CENTRE OF PLANNING AND ECONOMIC RESEARCH

DISCUSSION PAPERS

No 153

The impact of Belgium federal reform on economic well-being. A parametric and non-parametric synthetic control approach

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December 2019

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Η επίπτωση της ομοσπονδιακής μεταρρύθμισης του Βελγίου στην ευημερία.

Μια προσέγγιση παραμετρικής και μη παραμετρικής μεθόδου συνθετικού ελέγχου

Alessio Mitra και Αθανάσιος Χύμης

Περίληψη

Η παρούσα εργασία εφαρμόζει μια σχετικά καινούρια μέθοδο, τη μέθοδο συνθετικού ελέγχου (synthetic control method -SCM) για να αξιολογήσει τις επιπτώσεις από την συνταγματική μεταρρύθμιση του Βελγίου, το 1993, στην εξέλιξη του κατά κεφαλήν ΑΕΠ. Η συγκεκριμένη μεταρρύθμιση αποκέντρωσε το σύστημα των δαπανών από το κεντρικό κράτος προς τις περιφέρειες του Βελγίου ενώ, την ίδια στιγμή, η πλευρά των εσόδων (συλλογή φόρων) παρέμεινε υπό κεντρική εξουσία. Η εργασία εφαρμόζει τόσο τη παραμετρική όσο και τη μη παραμετρική μέθοδο συνθετικού ελέγχου. Τα ευρήματα δείχνουν ότι η μεταρρύθμιση έχει αρνητικό αντίκτυπο στην οικονομική ευημερία. Υποστηρίζεται ότι η παρουσία ισχυρής αποκέντρωσης με αυτονομία των τοπικών κυβερνήσεων στον έλεγχο των δαπανών αλλά, με ταυτόχρονη συλλογή φόρων σε κεντρικό κρατικό επίπεδο, έχει ενισχύσει τις μη παραγωγικές δαπάνες (pork barrel spending) σε περιφερειακό επίπεδο, αυξάνοντας το πρόβλημα των κοινών πόρων (common-pool problem). Αυτό συμβαίνει διότι οι τοπικές κυβερνήσεις συναγωνίζονται για το ποιος θα λάβει μεγαλύτερο μερίδιο από τα κρατικά φορολογικά έσοδα χωρίς να ασχολούνται οι ίδιες με την συλλογή αυτών των φόρων, πράγμα που υποσκάπτει την οικονομική ανάπτυξη.

The impact of Belgium federal reform on economic well-being. A parametric and non-parametric synthetic control approach

Alessio Mitra and Athanasios Chymis

Abstract

This paper applies both parametric and non-parametric synthetic control method in the case of a specific federal reform. It evaluates the impact of Belgium constitutional federalism reform of 1993 on GDP per capita. The findings show a negative impact of the reform on economic well-being. It is argued that the presence of a strong federalism with sub-national spending autonomy and, conversely, centralized tax system, has enhanced pork barrel spending, common-pool problem, thus damaging economic growth.

Introduction

Institutions shape how politicians behave, give incentives and promote or discourage certain practices. For this reason, it is of deep interest to understand which institutional structures trigger certain political behaviours and to which extent. The economics literature have deeply studied the relation between numerous institutional characteristics and economic performances in depth. Constitutional features, electoral rules and forms of governments can systematically shape economic policies and politician behaviours though political accountability and incentives mechanism (Torsten & Guido, 2000; 2004, McManus & Ozkan 2018 and Lederman, Loayza, & Soares, 2005).

However, it is complex to capture the actual causal effect of institutions. Indeed, institutions are usually stable over time and comparative studies face many issues of subjectivity. Cross-sectional, pooled time-series and even panel approaches suffer from the endogeneity problem, resulting in weak causal inference arguments.

The aim of the paper is to provide a focus on a specific institutional case study, namely the Belgian federal reform promulgated in 1993 and to evaluate the impact of Belgian federalism on economic well-being. Despite the rarity of such drastic institutional changes, the economic literature has not approached extensively this phenomenon yet. The only research on the topic (Arnold & Stadelmann-Steffen, 2017) evaluated the impact the Belgian reform on welfare expenditure, finding a positive impact of the reform on public expenditure. To the best of our knowledge, this is the first research evaluating the impact of Belgian federal reform on economic well-being.

Arnold and Stadelmann pointed out that federalism does not always lead to regional competition and fiscal austerity, as many times generally stated by the literature (Hayek, 1976) (Obinger, Leibfried, & Castles, 2005) and (Wilensky, 1975). On the contrary, the impact of such reforms on public finances depends largely on how federalism is implemented. The Belgian federal reform gave a substantial expansion of sub-national spending autonomy. However, the revenue collection part (*i.e.*: the tax system) remained highly centralized and sole responsibility of the central government. In other words, the public expenditure decided at a local level were financed at a national level, giving local politicians a scope of action greater than before and allowing them to fully exploit the well-known common pool problem (Christopher, 2008).

The common-pool problem arises when the benefits of a public program is restricted to a sub sample of the population (ex: local jurisdiction) whereas the cost of it is shared among all (ex: the entire population). The people receiving the benefits of such program will underestimate the cost of the program because they do not pay for its entirety. Therefore, local politicians can gain electoral support by increasing public spending and making sure that their voters do not bear the full cost. The key argument is that legislators internalize the benefit of public projects targeted at their district without bearing the electoral consequences of the fiscal cost. This phenomenon is frequently referred to as pork barrel spending (Egger & Koethenbuerger, 2010).

We argue that, the imbalance of fiscal responsibility between local and central government of the newly Federal Belgium has busted political oriented welfare expenditure and undermined economic growth. In synthesis, without political fiscal accountability, politicians have the interest in using the fiscal policy as a political tool without fearing electoral repercussions.

A similar argument has been proposed by Rodden and Eskeland (2003) who discuss about the relevance of fiscal decentralisation. According to their argument, federalism does not always obstruct state activities; rather the reduction of state intervention is closely related to the particular constellation of federalism and the subnational units' tax autonomy. In federal states in which subnational units have tax autonomy, fiscal competition between these units leads to financial self-responsibility and ultimately to lesser public spending at the subnational level. In contrast, federal states that do not have a decentralised fiscal system this competitive condition does not take place.

We add to the Rodden and Eskeland's argument by stating that not only the combination of strong federalism (high subnational autonomy in political decision making) and rather low subnational fiscal

autonomy (funding through transfers from the central level) increase spending behaviour at the subnational level, but it also promotes unnecessary and electorally oriented public expenditure, which, in turn, negatively affect economic growth.

In order to perform the policy evaluation of Belgian federalization the innovative synthetic control method is used. The analysis focuses on the impact of the reform on Belgian GDP per capita. In accordance to what suggested in the literature (Abadie, Diamond, & Hainmueller, Comparative Politics and the Synthetic Control Method, 2015) the recommended placebo tests for the SCM are conducted. Finally, as an additional robustness check, the paper employees a non-parametric version of the synthetic control method as proposed by Giovanni Cerulli (2019). The results obtained support the theory and find a negative impact of the Belgian federal reform of 1993 on GDP per capita. In addition to that, despite a noticeable impact on GDP per capita from 1993, it is important to notice how the rate of divergence became larger after 1995, which is the date of the first Belgian election after the federal reform[1].

The Belgian federal reform

In 1993, under Prime Minister Jean-Luc Dehaene, Belgium modified its constitution turning into a full-fledged federal state. The first article of the Belgian Constitution was amended as "Belgium is a Federal State which consists of Communities and Regions". The constitutional reform leads to direct election of the parliaments of the Communities and the Regions and substantial expansion of sub-national spending autonomy.

The territory of Belgium has always been subject to the influence of both the German and Latin world and today the country has three official languages: Dutch, French and German. This heterogeneous cultural background represents one of the main reasons that enacted the Belgian federal process (Popelier & Cantillon, 2013).

The Comparative Political Data Set defines the level of federalism as “no federalism”, “weak federalism” and “strong federalism”. Countries defined as weakly federal are Australia and Austria. Whereas countries defined as strongly federal are Canada, Germany, Spain, Switzerland and the United States of America. In 1993, Belgium shifted from “no federalism” to “strong federalism”, clearly marking its constitutional reform.

A turning characteristic of the reform is that aside with the significant expansion of the subnational spending autonomy, not any equivalent increase of fiscal accountability occurred. Indeed, the tax

[1] In some placebo test the reform’s impact starts in 1995.

system remained national. Hence, after the reform of 1993, the subnational units in Belgium were still largely dependent on the tax revenues of the central government (Deschouwer, 2000). The first direct elections for the parliaments of the Communities and the Regions took place on 21 May 1995.

Data

The research uses data from 1980 to 2017. This allows a considerably large pre-treatment period of 13 years, from 1980 to 1993. Economic well-being is measured with GDP per Capita (USD, constant prices, 2010 PPPs) as suggested by (Billmeier & Nannicini, 2013) and it is collected from OECD Productivity Database. Investment (as a share of GDP) is gathered from the IMF World Economic Outlook Database, whereas inflation (as annual percentage change in consumer prices), trade openness (measured as export plus imports as percentage of GDP) and unemployment rate are from the World Bank. The Comparative Political Data Set is used to distinguish between federal and non-federal states.

When applying the synthetic control method in the panel setup, Belgium is referred as the treated country, the Belgian federal reform of 1993 is considered the treatment, all the other countries used to build the synthetic Belgium are defined as the donor pool.

Method: The Synthetic Control Approach

The SCM method was developed by Gardeazabal & Abadie (2003), Abadie, Diamond & Hainmueller (2010) and Abadie, Diamond & Hainmueller (2015) with the primary aim of estimating the causal effects of a "treatment" on a specific outcome. Since then, it has been widely used in economics, political science and comparative analysis.

In order to evaluate the impact of a policy, the synthetic control method attempts to create a synthetic control unit that simulates what the outcome path of that unit would have been in absence of the policy intervention. As a consequence, the presented SCM will simulate what the outcome path of Belgium GDP per capita would have been if the Federal reform had not been implemented.

This hypothetical counterfactual unit is derived by taking the weighted average of pre-intervention outcomes (predictors) from selected donor countries.

In details, the synthetic control can be represented by a (J × 1) vector of weights $W = (w_2, \dots, w_{j+1})'$ with w_j between 0 and 1, of which the total sum is equal to 1. The selected value of W is such that the characteristics of the treated Belgium are best resembled by the

characteristics of the synthetic Belgium. In other words, W* is equal to the value of W that minimizes:

$$\sum_{m=1}^{k} v_m (X_{1m} - X_{0m} W)^2$$

$X_1$is a (k × 1) vector containing the values of the pre-intervention characteristics (predictors) of the treated Belgium that we aim to match as closely as possible (m-th variable), X_0 is (k × j) matrix containing the values of the pre-intervention characteristics for the countries in the donor pool (m-th variable) and v_m is a weight that reflects the relative importance assigned to the m-th variable while measuring the discrepancy between X_1 and X_0 W.

The resulting synthetic Belgium should closely match the treated Belgium outcome before treatment and, after policy enactment, the difference in outcomes between the treated Belgium and its synthetic control counterpart reveals the policy's impact. More formally:

$$Y_{1t} - \sum_{J=2}^{J+1} W_j^* Y_{jt}$$

In order to select the potential donor countries of the donor pool, it is fundamental to restrict the focus on those countries that have similar features to Belgium and have never been a federal state. Given these criteria, the potential donor pool is settled to be composed by OECD countries that have never had a federal system[2]. The selection of non-federal countries for the donor pool is based on the federal system definition of the Comparative Political Data Set (CPDS). We employs two different donor pools. The first follows the paper "How federalism influences welfare spending: Belgium federalism reform through the perspective of the synthetic control method" by Arnold & Stadelmann-Steffen (2017), 12 donor countries are selected: Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Netherlands, Norway, Sweden and the United Kingdom. The second, by enlarging the donor pool to all non-federal OECD countries available[3]. Note that the OECD countries defined as federal state (either weak or strong) are Australia, Austria, Germany, Mexico, Spain, Switzerland and the United States.

The predictors for GDP per capita are chosen as following: GDP per capita before the treatment, investment as a share of GDP, inflation rate, trade openness and unemployment rate. (Abadie,

[2] OECD countries for which there were missing data for at least one of the predictors in the entire pre-treatment period have been excluded from the donor pool. Most of those countries were post-communist countries: Chile, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Slovenia.
[3] Results shown in appendix.

Diamond, & Hainmueller, Comparative Politics and the Synthetic Control Method, 2015) and (Billmeier & Nannicini, 2013)

Empirical results

The synthetic Belgium is built with weights chosen so that the resulting synthetic Belgium best reproduces the values of the predictors of per capita GDP in Belgium in the pre-federal period. Table 1 shows the weights of each country in the synthetic version of Belgium. The synthetic Belgium is a weighted average of the Netherlands, Ireland, Finland, Iceland, Norway and Japan with weights decreasing in this order. The Netherlands accounts for 76% of the total weight, demonstrating a strong closeness to Belgium. All other countries in the donor pool obtain a weight of zero. The distribution of weights for synthetic Belgium is very similar to the one obtained by Arnold Tobias and Stadelmann-Steffen Isabelle (2017), with Netherlands and Ireland as the two major donors.

Table 1: Synthetic weights for Belgium

Country	Synthetic Control Weight	Country	Synthetic Control Weight
Denmark	0	Italy	0
Finland	0.056	Japan	0.011
France	0	Netherlands	0.761
Greece	0	Norway	0.014
Iceland	0.022	Sweden	0
Ireland	0.136	United Kingdom	0

Table 2 compares the pre-treatment characteristics of Belgium to those of the synthetic Belgium, overall almost all predictors closely match the pre-treatment real data.

Table 2: Economic growth predictor means before Belgium reform

	Treated Belgium	Synthetic Belgium
Inflation	4.46	4.47
Investment	22.50	22.47
Trade openness	116.24	99.20
Unemployment rate	8.89	8.35
GDP per capita (1992)	30645.1	30642.1
GDP per capita (1987)	26997.5	27084.8

GDP per capita (1981)	24687.5	24688.2

Figure 1 displays the per capita GDP trajectory of Belgium and its synthetic counterpart for the 1980–2013 period. The synthetic Belgium almost exactly reproduces the per capita GDP for actual Belgium during the entire pre-federal reform period. The estimate of the effect of the Belgian federal reform on per capita GDP in Belgium is obtained as the difference between the actual Belgium GDP per capita and its synthetic version. It is estimated that the federal reform has an immediate small negative effect on Belgium GDP per capita, an effect that increases soon after the first post-reform election in Belgium in 1995. This specific timing seems to confirm our argument on the political mechanism through which the effect is working.

In other words, in absence of the federal reform, Belgium would have seen its GDP per capita growing at a faster rate.

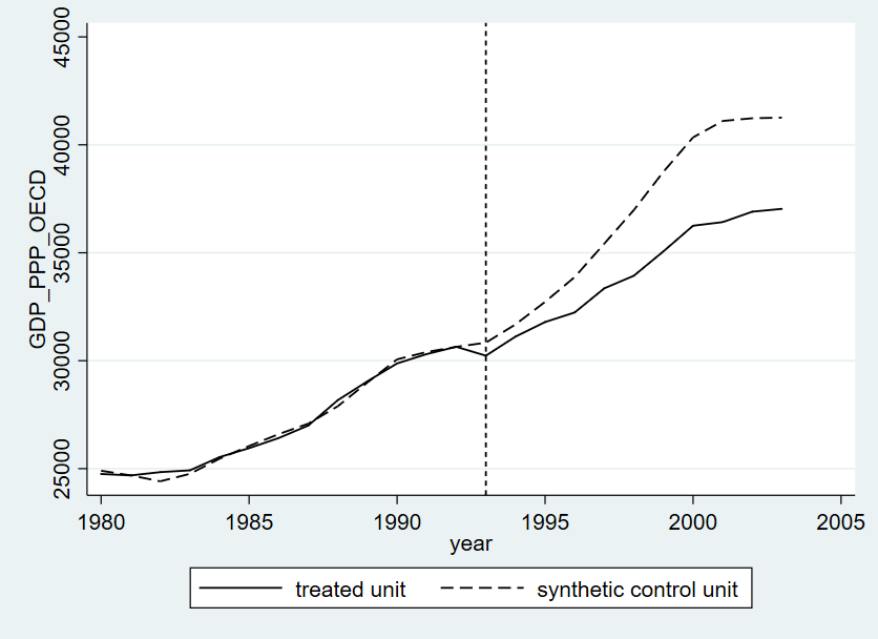

Figure 1: Trends in per Capita GDP: Belgium versus synthetic Belgium

A rebalancing of the federal system: the Lambermont Accord

The 1993 Belgian reform forms part of the process of federalization of the country. In 2001, under Prime Minister Guy Verhofstadt, Belgium went through an ulterior relevant federal reform called the Lambermont accord. Thanks to this accord, additional powers were assigned to the Communities and the Regions with respect to the financing of the communities and the extension of the fiscal powers of the regions. In particular, the Regions became responsible for the management and application of twelve regional taxes, previously of state duty.

Given the existence of the 2001 Lambermont accord, the trends in GDP per capita shown previously obtained with the synthetic control method were purposely limited until 2003. Indeed, if the negative impact of the 1993 federal reform was due to the imbalance of the 1993 federal system, by reducing such imbalance, the 2001 reform might have reduced the underlying pork barrel mechanism and negative impact on economic wealth.

Figure 2 shows the same parametric synthetic control estimation presented in figure 1 with an extended prediction time until 2017. It can be noticed that, after the 2001, the two lines stop diverging and, instead, start following a similar trend. In other words, the mechanism that was causing the divergence in trend of economic wealth from 1993 stopped producing this effect soon after 2001.

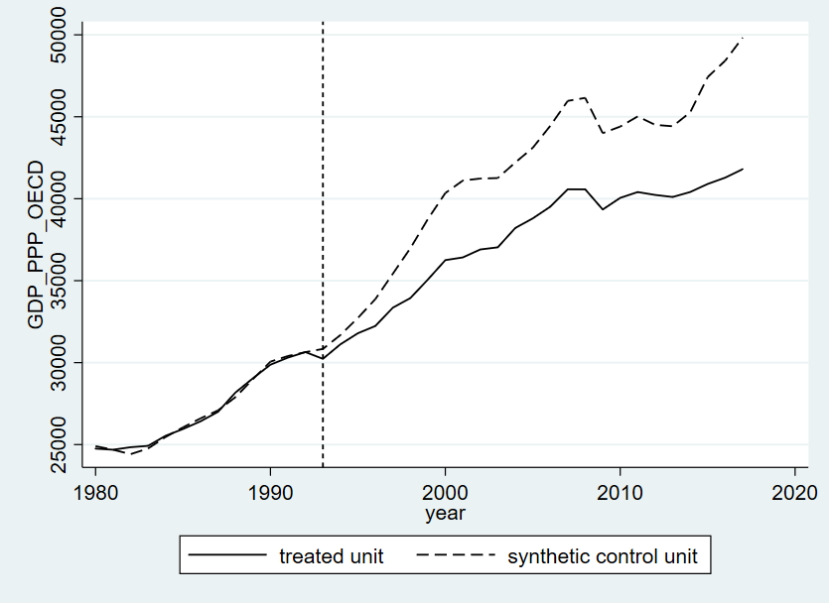

Figure 2: Trends in per Capita GDP: Belgium versus synthetic Belgium

To disentangle the two effects and evaluate the relevance of the Lambermont accord, the synthetic control method is performed on two different dates: 2001 (year in which the Lambermont accord was approved) and 2006 (when the first election after the reform took place). The same donors and predictors of the main analysis are used. Furthermore, in order to restrict the construction of the weights and synthetic Belgium to the unbalanced federal Belgium state, only the years from 1993 to 2001 (or from 1993 to 2006) are used as pre-treatment period. Such design allows us to depict how Federal Belgium would have performed if the Lambermont accord would have never been implemented.

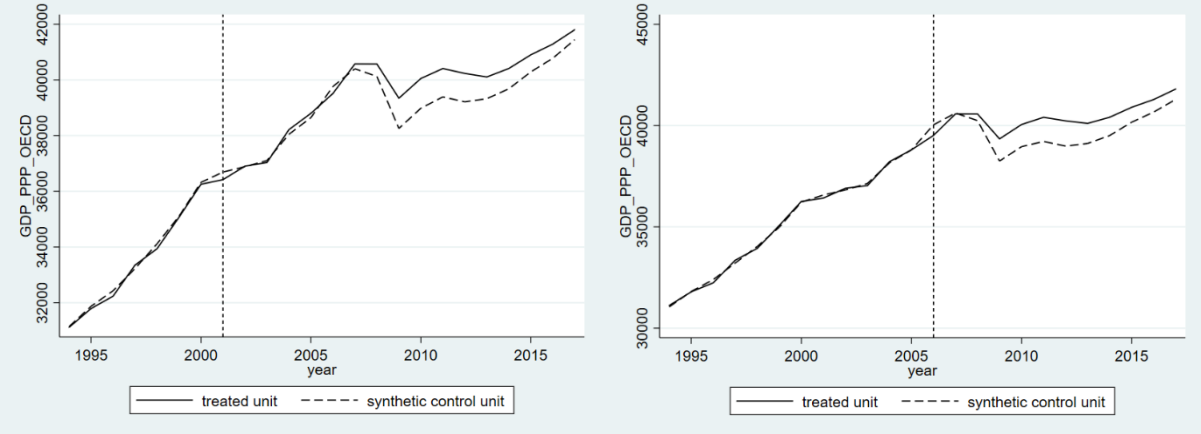

Figure 3: Trends in per Capita GDP: Federal Belgium versus synthetic Federal Belgium

Figure 3 shows the aftermath of the Lambermont accord: as soon as the new local councils are elected, the actual Belgium performs better than the synthetic one. The extension of fiscal responsibility to the regions has reduced considerably the negative impact of the previous imbalanced system, causing a positive impact on GDP per capita.

The positive impact of the Lambermont, side with the negative impact of 1993 federal reform, reinforces the federal imbalance mechanism that has been argued as having rooted the negative impact of 1993 reform on economic wealth.

Placebo tests

As suggested by Abadie, Diamond and Hainmueller (2015), to evaluate the credibility of our main results, a series of placebo studies are conducted:

1. In-time placebo test. The treatment of interest is reassigned to a different year, not the actual one. At the placebo year we should not observe any divergence.
2. In space placebo test. The treatment of interest is reassigned to a different country to the actual one. Other countries should not register significant shocks.
3. Leave one out test. One by one, each country of the donor pool is excluded from the sample. The results should not be driven by any specific country.

Finally, as an additional test, a new placebo test of predictor sensibility is performed. One by one, each predictor is excluded from the sample. The results should not be driven by any specific predictor.

Under the in-time placebo test, the model is rerun supposing the federal reform is reassigned to different dates during the pre-treatment period. This test is performed twice, in the year 1989 and

1985, respectively about 4 and 8 years before the actual reform[4]. Given the fact that in these years Belgium did not have any actual federal reform, the synthetic control method should not detect any impact of the placebo federal reform.

Figure 4 shows no significant divergence in the placebo treatment in 1985; the trend of GDP per capita of Belgium and its synthetic control result to be similar in both pre and post placebo periods. An analogous behaviour is found in figure 5, where the placebo treatment is shifted to 1989. This output enhances the credibility of our original results by ensuring that the SCM does not systematically overestimate the performance of Belgium GDP per capita in any post-treatment periods.

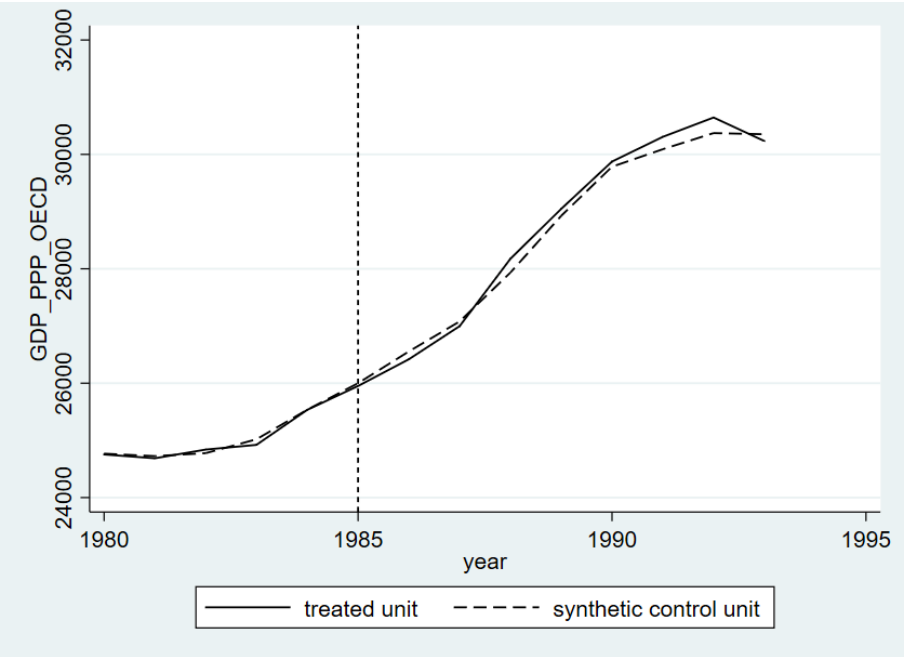

Figure 4: In-time placebo test, year 1985

[4] The two in-time placebo test are performed using the same predictors and donor pool of the main analysis.

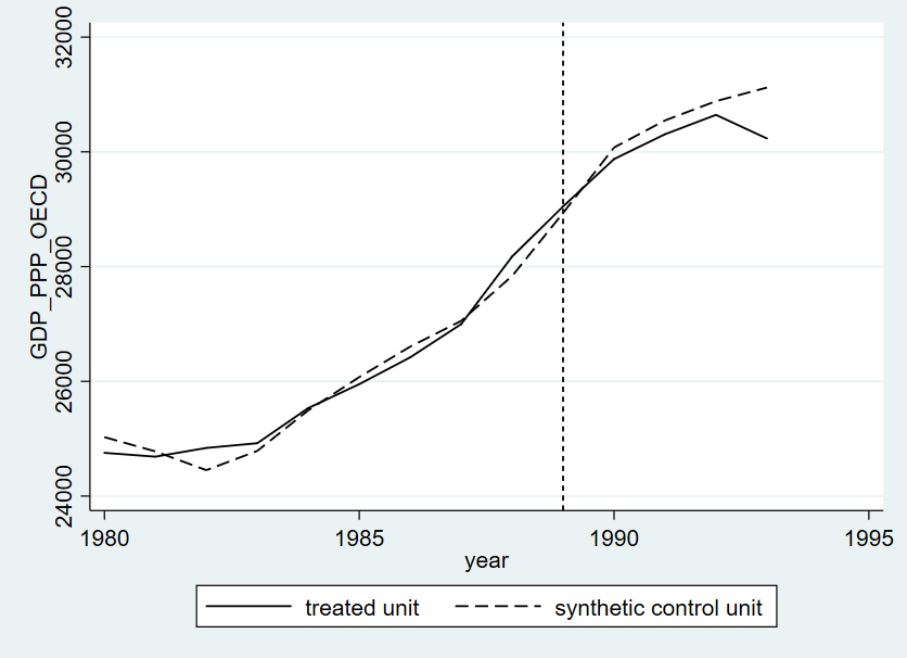

Figure 5: In-time placebo test, year 1989

In the in space placebo test the treatment is supposed to have taken place in all comparison countries. This way, synthetic control estimates for countries that did not experience the Belgian federal reform are obtained. If many countries display the same divergence, it will signal that the findings of Belgium are likely to be given by chance and are not caused by an actual treatment effect.

With the aim to compare the treatment effect between all the countries, the ratio between post-period RMSPE[5] and pre-period RMSPE is computed. Clearly, having a large post-period RMSPE does not always indicate a large post-treatment effect. If the pre-period RMSPE is very large it means that the synthetic control is not able to reproduce well the pattern of that country, consequently, a large post-treatment divergence is meaningless. By obtaining the ratio between the two RMSPE this element is taken into account. The countries with the highest "Post period RMSPE / Pre period RMSPE" are the ones that experienced the biggest treatment shock[6].

Figure 6 reports the ratios between the post-1993 RMSPE and the pre-1993 RMSPE for Belgium and for all the countries in the donor pool. Belgium clearly stands out as the country with the highest RMSPE ratio. Hence, it is unlikely the Belgium results are just given by chance.

[5] Root Mean Squared Prediction Error.
[6] Recall that RMSPE measures the magnitude of the gap in the outcome of GDP per capita between each country and its synthetic counterpart.

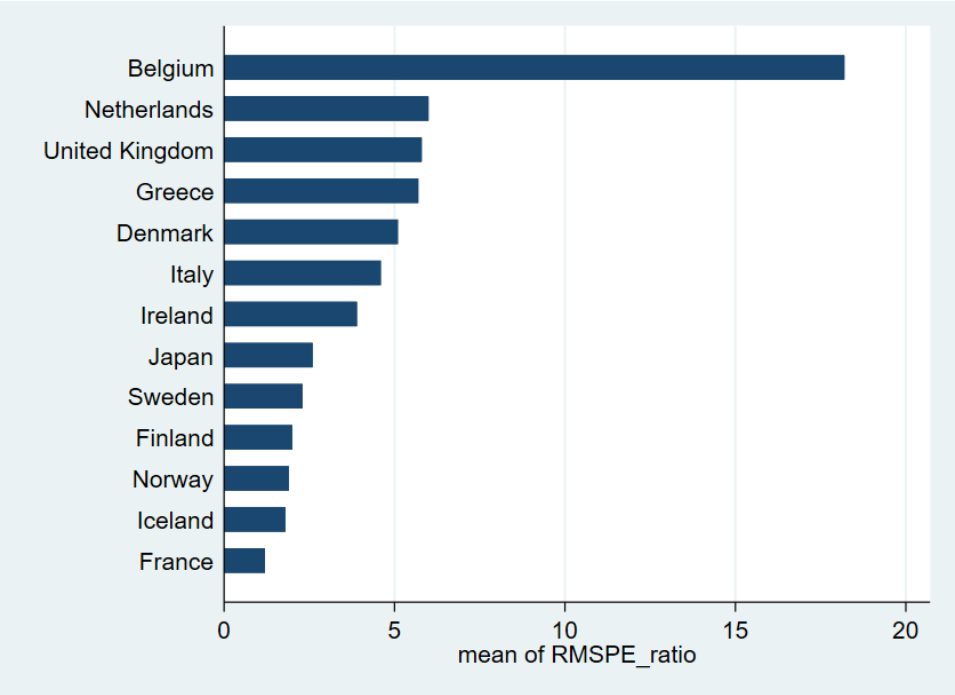

Figure 6: Ratio of Post reform RMSPE to Pre reform RMSE. Belgium and control countries.

The aim of the leave-one-out test is to investigate whether the SCM estimates are driven by the presence of a specific donor country in the donor pool. To exclude this possibility, the main estimation is performed several times by excluding every time one of the donor countries that were contributing in the construction of the synthetic Belgium, namely Netherlands, Ireland, Finland, Iceland, Norway and Japan. For our results to be robust, we expect to have all the leave-one-out synthetic Belgium at least above the treated Belgium

Figure 7 summarizes the results of the leave-one-out test. The synthetic Belgium exceeds the treated Belgium in all the placebo cases. The results do not drastically change by removing Finland, Japan, Norway or Iceland, whereas, by dropping the Netherland or Ireland, the treatment effect detected by the SCM is considerably smaller and starts from 1995. As previously noted, given that the first election after the federal reform occurred in 1995, it is likely that in absence of two of the major contributors to the synthetic Belgium, the method manages to detect a smaller negative impact of the reform only after 1995.

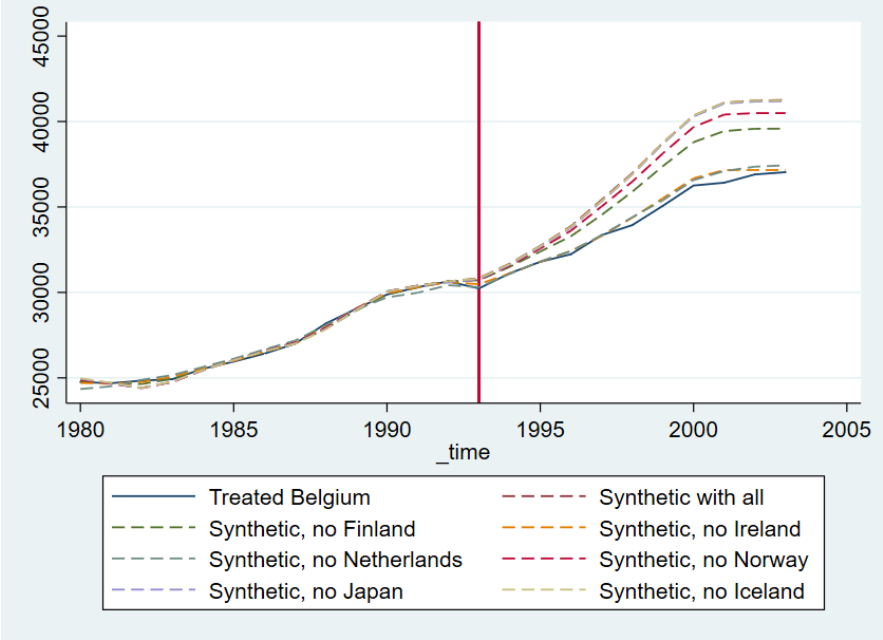

Figure 7: Leave-one-out test

Finally, given the relevance in the selection of the predictors for the outcome variable of interest, a predictor sensibility test is performed. The objective of interest in the application of this test is to check whether the SCM estimates are driven by the presence of a specific predictor of GDP per capita. The main estimation is performed several times by excluding every time one of the predictors that were contributing in the construction of the synthetic Belgium, namely GDP per capita before the treatment, investment as a share of GDP, inflation rate, trade openness and unemployment rate. Figure 8 shows the results of the predictor sensibility test: the trend of synthetic Belgium does not vary much depending on which predictor is excluded from the computation.

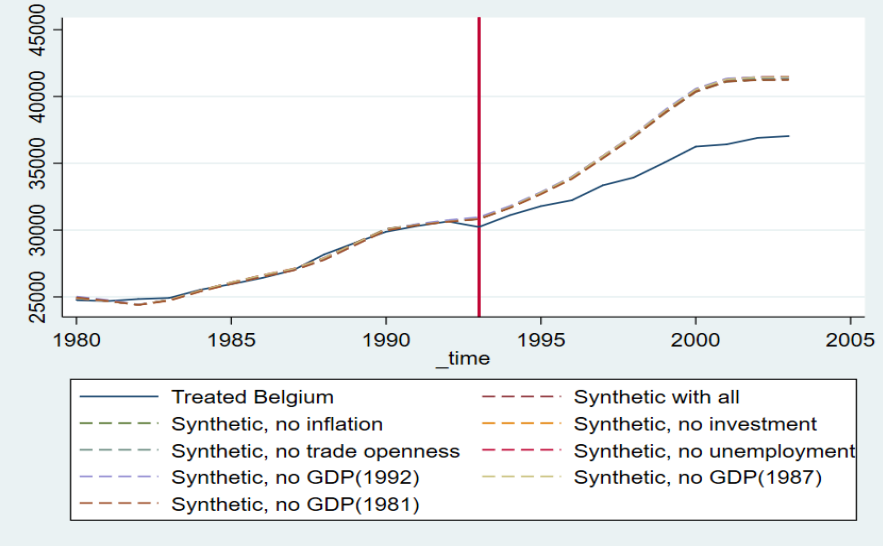

Figure 8: Predictor sensibility test

Non-parametric synthetic control approach

In this section an extension of the analysis, through a flexible nonparametric construction of the weights for estimating the synthetic time pattern of Belgium, is presented. Indeed, the parametric synthetic control method assumes a linear conditional mean of the treated unit's covariates in the vector space spanned by the donors' covariates. As a consequence, if this conditional mean is not linear, the weights may be inconsistently estimated and the counterfactual imprecisely imputed (Cerulli, 2019).

A recent development of the method by Giovanni Cerulli (2019) consists in the computations of the weights as proportional to the vector-distance between the treated unit and the controls, using a kernel weighting scheme. Hence, given a certain bandwidth, the estimated matrix of weights is proportional to the distance between the treated unit and all the rest of untreated ones, reducing the risk of imprecise counterfactuals. In all the different specifications it is firstly identified the optimal bandwidth by selecting the one that minimizes the pre-intervention Root Mean Squared Prediction Error (RMSPE). Figure 9 depicts how the optimal bandwidth is identified by plotting the RMSPE levels for all the kernel type of function.

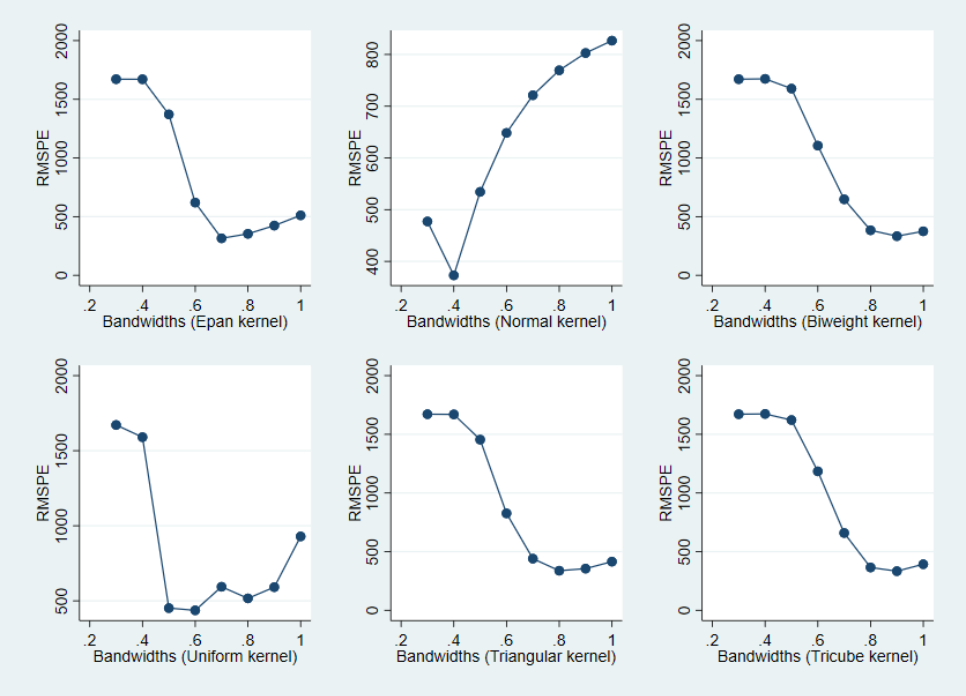

Figure 9: Optimal bandwidth by minimizing the RMSPE

Figure 10 shows the results of the non-parametric synthetic control method using different kernel functions. It can be observed that, independently from the kernel function chosen, the non-parametric estimates result similar and match in magnitude and direction with the parametric one. The following results add confidence to the consistency and the credibility of the main finding. The superior flexibility of the non-parametric approach can be detected by observing the composition of the weights chosen by the method. As a matter of fact, if in the parametric approach many countries were not contributing and there was a high concentration of weight on few countries as the Netherlands and Ireland, the non-parametric approach, on the other hand, provides a more homogeneous distribution of weights, where the Netherlands are still relevant, but not as predominant as before. As observed, In the parametric estimation the Netherlands account for 76% of the total weight, with many countries close to zero, whereas in the non-parametric estimation, depending on the kernel function adopted, the Netherlands accounts for 26% to 40% of the total weight and most of the other countries have with values ranging from 10% to 20%[7]. The impact of such increased flexibility will be noticeable in the leave-one-out placebo test, allowing the synthetic control method to recalibrate more efficiently in absence of one of the main donors (ex: the Netherlands).

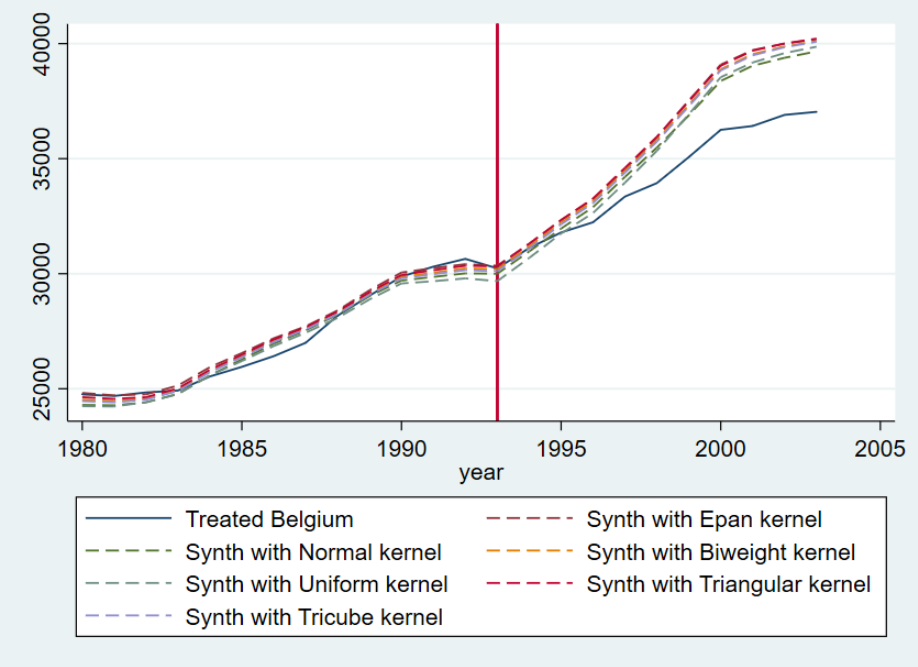

Figure 10: Non-parametric estimations SCM

[7] All the non-parametric weight tables are showed in Appendix.

For each of the Kernel functions, both the in time and leave-one-out placebo tests are performed. All the results are consistent with the one of the parametric version[8]. Figure 11 depicts the in time placebo test using all different kernel function, no divergence is present at the placebo treatment year.

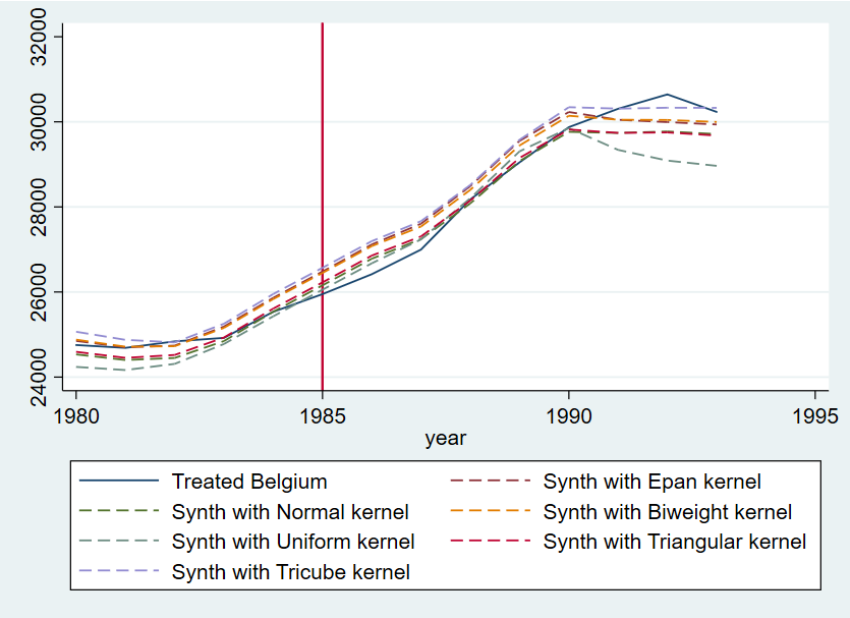

Figure 11: In time placebo test in non-parametric SCM

Among the leave-one-out non-parametric placebo tests, Figure 12 might be the most relevant showing the results without the Netherlands. In the parametric version of the placebo test, the synthetic Belgium without the Netherlands is above the treated Belgium, however of a small margin. The non-parametric version of the same test is instead more prominent as all the synthetic estimates exceed the treated Belgium of a wider margin.

[8] All leave-one-out placebo tests for the non-parametric SCM are showed on Appendix

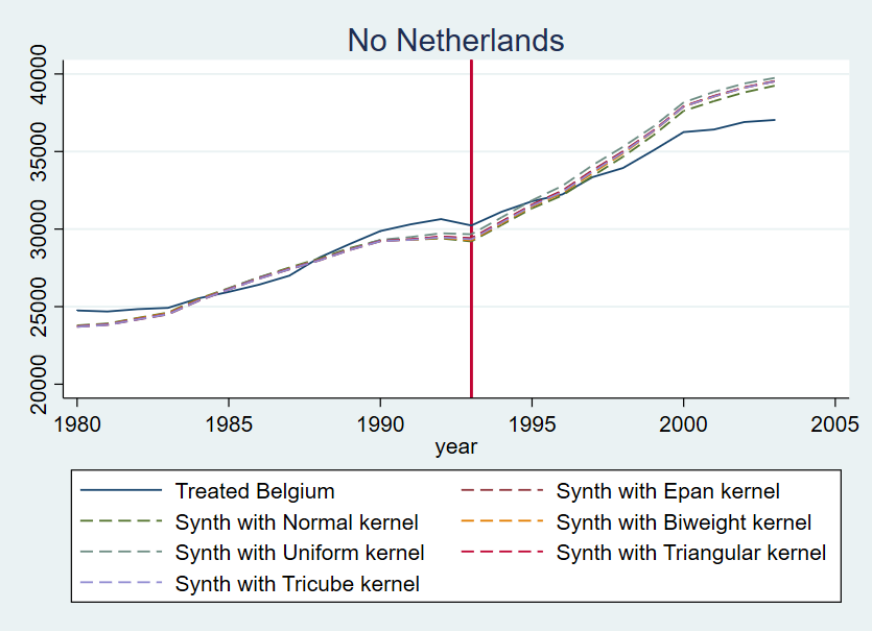

Figure 12: Non-parametric leave-one-out placebo test (without The Netherlands)

Conclusions

The presented research originates from the idea that an unbalanced federal system, with decentralized expenditure system but centralized tax system can generate high incentives leading to opportunistic political behaviour, pork barrel spending, consolidation of unproductive public expenditure and degradation of economic growth. The federalisation that came into existence in 1993 was a turning point in Belgium: welfare expenditure stopped its decreasing trend and consolidated at a higher levels. It has been acknowledged that such change of direction was due to the incentives, underlying the reform, for subnational entities to spend on social policies and to use these programmes as a source of subnational legitimation and identity-building (Arnold & Stadelmann-Steffen, 2017) .

This paper contributes to the existing literature by evaluating the impact of the Belgian federal reform on economic well-being, expanding the related literature on federalism and fiscal accountability and employing a very recent non-parametric version of the synthetic control method. The four placebo tests used in the related literature are implemented and confirm the reliability of the main results.

Social policies motivated by mere electoral interests are not going to have the same positive economic impact than social policies implemented for actual economic reasons. As a result, fiscal decentralisation should be considered a key point for a successful implementation of federal

systems (Rodden & Eskeland, 2003). Thanks to the Belgian unbalance federal system, local politician were able to finance local programs without bearing the electoral cost of the related fiscal burden. This lack of accountability leaded to unnecessary local expenditure motivated more by subnational legitimation and identity building of the politicians rather than by actual economic reasons. In accordance with the prediction of Rodden and Eskeland (2003), we argue that the Belgian 1993 federal design promoted unnecessary and electorally oriented public expenditure, which, in turn, negatively affected economic growth. The detected positive impact on GDP per capita of the subsequent fiscal decentralization caused by the Lambermont accord (2001) confirms such argument. The additional local fiscal responsibility introduced by the Lambermont accord (2001) reduced the space for opportunistic political behaviours, which, in turn, enhanced economic performances.

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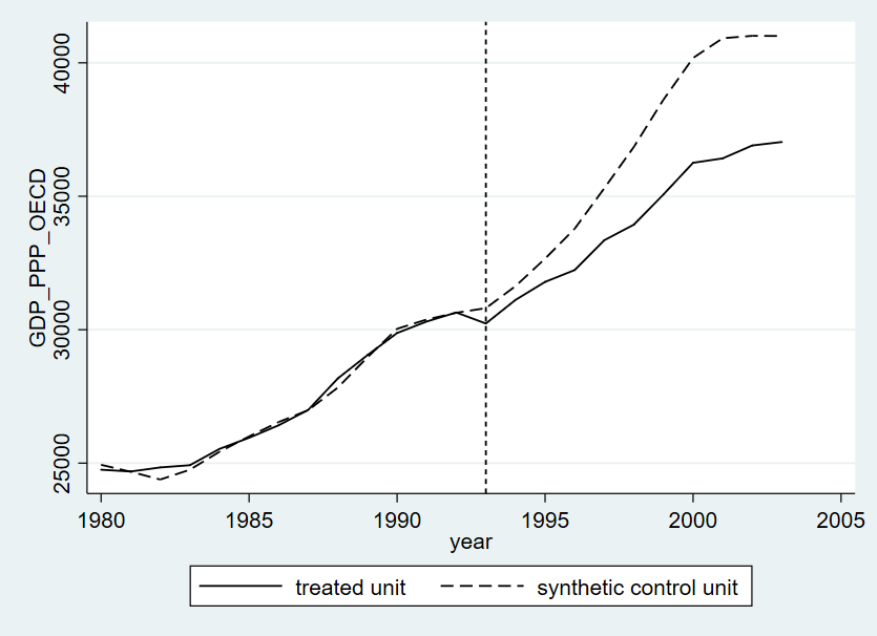
Appendix

Country	Synthetic Control Weight
Canada	0
Denmark	0
Finland	0.064
France	0
Greece	0
Iceland	0
Ireland	0.116
Israel	0
Italy	0
Japan	0
Korea	0
Luxemburg	0
Netherlands	0.794
New Zealand	0
Norway	0.007
Portugal	0.019
Sweden	0
Turkey	0
United Kingdom	0

Appendix Table 1: Synthetic weights for Belgium with expanded donor pool (addition of Canada, Israel, Korea, Luxemburg, New Zealand, Portugal and Turkey to the donor poo)

	Treated Belgium	Synthetic Belgium
Inflation	4.46	3.98
Investment	22.50	22.50
Trade openness	116.24	99.84
Unemployment rate	8.89	8.42
GDP per capita (1992)	30645.1	30634.4
GDP per capita (1987)	26997.5	26987.2
GDP per capita (1981)	24687.5	24678.7

Appendix Table 2: Economic growth predictor means before Belgium reform with expanded donor pool (addition of Canada, Israel, Korea, Luxemburg, New Zealand, Portugal and Turkey to the donor poo)



Appendix Figure 1: Trends in per Capita GDP: Belgium versus synthetic Belgium with expanded donor pool (addition of Canada, Israel, Korea, Luxemburg, New Zealand, Portugal and Turkey to the donor poo)

Country	Synthetic Control Weight
Denmark	.103
Finland	.004
France	.088
Greece	0
Iceland	.009
Ireland	.113
Italy	.011
Japan	0
Netherlands	.430
Norway	.015
Sweden	.22
United Kingdom	.002

Appendix Table 3: Synthetic weights for Belgium using non parametric SCM (epan kernel function)

Country	Synthetic Control Weight
Denmark	.104
Finland	.037
France	.087
Greece	.033
Iceland	.035
Ireland	.109
Italy	.053
Japan	.015
Netherlands	.280
Norway	.055
Sweden	.149
United Kingdom	.038

Appendix Table 4: Synthetic weights for Belgium using non parametric SCM (normal kernel function)

Country	Synthetic Control Weight
Denmark	.114
Finland	.016
France	.089
Greece	.014
Iceland	.018
Ireland	.123
Italy	.037
Japan	0
Netherlands	.337
Norway	.041
Sweden	.185
United Kingdom	.02

Appendix Table 5: Synthetic weights for Belgium using non parametric SCM (biweight kernel function)

Country	Synthetic Control Weight
Denmark	.131
Finland	.010
France	.125
Greece	0
Iceland	.023
Ireland	.149
Italy	0
Japan	0
Netherlands	.268
Norway	.022
Sweden	.268
United Kingdom	0

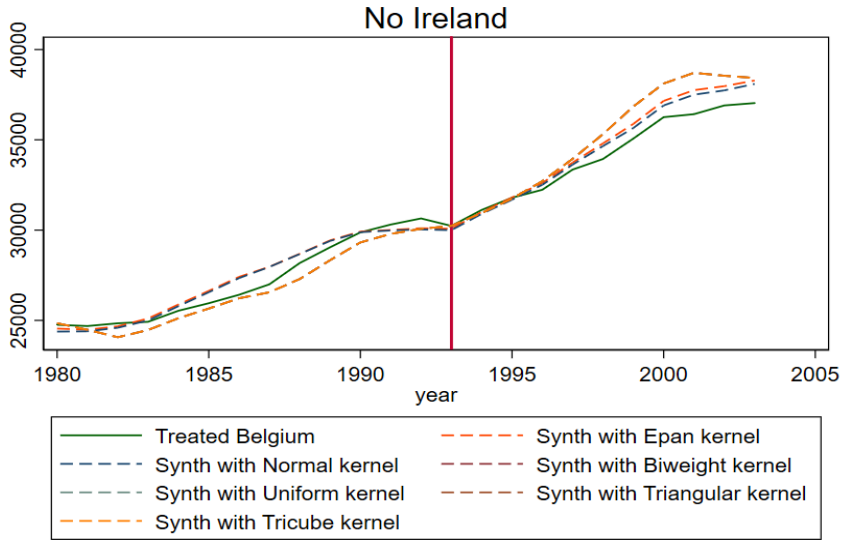
Appendix Table 6: Synthetic weights for Belgium using non parametric SCM (uniform kernel function)

Country	Synthetic Control Weight
Denmark	.111
Finland	.011
France	.086
Greece	.011
Iceland	.015
Ireland	.121
Italy	.033
Japan	0
Netherlands	.372
Norway	.037
Sweden	.182
United Kingdom	.017

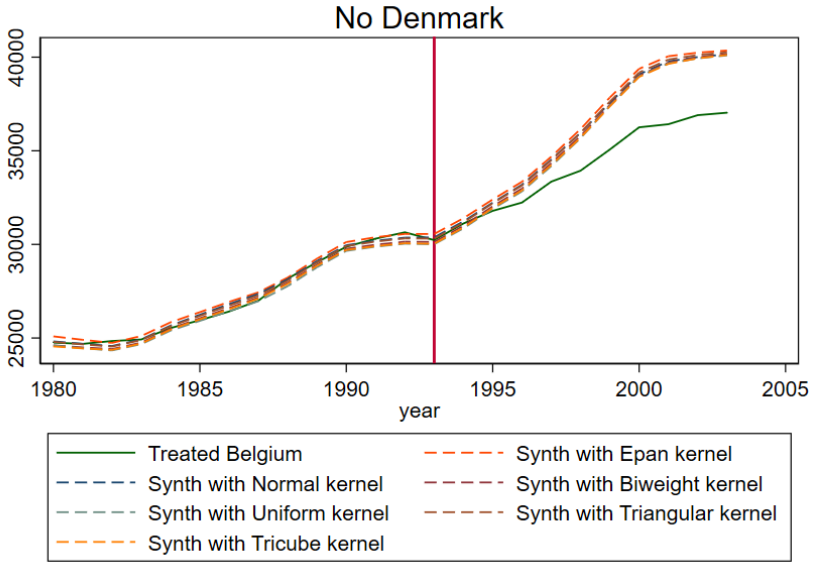
Appendix Table 7: Synthetic weights for Belgium using non parametric SCM (triangular kernel function)

Country	Synthetic Control Weight
Denmark	.118
Finland	.012
France	.094
Greece	.011
Iceland	.016
Ireland	.130
Italy	.033
Japan	0
Netherlands	.324
Norway	.036
Sweden	.203
United Kingdom	.017

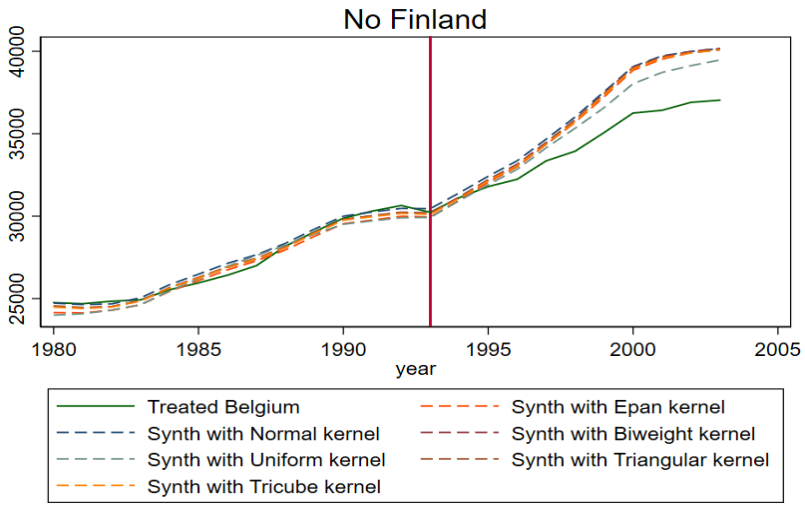
Appendix Table 8: Synthetic weights for Belgium using non parametric SCM (tricube kernel function)



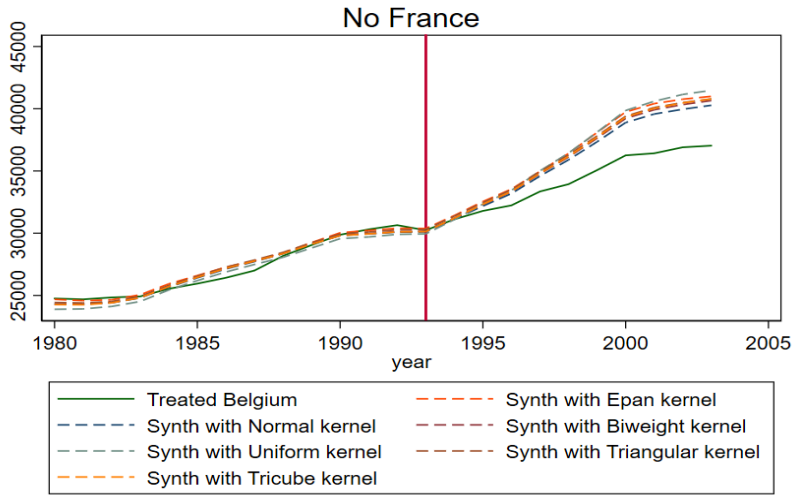
Appendix Figure 2: Non-parametric leave-one-out placebo test (without Ireland)



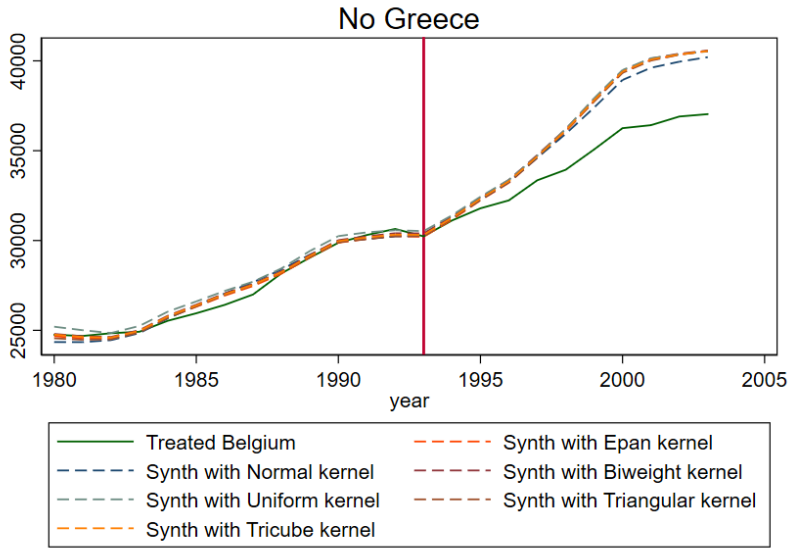
Appendix Figure 3: Non-parametric leave-one-out placebo test (without Denmark)



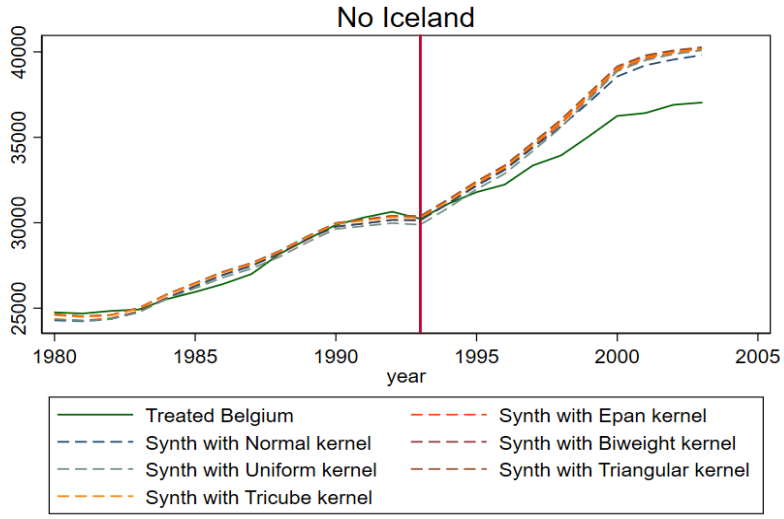
Appendix Figure 4: Non-parametric leave-one-out placebo test (without Finland)



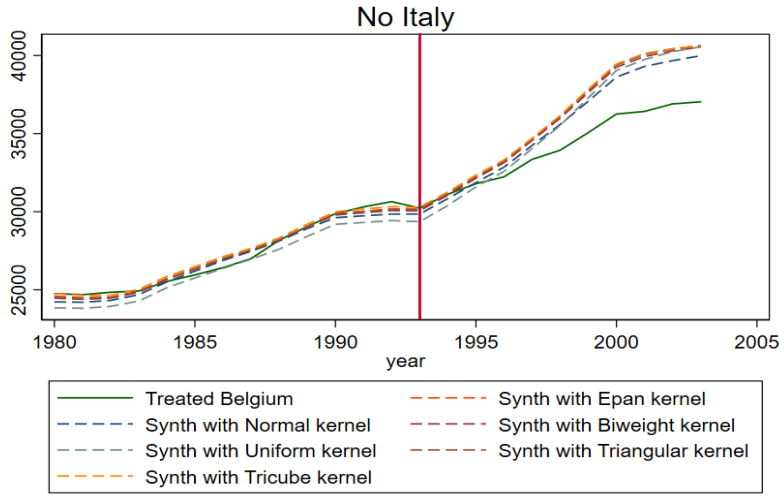
Appendix Figure 5: Non-parametric leave-one-out placebo test (without France)



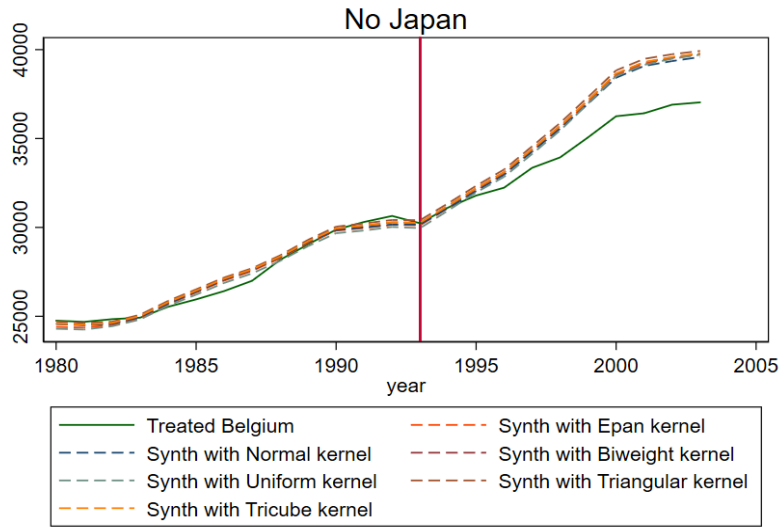
Appendix Figure 5: Non-parametric leave-one-out placebo test (without Greece)



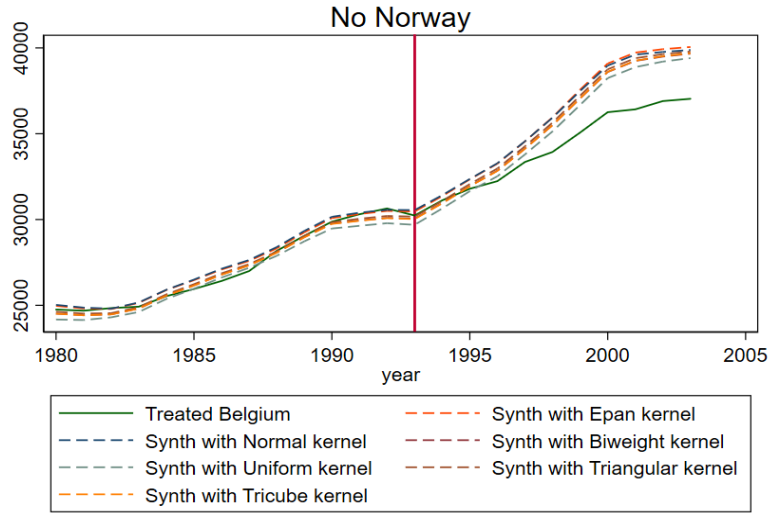
Appendix Figure 6: Non-parametric leave-one-out placebo test (without Iceland)



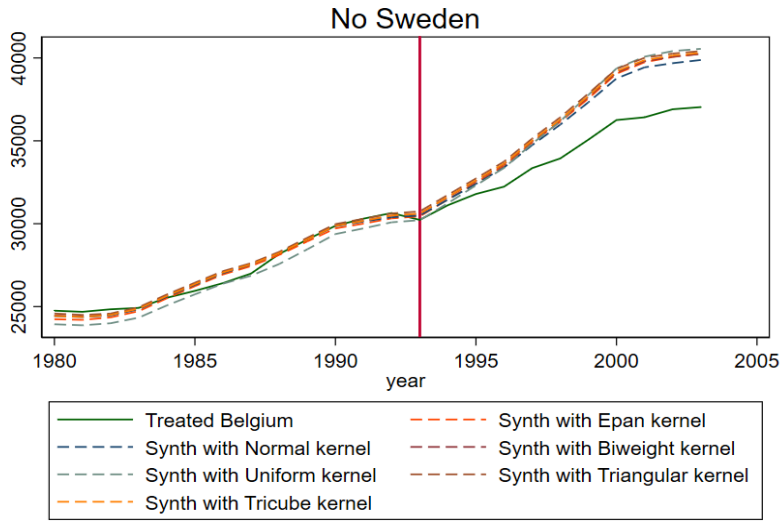
Appendix Figure 7: Non-parametric leave-one-out placebo test (without Italy)



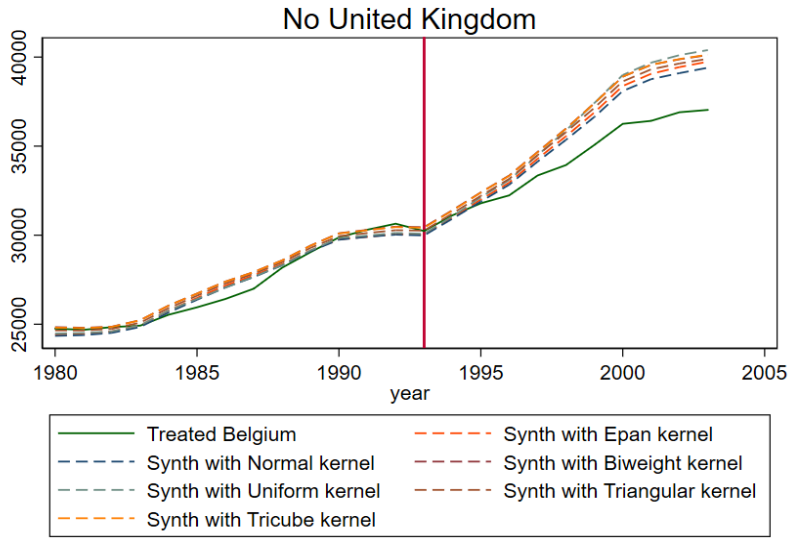
Appendix Figure 8: Non-parametric leave-one-out placebo test (without Japan)



Appendix Figure 9: Non-parametric leave-one-out placebo test (without Norway)



Appendix Figure 10: Non-parametric leave-one-out placebo test (without Sweden)



Appendix Figure 11: Non-parametric leave-one-out placebo test (without The United Kingdom)

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