-Trøndelag	2.26	-10.78	-24.56	-4.31	33.82	-5.73
Nordland	0.08	-15.02	-10.67	11.29	9.63	-4.69
Troms	-11.73	8.74	-30.92	6.47	13.11	-12.60
Finnmark	-12.25	-8.49	-28.70	-6.55	-3.10	-9.29
MEAN	-4.60	9.72	-18.22	2.99	12.38	-4.04
MEDIAN	-2.85	6.11	-23.13	5.28	12.10	-4.61

Table A.10.A.
Excluding Austrian and Finnish regions from the donor pool:
Post-1995 difference in compound annual growth rates of GVA per worker (index, 1980=100)
between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	-0.77		1.30	-1.73	1.12	-0.26
Akershus	0.42	1.78	-2.31	-1.17	4.92	0.98
Hedmark	-1.75	-3.70	-3.73	-3.69	-1.93	-3.63
Oppland	-0.26	-1.17	-1.10	-0.92	1.61	-0.31
Østfold	-0.93	0.29	-5.03	-3.87	0.14	-2.99
Buskerud	-0.86	-0.46	-4.78	-1.90	2.71	-0.50
Vestfold	-1.37	-1.93	-6.14	-2.16	3.19	-1.22
Telemark	-2.90	5.22	-7.67	-1.57	4.37	0.22
Aust-Agder	-1.75	0.69	-2.67	-4.75	-0.16	-3.57
Vest-Agder	-1.53	2.84	-2.26	-4.17	1.51	-1.98
Rogaland	-1.42	-0.38	-3.23	-1.84	2.96	-1.58
Hordaland	0.37	-4.92	0.20	-2.01	0.60	-1.22
Sogn og Fjordane	-0.17	-1.13	-0.46	-3.83	1.40	-2.72
Møre og Romsdal	-2.09	-1.60	-3.82	-2.96	2.76	-0.59
Sør-Trøndelag	-0.15	0.36	-2.09	-1.24	3.20	-0.53
Nord-Trøndelag	-0.49	-0.61	-5.06	-1.78	4.20	-0.53
Nordland	0.22	-3.54	-1.38	-0.88	0.71	-1.84
Troms	-1.75	-1.55	-6.48	-0.80	1.27	-2.54
Finnmark	-1.62	-2.80	-6.28	-1.27	0.29	-1.27
MEAN	-0.99	-0.70	-3.32	-2.24	1.84	-1.37
MEDIAN	-0.93	-0.87	-3.23	-1.84	1.51	-1.22

Table A.10.B.
Excluding Austrian and Finnish regions from the donor pool:
Post-1995 average percentage difference in GVA per worker (index, 1980=100)
between actual and synthetic region

NUTS 3 region	total	agr	ind	const	fbs	wrtafic
Oslo	-3.61		20.75	-12.87	11.80	-9.49
Akershus	11.85	24.16	-0.96	-6.60	40.34	9.52
Hedmark	-4.23	10.44	-30.52	-6.97	-24.21	-13.08
Oppland	-0.13	25.51	-7.55	0.07	-15.23	0.35
Østfold	44.36	71.76	2.50	-9.94	1.85	-9.72
Buskerud	51.91	45.34	8.43	11.20	18.39	0.90
Vestfold	36.11	12.25	15.51	-7.07	29.92	-3.00
Telemark	22.14	156.25	-25.49	23.20	83.85	22.97
Aust-Agder	-13.34	10.74	-28.91	-18.99	-0.88	-21.96
Vest-Agder	-6.11	24.99	-23.34	-16.34	12.06	-5.72
Rogaland	-2.32	17.74	-20.36	-7.01	24.73	-6.64
Hordaland	10.87	-10.19	1.89	23.96	9.08	-1.77
Sogn og Fjordane	6.61	25.71	37.63	-16.17	5.06	-9.04
Møre og Romsdal	-6.91	25.14	-21.13	-16.70	14.90	-7.76
Sør-Trøndelag	8.34	3.20	-9.90	-15.19	31.46	0.00
Nord-Trøndelag	10.57	35.73	-22.39	-7.59	40.98	-1.71
Nordland	14.22	4.13	5.48	5.70	12.53	-3.61
Troms	-7.76	-2.42	-33.62	3.56	14.42	-11.61
Finnmark	-8.42	20.44	-32.80	-13.60	-6.15	-7.08
MEAN	8.64	27.83	-8.67	-4.60	16.05	-4.13
MEDIAN	6.61	22.30	-9.90	-7.07	12.53	-5.72

Figure A.2.
Distributions of post-1995 difference (pre-1995 RMSPE weighted) in compound annual growth rates of GVA per worker (index, 1980=100) between actual and synthetic region
(*Difference in CAGR*weight*, where weight = 1 if smallest RMSPE or = 0 if largest RMSPE in the sample)

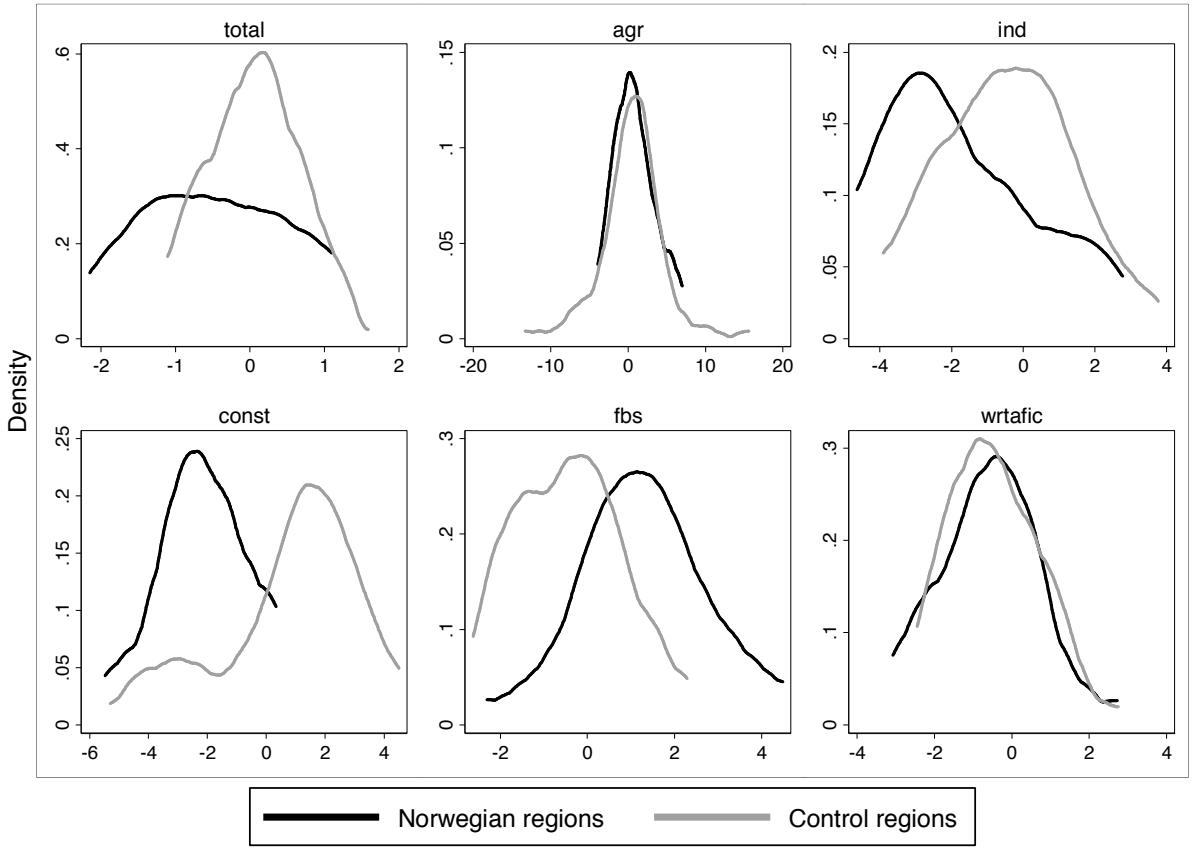


Figure A.3.
Distributions of the ratio between post-1995 RMSE and pre-1995 RMSE
in the estimation of synthetic GVA per worker (index, 1980=100)

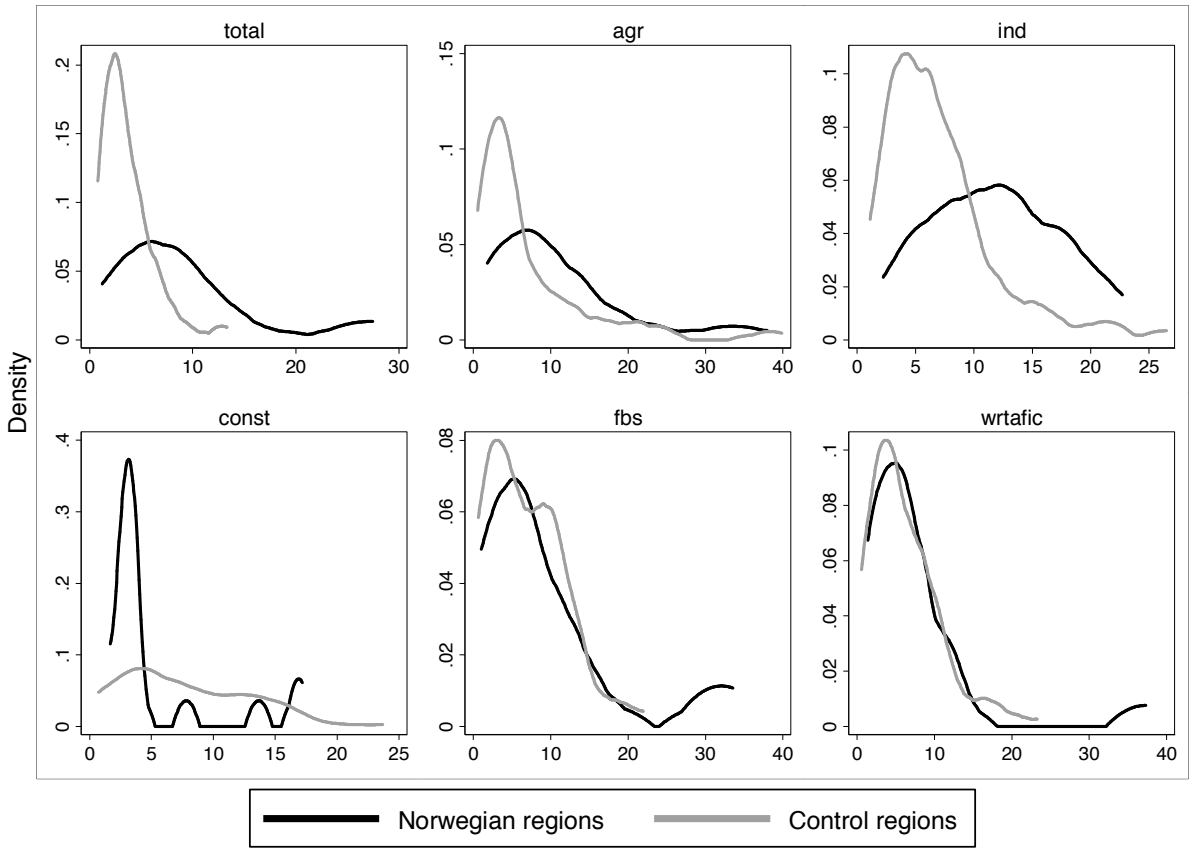


Table A.11. Difference-in-differences estimates using actual and synthetic control series

	(1) total	(2) agr	(3) ind	(4) const	(5) fbs	(6) wrtafic
			PANEL A			
Dependent variable:			GVA per worker (index, 1980=100)			
Post 1995 * Norway	-4.07	45.78	-70.27***	-5.40	13.84***	-1.00
	(3.63)	(28.93)	(17.08)	(5.29)	(3.58)	(2.47)
Observations	760	720	760	760	760	760
R-squared	0.93	0.78	0.83	0.77	0.52	0.80
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Nuts2*Year FE	YES	YES	YES	YES	YES	YES
			PANEL B			
Dependent variable:			Growth rate of GVA per worker (index, 1980=100)			
Post 1995 * Norway	-0.57	1.34	-1.48*	-2.12***	1.12*	-0.65
	(0.37)	(0.81)	(0.74)	(0.55)	(0.64)	(0.54)
Observations	722	684	722	722	722	722
R-squared	0.57	0.49	0.39	0.49	0.46	0.44
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Nuts2*Year FE	YES	YES	YES	YES	YES	YES
			PANEL C			
Dependent variable:			Trend growth rate of GVA per worker			
Post 1995 * Norway	-0.66***	-0.89	-1.94***	-0.56*	0.01	-0.35
	(0.22)	(0.59)	(0.45)	(0.29)	(0.22)	(0.23)
Observations	760	720	760	760	760	760
R-squared	0.88	0.62	0.83	0.93	0.66	0.54
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Nuts2*Year FE	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors clustered at the regional level in parentheses. *** p<0.01, **p<0.05, * p<0.1. *Total* refers to the regional economy (all sectors); *agr* to the agriculture, forestry and fishing ; *ind* to industry less construction; *const* to construction; *fbs* to financial & business services; *wrtafic* to wholesale, retail, transport, accommodation & food services, information and communication.

APPENDIX B.

Table B.1
RMSPE, Units weights, and Predictor Balance (*total* NUTS3 economy)

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Oslo	2.01	Wien	0.11	gfcf_gva	0.19	0.27
		Linz-Wels	0.02	sh_emp_agr	0.00	0.13
		Salzburg und Umgebung	0.08	sh_emp_ind	0.11	0.18
		Innsbruck	0.26	sh_emp_const	0.09	0.08
		Osttirol	0.22	sh_emp_fbs	0.16	0.09
		Etelä-Pohjanmaa	0.28	sh_emp_wrtafic	0.34	0.27
		Satakunta	0.04	edu	8.91	10.35
				GR_pop	1.29	0.55
				pop_dens	0.96	0.45
				distance	0.00	353.93
				gva_emp100	102.29	102.33

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Akershus	1.37	Klagenfurt-Villach	0.07	gfcf_gva	0.19	0.27
		Linz-Wels	0.57	sh_emp_agr	0.04	0.04
		Salzburg und Umgebung	0.05	sh_emp_ind	0.12	0.27
		Außerfern	0.03	sh_emp_const	0.06	0.07
		Pirkanmaa	0.01	sh_emp_fbs	0.14	0.09
		Helsinki-Uusimaa	0.04	sh_emp_wrtafic	0.32	0.24
		Blekinge län	0.25	edu	8.90	10.06
				GR_pop	0.96	0.57
				pop_dens	0.09	0.20
				distance	19.62	270.85
				gva_emp100	122.09	122.11

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Hedmark	1.10	Mittelburgenland	0.36	gfcf_gva	0.21	0.26
		Südburgenland	0.05	sh_emp_agr	0.12	0.10
		Lungau	0.08	sh_emp_ind	0.16	0.23
		Etelä-Savo	0.02	sh_emp_const	0.06	0.09
		Blekinge län	0.09	sh_emp_fbs	0.04	0.06
		Dalarnas län	0.32	sh_emp_wrtafic	0.24	0.22
		Gävleborgs län	0.04	edu	8.41	9.79
		Jämtlands län	0.04	GR_pop	-0.18	0.11
				pop_dens	0.01	0.03
				distance	164.83	228.97
				gva_emp100	120.59	120.49

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Oppland	1.49	Mittelburgenland	0.26	gfcf_gva	0.21	0.27
		Pohjanmaa	0.19	sh_emp_agr	0.11	0.10
		Satakunta	0.05	sh_emp_ind	0.17	0.24
		Blekinge län	0.04	sh_emp_const	0.06	0.08
		Värmlands län	0.46	sh_emp_fbs	0.04	0.06
				sh_emp_wrtafic	0.26	0.21
				edu	8.50	9.82
				GR_pop	-0.23	0.03
				pop_dens	0.01	0.03
				distance	172.74	272.56
				gva_emp100	109.20	109.17

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Østfold	7.73	Päijät-Häme	0.69	gfcf_gva	0.25	0.27
		Etelä-Karjala	0.31	sh_emp_agr	0.09	0.10
				sh_emp_ind	0.23	0.32
				sh_emp_const	0.03	0.05
				sh_emp_fbs	0.05	0.06
				sh_emp_wrtafic	0.25	0.21
				edu	8.37	10.33
				GR_pop	0.51	0.15
				pop_dens	0.06	0.03
				distance	97.69	136.41
				gva_emp100	170.76	169.01

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Buskerud	12.54	Päijät-Häme	0.58	gfcf_gva	0.25	0.27
		Etelä-Karjala	0.42	sh_emp_agr	0.05	0.10
				sh_emp_ind	0.21	0.31
				sh_emp_const	0.06	0.05
				sh_emp_fbs	0.06	0.05
				sh_emp_wrtafic	0.27	0.21
				edu	8.43	10.33
				GR_pop	0.67	0.10
				pop_dens	0.01	0.03
				distance	53.50	151.28
				gva_emp100	176.10	171.74

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Vestfold	6.28	Varsinais-Suomi	0.16	gfcf_gva	0.25	0.27
		Päijät-Häme	0.76	sh_emp_agr	0.07	0.09
		Etelä-Karjala	0.08	sh_emp_ind	0.22	0.32
		Etelä-Savo	0.01	sh_emp_const	0.06	0.05
				sh_emp_fbs	0.05	0.06
				sh_emp_wrtafic	0.27	0.21
				edu	8.62	10.33
				GR_pop	0.40	0.27
				pop_dens	0.09	0.03
				distance	121.77	119.85
				gva_emp100	166.37	165.50

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Telemark	6.06	Päijät-Häme	0.63	gfcf_gva	0.25	0.28
		Etelä-Savo	0.01	sh_emp_agr	0.04	0.10
		Lappi	0.37	sh_emp_ind	0.24	0.27
				sh_emp_const	0.06	0.06
				sh_emp_fbs	0.06	0.06
				sh_emp_wrtafic	0.24	0.21
				edu	8.51	10.26
				GR_pop	-0.21	0.24
				pop_dens	0.01	0.02
				distance	146.39	359.36
				gva_emp100	169.40	169.15

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Aust-Agder	0.85	Mittelburgenland	0.04	gfcf_gva	0.23	0.26
		Klagenfurt-Villach	0.20	sh_emp_agr	0.05	0.05
		Außerfern	0.00	sh_emp_ind	0.19	0.21
		Osttirol	0.00	sh_emp_const	0.05	0.07
		Pohjanmaa	0.06	sh_emp_fbs	0.05	0.09
		Pirkanmaa	0.01	sh_emp_wrtafic	0.26	0.23
		Stockholms län	0.14	edu	8.59	9.90
		Blekinge län	0.17	GR_pop	0.38	0.31
		Hallands län	0.04	pop_dens	0.01	0.08
		Värmlands län	0.34	distance	261.96	298.98
				gva_emp100	112.97	113.02

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Vest-Agder	0.77	Östliche Obersteiermark	0.10	gfcf_gva	0.23	0.27
		Lungau	0.18	sh_emp_agr	0.03	0.09
		Außerfern	0.07	sh_emp_ind	0.20	0.25
		Rheintal-Bodenseegebiet	0.21	sh_emp_const	0.05	0.07
		Päijät-Häme	0.12	sh_emp_fbs	0.06	0.07
		Pohjois-Karjala	0.06	sh_emp_wrtafic	0.29	0.24
		Blekinge län	0.07	edu	8.69	10.08
		Dalarnas län	0.20	GR_pop	0.51	0.49
				pop_dens	0.02	0.09
				distance	315.59	361.90
				gva_emp100	131.05	130.97

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Rogaland	0.89	Lungau	0.22	gfcf_gva	0.23	0.26
		Salzburg und Umgebung	0.16	sh_emp_agr	0.10	0.11
		Außerfern	0.36	sh_emp_ind	0.20	0.18
		Helsinki-Uusimaa	0.17	sh_emp_const	0.05	0.08
		Keski-Pohjanmaa	0.03	sh_emp_fbs	0.08	0.09
		Pohjois-Pohjanmaa (nuts2013)	0.04	sh_emp_wrtafic	0.27	0.32
		Uppsala län	0.03	edu	8.52	10.39
				GR_pop	1.07	0.95
				pop_dens	0.04	0.06
				distance	458.49	331.56
				gva_emp100	132.32	132.15

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Hordaland	2.08	Klagenfurt-Villach	0.00	gfcf_gva	0.22	0.28
		Unterkärnten	0.01	sh_emp_agr	0.04	0.11
		Innviertel	0.38	sh_emp_ind	0.17	0.29
		Linz-Wels	0.17	sh_emp_const	0.05	0.06
		Satakunta	0.01	sh_emp_fbs	0.08	0.07
		Pirkanmaa	0.15	sh_emp_wrtafic	0.28	0.19
		Blekinge län	0.28	edu	8.70	9.98
				GR_pop	0.69	0.34
				pop_dens	0.03	0.10
				distance	476.73	307.01
				gva_emp100	124.74	124.71

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Sogn og Fjordane	1.98	Mittelburgenland	0.08	gfcf_gva	0.22	0.28
		Westliche Obersteiermark	0.61	sh_emp_agr	0.10	0.14
		Innviertel	0.04	sh_emp_ind	0.19	0.27
		Päijät-Häme	0.05	sh_emp_const	0.05	0.06
		Blekinge län	0.23	sh_emp_fbs	0.04	0.05
				sh_emp_wrtafic	0.23	0.23
				edu	8.52	10.08
				GR_pop	-0.43	-0.01
				pop_dens	0.01	0.04
				distance	528.57	247.56
				gva_emp100	128.12	127.92

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Møre og Romsdal	2.40	Südburgenland	0.17	gfcf_gva	0.22	0.27
		Östliche Obersteiermark	0.02	sh_emp_agr	0.12	0.11
		Lungau	0.05	sh_emp_ind	0.24	0.23
		Außerfern	0.06	sh_emp_const	0.05	0.07
		Päijät-Häme	0.19	sh_emp_fbs	0.04	0.06
		Pohjois-Karjala	0.12	sh_emp_wrtafic	0.23	0.22
		Dalarnas län	0.38	edu	8.45	9.95
				GR_pop	0.12	0.26
				pop_dens	0.02	0.03
				distance	553.49	252.42
				gva_emp100	134.80	135.05

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Sør-Trøndelag	1.26	Klagenfurt-Villach	0.03	gfcf_gva	0.27	0.27
		Innviertel	0.30	sh_emp_agr	0.06	0.10
		Linz-Wels	0.24	sh_emp_ind	0.14	0.28
		Außerfern	0.06	sh_emp_const	0.06	0.07
		Pirkanmaa	0.07	sh_emp_fbs	0.09	0.08
		Päijät-Häme	0.02	sh_emp_wrtafic	0.28	0.21
		Blekinge län	0.28	edu	8.75	10.00
				GR_pop	0.70	0.43
				pop_dens	0.01	0.12
				distance	542.00	317.18
				gva_emp100	126.77	126.74

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Nord-Trøndelag	2.35	Westliche Obersteiermark	0.13	gfcf_gva	0.27	0.28
		Innviertel	0.47	sh_emp_agr	0.16	0.15
		Satakunta	0.16	sh_emp_ind	0.14	0.29
		Päijät-Häme	0.03	sh_emp_const	0.03	0.06
		Blekinge län	0.21	sh_emp_fbs	0.03	0.06
				sh_emp_wrtafic	0.22	0.19
				edu	8.63	10.05
				GR_pop	-0.04	0.21
				pop_dens	0.01	0.06
				distance	679.37	307.65
				gva_emp100	127.46	127.38

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Nordland	2.38	Westliche Obersteiermark	0.35	gfcf_gva	0.27	0.28
		Innviertel	0.31	sh_emp_agr	0.09	0.15
		Päijät-Häme	0.23	sh_emp_ind	0.12	0.30
		Blekinge län	0.12	sh_emp_const	0.05	0.06
				sh_emp_fbs	0.05	0.05
				sh_emp_wrtafic	0.29	0.21
				edu	8.35	10.19
				GR_pop	-0.39	0.19
				pop_dens	0.01	0.05
				distance	1221.20	233.45
				gva_emp100	139.57	139.34

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Troms	1.63	Mittelburgenland	0.12	gfcf_gva	0.27	0.27
		Klagenfurt-Villach	0.07	sh_emp_agr	0.07	0.09
		Innviertel	0.16	sh_emp_ind	0.08	0.25
		Satakunta	0.14	sh_emp_const	0.05	0.07
		Blekinge län	0.13	sh_emp_fbs	0.07	0.07
		Värmlands län	0.37	sh_emp_wrtafic	0.26	0.20
				edu	8.43	9.87
				GR_pop	0.09	0.15
				pop_dens	0.01	0.05
				distance	1771.61	293.54
				gva_emp100	118.46	118.41

NUTS 3 region	RMSPE	Control unit	Weight	Predictor	Actual	Synthetic
Finnmark	1.73	Mittelburgenland	0.28	gfcf_gva	0.27	0.27
		Westliche Obersteiermark	0.15	sh_emp_agr	0.05	0.10
		Innviertel	0.03	sh_emp_ind	0.12	0.25
		Satakunta	0.06	sh_emp_const	0.07	0.08
		Blekinge län	0.15	sh_emp_fbs	0.02	0.06
		Värmlands län	0.33	sh_emp_wrtafic	0.29	0.21
				edu	8.18	9.83
				GR_pop	-0.25	0.04
				pop_dens	0.00	0.04
				distance	1990.71	248.70
				gva_emp100	119.83	119.64