Do countries really benefit from customs unions? a non-parametric approach*

Huseyin Aytug†, Merve Mavus Kutuk‡, Arif Oduncu§ and Subidey Togan**

Abstract

In this paper, we study the impacts of a CU on the countries’ export and GDP performance. Specifically, we analyse whether export and GDP per capita in Turkey has increased after Turkey became a member of the European Customs Union in 1996. The discussion on the impacts of the European Customs Union on Turkey is still inconclusive in the literature since the results of papers, usually use gravity and growth models, are conflicting. Instead, we use a new micro-econometric technique, namely Synthetic Control Method (SCM). The SCM estimates what would have been the level of export and GDP per capita in Turkey if Turkey had not become a member of the European Customs Union. We find that Turkey would have experienced a lower level of export and GDP per capita in the absence of the European Customs Union. Specifically, Turkey’s export to the European Union countries and GDP per capita in Turkey could have been 38 and 13 percent less, respectively.

JEL Codes: C31, F14, F15, F17, F40

Keywords: International Trade, Customs Union, Economic Growth, Synthetic Control Method

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1 Introduction

As well as political, social and cultural integration, important economic integration steps have been observed especially in trade liberalization which goes back to World War II and gains popularity in the 1980s. It is argued that as trade barriers in the world are eliminated, international trade has played an important role in the development and industrialization of countries. In this context, the General Agreement on Tariffs and Trade (GATT) and its successor organization the World Trade Organization (WTO) paved the way to create a strong, opulent and liberal international trading system, and thus contributed to global economic growth. Nevertheless, these developments are deadlocked with the Doha Round of WTO negotiations for multilateral trade, and hence a need for bilateral and regional trade negotiations arose to promote trade liberalization. Countries, therefore, have attempted to establish regional trade agreements such as free trade agreements (FTAs) and customs unions (CUs) in order to create trade opportunities in advance of partner countries by eliminating tariffs and non-tariff barriers, which affect trade costs among partner countries. Transatlantic Trade and Investment Partnership (TTIP) and the Trans-Pacific Partnership (TPP) are two important initiatives of recent FTAs.

Although a CU is very similar to an FTA in many ways, CUs are higher level of economic integration than FTAs since the partner countries of customs unions have also common foreign trade policy. Thus, the external tariff to third countries is the same among CU countries but it may be different among FTA countries. Moreover, Krueger (1997) claims that a CU is Pareto-superior to an FTA on welfare grounds. Although there are many studies about the impacts of FTAs, there is less about the CUs. In this paper, we study the impacts of a CU on the countries export and GDP performance. Specifically, we analyse whether exports and GDP per capita in Turkey have increased after Turkey became a member of the European Customs Union. Turkey and the EU have had the CU Decision in effect since December 31, 1995. The CU Decision brings elimination of tariff rates on export of industrial
and process agriculture products between members of the European Customs Union. On the other hand, The CU Decision requires that Turkey has to adapt her trade policy according to the EUs Common Commercial Trade Policy. In line with this requirement, Turkey has to apply the EUs Common External Tariff to imports of covered goods under the CU Decision from the rest of the world due to nature of customs unions. In addition, as the Decision entered into force, Turkey had to sign several FTAs, which the EU had already established with third countries, within 5 years because of the legal obligation related to the adaption of trade policy. Moreover, the Customs Union brings another obligation which compels Turkey to make FTAs with third countries signing FTAs with the EU. As a result, Turkey has been an important trade partner of the EU under special provisions of the Customs Union for more than 19 years.

Furthermore, Turkey has to adopt reforms to apply Common Commercial Trade Policy of the EU. Those reform areas are rules modernization of customs; elimination of technical barriers to trade; competition policy; intellectual property rights; and antidumping, countervailing duties, surveillance and safeguards measures (Togan, 2011). Despite the fact that all reforms and requirements arisen from the CU Decision are not completed for the time being; important steps are taken in Turkey.

In this paper, we investigate both exports and GDP per capita performance of Turkey after the CU Decision. Although the CU Decision seems that it directly affects export of Turkey, it also has an impact on welfare closely due to the reforms mentioned above. The discussion on the impacts of the European Customs Union on Turkey is still inconclusive in the literature since the results of papers, usually use gravity and growth models, are conflicting. Instead, we use a new micro-econometric technique, namely Synthetic Control Method (SCM). The SCM estimates what would have been the level of exports and GDP per capita in Turkey if Turkey had not become a member of the European Customs Union. Thus, the implementation of the SCM makes an important contribution to the literature.

We find that Turkey would have experienced a lower level of exports and GDP per capita.
capita in the absence of the European Customs Union. Specifically, Turkey's exports to the European Union countries and GDP per capita in Turkey could have been 38 and 13 percent less, respectively. The remainder of the paper is organized as follows. The next section presents the brief review of the literature. Section 3 gives details about the dataset. Section 4 explains the Synthetic Control Method Methodology. Section 5 shows the results and robustness checks. Section 6 concludes the paper.

2 Literature Review

Our study contributes to two different literatures. The first literature is about the impacts of Customs Union Agreement on Turkish economy. Although many studies examine whether the CU is beneficial to Turkey, the results are inconclusive. The second literature is about the SCM and how it is used for various situations. The literature related to SCM is provided in fourth section explaining the methodology applied in this study.

The study of Antonucci and Manzocchi (2006) investigates whether the Customs Union Agreement provides additional foreign trade for these two parties Turkey and the EU members. They use a balanced panel data for 45 countries starting from 1967 until 2001. Firstly, the study shows that the gravity model approach is an appropriate method in order to explain international trade flows of Turkey. Moreover, the empirical results in this study shows that there is not enough evidence to claim that the Customs Union Agreement between the EU and Turkey provided additional foreign trade between parties of this Agreement. In addition, they argue that regional trade agreements of Turkey other than the Customs Union Agreement are not a significant component to foster export and import of Turkey.

Adam and Moutos (2008) investigate the effects of the EU-Turkey Customs Union on manufacturing export of both Turkey and 15 EU member countries. They used a gravity model covering 24 countries for 17 year up to 2004. Empirical results in their study suggest that inclusion of Turkey in the European Customs Union decreases export among 15 Euro-
ean countries; however, it has a positive impact on export of Turkey to the EU and export of the EU to the Turkey (Turkey's import from the EU).

Bilici, Erdil and Yetkiner (2008) also utilize gravity model in order to evaluate effects of the CU between the EU and Turkey on Turkey's trade flow. The study estimates the gravity equation using panel data with 42 countries starting from 1992 until 2006. The estimated results suggest the EU has been important in trade flow of Turkey both before and after the CU. They conclude that the distance between the EU and Turkey has lost importance after the CU Agreement which leads authors to conclude that the CU has increased its importance in Turkey's trade flow. However, they suggest that the CU did not cause a significant change in foreign trade of Turkey. In addition to these studies, Nowak-Lehmann, Herzer, Martinez-Zarzoso and Vollmer (2007) investigates trade flows between Turkey and the EU in 16 important export sectors of Turkey using gravity equation and panel data for the period starting from 1988 until 2002. The estimated results suggest that export in industrial goods only some of them covered in the study- has increased too little after the CU. However, it is indicated that if agricultural products are covered in the CU, authors expects significant increase in Turkey's agricultural product exports to the EU.

Alongside the studies using gravity model, there exist other empirical paper which try to figure out the impacts of the CU Agreement on Turkish economy. One of the studies is of Neyapt, Takn and ngr (2007). They use an econometric model including conjectural variables other than the gravity model for Turkey's foreign trade over the period 1980-2001. They conclude that the Customs Union Agreement between Turkey and the EU affected Turkey's trade flow positively. In addition to the econometric studies about the impacts of the CU, there are also computable general equilibrium analyses for ex-ante forecasts. In the study of Mercenier and Yeldan (1997), intertemporal general equilibrium is applied. They observe that negative consequences for Turkish economy can be observed since CU Agreement can deteriorate terms of trade of Turkey arisen from removal of custom tariffs of Turkey against the EU. On the other hand, the study of Mercenier and Yeldan (1997) also argues that if
Turkey becomes a member of the EU, then the overall impact on Turkish economy becomes positive since membership of the EU brings elimination of non-tariff barriers together with removal of customs tariffs.

Another ex-ante study is conducted by Harrison, Rutherford and Tarr (1997). They use a computable general equilibrium model and forecast possible impacts of the Turkey-EU CU Agreement between on Turkish economy. The study shows that the CU Agreement can generate positive impacts on Turkish economy; specifically welfare gains which is equal to 1 - 1.5 percent of GDP. Authors argue that this dramatic increase in welfare of Turkey is arisen from small trade diversion effect faced by Turkey.

3 Methodology

This paper investigates whether exports and GDP per capita in Turkey have increased after becoming a member of the Customs Union. In order to do that, we use a new micro-econometric technique, namely synthetic control methods (SCM), which was develop and extended by Abadie and Gardeazabal (2003) and Abadie et al. (2010). The methodology has been used widely for comparative case studies since it selects control groups with an appealing data-driven procedure. For instance, Abadie and Gardeazabal (2003) evaluates the effect of terrorism in Spain, Abadie et al. (2010) estimates the impact of California Tobacco program on tobacco consumption, Lee (2011) investigates whether inflation targeting has been successful in reducing inflation rates and Nannicini and Billmeier (2013) evaluates the impact of economic liberalization on GDP per capita all using the SCM. Other papers utilizing the SCM are Campos et al. (2013), Gomis-Porqueras and Puzzello (2014), and Chamon et al (2015).

The intuition behind this methodology is to approximate the relevant characteristics of the country affected by the intervention using a weighted combination of potential control countries, which is the synthetic control. The SCM can be used to estimate the counterfactual
situation in this country by using the synthetic control in the absence of the intervention. The counterfactual shows what the outcome of the affected country would have been if the intervention had not happened. In our case, the synthetic control helps us answering what would have been the level of exports and GDP per capita in Turkey if Turkey had not become a member of the Customs Union.

Formally, the general idea behind the SCM is as follows. Let $Y_{it}^0$ be the outcome (exports or GDP per capita) that would be observed for country $i$ (Turkey) at time $t$ in the absence of intervention (membership of the Customs Union) for units $i = 1, ..., J + 1$ and time periods $t = 1, ..., T$. Let $T_0$ be the intervention period, where $1 \leq T_0 \leq T$. Let $Y_{it}^1$ be the outcome that would be observed for country $i$ at time $t$ when country is exposed to the intervention between periods $T_0 + 1$ and $T$. Then, the treatment effect (the impact of the intervention) for country $i$ can be defined as $\tau_{it} = Y_{it}^1 - Y_{it}^0$. However, $Y_{it}^1$ is observed and $Y_{it}^0$ is not observed between $T_0 + 1$ and $T$. Thus, $Y_{it}^0$, which is the counterfactual, has to be estimated in order to find the impact of the intervention.

Abadie et al. (2010) show how to identify the treatment effect, $\tau_{it}$ under the following model for potential outcomes:

$$Y_{it}^0 = \delta_t + Z_i \Theta_t + \lambda_t \mu_i + \varepsilon_i$$  \hspace{1cm} (1)

$$Y_{it}^1 = \delta_t + \tau_{it} + Z_i \Theta_t + \lambda_t \mu_i + \varepsilon_i$$ \hspace{1cm} (2)

where $Z_i$ is a vector of relevant observed covariates (either time-varying or time-invariant) that are not affected by the intervention, $\Theta_t$ is a vector of parameters, $\lambda_t$ is an unknown common factor, $\mu_i$ is a country-specific unobservable, $\varepsilon_{jt}$ is a transitory shock with a zero mean and $\tau_{it}$ is a dummy variable that takes value 1 for the treated unit and 0 otherwise.

Now consider only the first country (Turkey), $i = 1$, receives the treatment (membership of the Customs Unions) and the remaining $J$ countries, $i = 2, ..., J + 1$ do not. The proposed data-driven approach is to approximate $Y_{it}^1$ by a weighted average of $Y_{it}^1$ taking into account
of the covariates $Z$ for the pre-intervention period, $t \leq T_0$, such that

$$Y_{it} = \sum_{i=2}^{J+1} w_j^* Y_{jt}$$  \hspace{1cm} (3)$$

$$Z_1 = \sum_{i=2}^{J+1} w_j^* Z_i$$  \hspace{1cm} (4)$$

where the weights, $w_i$, satisfy $\sum_{i=2}^{J+1} w_i = 1$ and $w_i \geq 0$. These two assumptions for the weights make sure that there is no extrapolation of outcomes from the model. Finally, the treatment effect can be estimated using

$$\hat{\tau}_{it} = Y_{it} - \sum_{i=2}^{J+1} w_j^* Y_{jt} \hspace{1cm} for \hspace{1cm} t = T_0 + 1, ..., T$$  \hspace{1cm} (5)$$

The main idea here is that the synthetic control imitates the counterfactual of the treated country that would have been observed in the absence of the intervention using the weighted average of all control countries. For the optimal choice of $W^*$, consider $X_1 = (Z_1, Y_{11}, ..., Y_{1T_0}$ the vector of pre-intervention characteristics for the country $i = 1$ and $X_0 = (Z_j, Y_{jt}, ..., Y_{jT_0}$ the matrix of the same characteristics for the control units $j \in [2, J + 1]$. Then the vector $W^*$ is chosen to minimize the distance between $X_1$ and $X_0 W$ following

$$\min_W \| X_1 - X_0 W \|_V = \min_{W(V)} \sqrt{(X_1 - X_0 W)'V(X_1 - X_0 W)}$$  \hspace{1cm} (6)$$

$$s.t \hspace{1cm} w_i \geq 0 \hspace{1cm} for \hspace{1cm} i = 2, ..., J + 1 \hspace{1cm} and \hspace{1cm} \sum_{i=2}^{J+1} w_i = 1$$  \hspace{1cm} (7)$$

where $V$ is a $(k \times k)$ symmetric and positive semi-definite matrix, which measures the relative importance of the pre-intervention characteristics included in $X$. Thus, $W$ is a function of the elements of $V$. The minimization problem above provides a solution for $W^*(V^*)$ that minimizes the pre-intervention Root Mean Square Prediction Error (RMSPE) of the outcome over the control period. Thus, the accuracy of the approximation depends on
the minimization problem, which is satisfied with a lower RMSPE. In other words, the SCM estimates the unobserved counterfactual as a weighted average of the outcomes of control countries, with weights chosen to approximate the pre-intervention characteristics of the affected country.

In the choice of control countries, two important assumptions are made. First, the pre-intervention characteristics, \( X_1 \), should include variables, which can approximate the affected country, but cannot anticipate the effects of intervention. For instance, if pre-intervention characteristics of Turkey can anticipate the effects of European Customs Union, the synthetic Turkey would generate a lower-bound estimate since some part of the real affect occurs before the membership. Second, the control countries, \( Y_i \), used in the minimization problem must not be affected by the intervention. For instance, if a European country is chosen as a control country, Turkey’s membership to the European Custom Union will definitely affect this country. Thus, the control countries must not affected by Turkey’s membership to the European Custom Union.

Compared to other comparative case studies (panel data or difference in differences), the SCM has some evident advantages. In other comparative case studies, the control units are chosen on the basis of subjective measures. However, the SCM is data-driven method and it chooses the control units that can approximate the affected unit the best. Another shortcoming in other studies is that it is not possible to test whether any of the control units can replicate the evolution of the affected unit’s outcome. In SCM, as Abadie et al (2010) suggests, placebo experiments can be implemented to make inferences. Placebo experiments are implemented by reassigning the intervention to each control unit and estimating the intervention effect for each control unit. Finally, we can compare these results with baseline results. In other words, we can assess whether the baseline results are for the treated unit are larger than the effects for countries chosen at random.

One of the important advantages of the SCM over panel data models is that the effect of the unobserved heterogeneity does not have be time-invariant and independent of the
error term as implied by equation (1). In contrast, panel data models control only for confounding factors that are time-invariant (fixed effect) or share a common trend (difference-in-differences). Thus, the SCM can handle endogeneity due to time-varying omitted bias.

4 Data

This study attempts to answer what would have been the level of exports and GDP per capita in Turkey if Turkey had not become a member of the European Customs Union. In order to answer this question, the SCM is applied using a panel data set. Since there is two outcome variables that we try to estimate in the absence of the European Customs Union growth of export to the EU members and GDP per capita, characteristic variables explaining these two outcomes are determined in line with the literature.

The empiric literature explaining trade flows bases on gravity model. In line with importance of gravity model, characteristic variables for export growth depend on explanatory variables mostly used in gravity equation estimations. Those characteristic variables used in this study are real GDP, bilateral distance between countries and area. The other explanatory variables mostly used in the gravity models are binary variables for common language, membership of a regional trade agreement, common border and common colonial history. However, those variables could not be used as a characteristic variable due to methodological properties of SCM. The real GDP series for selected countries (measured in 2005 USD) are from the World Bank. The two other variables -area and distance- come from the Centre for International Prospective Studies (CEPII). Bilateral distance is calculated according to great circle formula using geographic coordinates of the most important and crowded cities of those countries. Export of selected countries to the EU members in terms of USD is from United Nations Comtrade Database and those are merchandise trade data without services.

In order to capture dynamic impacts of the inclusion in the European Customs Union on overall wellbeing of Turkey, GDP per capita is used as an outcome variable. The series of
real GDP per capita is also measured in 2005 USD and taken from the World Bank. In line with the empirical growth literature\(^1\), shares of industry and investment in GDP, population growth rate, ratio of current account balance to GDP, average schooling years and inflation rates are used as characteristic variables are for outcome variable of real GDP per capita. Share of industry and investment in GDP, population growth rate, current account balance to GDP and inflation rate come from the International Monetary Fund. Average number of years of education received by people ages 25 and older from United Nations Development Programme and real GDP per capita measured in 2005 USD from the World Bank are used in the panel data set.

The data set covers mentioned variables above for Turkey and 18 countries similar to Turkey\(^2\) between 1989 and 2013. The frequency of all time variant variables is annual.

5 Results

5.1 Baseline Results

In order to analyse what would have been the level of exports and GDP per capita in Turkey if Turkey had not become a member of the European Customs Union, two independent estimations are run using the SCM.

First of all, growth of export of Turkey to 28 European Union members is taken into consideration. Nominal export of Turkey, the outcome variable, is estimated using characteristic variables of control countries, namely real GDP, distance to European Union and area chosen in line with the Gravity Model framework. All combinations of 18 control countries mentioned earlier sections are used to achieve maximum match to realized growth of export from Turkey to European Union and characteristic variables of Turkey in period before the

\(^1\)See Barro (1991)

\(^2\)The selected countries are Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Israel, Malaysia, Mexico, Pakistan, Peru, Philippines, Republic of Korea, Russia, South Africa, Thailand, and Ukraine. Country selection criteria are explained in the next section.
treatment, specifically period before the year of inclusion of Turkey in European Customs Union, 1996.

Maximum match of both realized export growth of Turkey outcome variable- and other characteristic variables, i.e. minimum distance between synthetic and realized outcome and characteristic variables, is achieved using eight countries listed in Table ??table:1. The table also includes weights for those control countries which are obtained as a result of minimization described in Equation 6 ve 7. Following minimization process, not only synthetic export growth of Turkey but also synthetic characteristic variables, namely real GDP, distance to European Union and are also calculated using the weights for each country. As can be seen from Table ??table:2, the gap between actual and synthetic outcome and characteristic variables are quite small.

Both realized and synthetic export growth of Turkey to the European Union is shown in panel (a) of Figure ??figure:1. As illustrated by the graph, quite close match is captured before the treatment period (1989-1995). After the treatment period starting from 1996, the series labelled as synthetic Turkey shows estimated export growth of Turkey to the European Union if Turkey had not become a member of the European Customs Union. From the figure, it is clear that the realized export growth is higher than synthetic one in most of the years especially after 2005. This result suggests that Turkeys export growth would have been lower under the case of non-inclusion of Turkey in European Customs Union.

The minimization process of both outcome and characteristic variables are repeated in order to estimate the level of per capita GDP in Turkey without the European Customs Union. In this case, characteristics variables are comprised of ratio of current account balance to GDP in 1990, share of investment in GDP in 1990 and industry value added in GDP in 1991 , population growth in 1995, average number of years of education received by people ages 25 in 1995 and inflation rate in 1992 as suggested by the growth literature. Those variables are tried to be matched as close as possible using country weights obtained as a result of minimization process displayed in third column of Table 1. As is shown in Table
Estimated and actual real GDP per capita in Turkey throughout the whole period is depicted in panel (b) of Figure 1. The movement and levels of the actual and synthetic series suggests that although actual series is higher than synthetic one in some years at the beginning of treatment period, Turkeys real GDP per capita would have been lower especially after 2005 similar to the results in the first case.

To account for the cumulative effect in 2013, we used the numbers that is illustrated in Figure 1. Calculation results indicate that Turkey would have experienced a lower level of exports and GDP per capita in the absence of the European Customs Union. In detail, Turkeys exports to the European Union countries in 2013 could have been lower by 38 percent in the absence of European Customs Union. Hence, the export of Turkey to the European Union could have been 39.4 million USD instead of 63.6 million USD in 2013. Moreover, real GDP per capita could be 7418 USD instead of 8540 USD as of 2013. To put it another way, Turkeys total export and real GDP per capita could have been 16 and 13 percent less in 2013, respectively.

### 5.2 Robustness

In order to check the robustness of our estimates, we run placebo tests to see whether our results could be driven by chance. The main question here is that would we estimate similar effects if we had chosen a random country included in the dataset. Following Abadie and Gardeazabal (2003) and Abadie et al. (2010), we apply the synthetic control method to countries that did not become a member of the customs union. If the placebo studies generate similar results to Turkey, then the increase in the growth of exports and GDP per capita have been driven other factors than the membership of the customs union. Otherwise, our results provide significance evidence of positive effect of the customs union.

In doing so, we choose two countries that have the largest weights in the synthetic control for Turkey. The countries that have the largest weights for exports growth and GDP per
capita are Chile and Indonesia, and Mexico and South Africa, respectively.

Figure ??figure:3 shows the gap in growth of exports for Turkey, Chile and Indonesia. It seems that the gap is bigger in the pre-intervention period and smaller in the post-intervention period for Chile and Indonesia. On average, Turkey’s exports has grown 2.67 percentage point more than its synthetic control, exports of Chile and Indonesia has grown 1.22 and 3.53 percentage point less than their synthetic controls. On the other hand, the gap for Turkey is smoother compared to control countries. As we mentioned above, it is vital to mimic the actual growth of exports in the pre-intervention period. Another way to assess the performance of the optimization period is to look at the RSMPEs. Table ??table:4 reveals that RSMPE for Turkey is 6.11. In contrast, RSMPE for Chile and Indonesia are 28.13 and 17.56. One final way to evaluate the significance of our results is to look at the ratios of post/pre-intervention RSMPE. This ratio is 1.84 for Turkey, which at least two times larger than the ratios of Chile and Indonesia that are 0.87 and 0.64. Based on the placebo tests, we can confirm that our results are robust for the growth of exports.

The placebo test for GDP per capita are shown in Figure ??figure:4. First, the gap in GDP per capita for Turkey is smooth during the pre-intervention period and increases in the post-intervention period. As shown in Table ??table:4, average GAP for Turkey is $379. While the gap is negative for Mexico, it is $763 for South Africa. Although there might seem a bigger effect for South Africa, we need to check pre and post-intervention RSMPE. Pre-intervention RSMPE for Turkey is smaller than for both control countries, which indicates that the performance of the optimization is better for Turkey. On the other hand, the ratio of post/pre-intervention RSMPE is at least four times bigger for Turkey. The exact ratios are 3.80, 0.48, and 0.98, respectively. In parallel to above placebo test, our estimations provide significant and robust results for GDP per capita as well.
6 Conclusion

Turkey and the EU have had the CU Decision in effect since December 31, 1995. The CU Decision brings elimination of tariff rates on export of industrial and process agriculture products between members of the European Customs Union. On the other hand, The CU Decision requires that Turkey has to adapt her trade policy according to the EUs Common Commercial Trade Policy. Turkey has been an important trade partner of the EU under special provisions of the Customs Union for more than 19 years.

In this paper, we investigate both exports and GDP per capita performance of Turkey after the CU Decision. Although the CU Decision seems that it directly affects export of Turkey, it also has an impact on welfare closely due to the reforms mentioned.

The discussion on the impacts of the European Customs Union on Turkey is still inconclusive in the literature since the results of papers, usually use gravity and growth models, are conflicting. Instead, we use SCM to answer what would have been the level of exports and GDP per capita in Turkey if Turkey had not become a member of the European Customs Union. We find that Turkey would have experienced a lower level of exports and GDP per capita in the absence of the European Customs Union. Specifically, Turkeys exports to the European Union countries and GDP per capita in Turkey could have been 38 and 13 percent less, respectively.
References


Pedro Gomis-Porqueras and Laura Puzzello. Winners and losers from the euro.


Figure 1: Synthetic Controls

(a) Growth of Exports for Turkey

(b) GDP per capita for Turkey

Figure 2: Placebo Tests

(a) Growth of Exports for Turkey

(b) GDP per capita for Turkey
Table 1: Country Weights for the Synthetic Controls

<table>
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<tr>
<th>Country</th>
<th>Growth of Exports</th>
<th>GDP per capita</th>
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<tr>
<td>Argentine</td>
<td>0</td>
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<td>Brazil</td>
<td>0.124</td>
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<td>Chile</td>
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<td>Colombia</td>
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<td>Mexico</td>
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<td>South Africa</td>
<td>0</td>
<td>0.189</td>
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Table 2: Predictor Balance for Growth of Exports

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<th>Actual</th>
<th>Synthetic</th>
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<td>Area</td>
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<td>Distance to the EU</td>
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<td>Exports to the EU/GDP(1989)</td>
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<td>7.20</td>
<td>3.74</td>
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<td>Exports to the EU/GDP(1995)</td>
<td>7.22</td>
<td>4.17</td>
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Table 3: Predictor Balance for GDP per capita

<table>
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<th>Variable</th>
<th>Actual</th>
<th>Synthetic</th>
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<td>5363.20</td>
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<tr>
<td>Investment/GDP (1990)</td>
<td>23.66</td>
<td>22.35</td>
</tr>
<tr>
<td>Population Growth (1995)</td>
<td>1.90</td>
<td>1.83</td>
</tr>
<tr>
<td>Industry Value Added/GDP (1991)</td>
<td>32.69</td>
<td>33.17</td>
</tr>
<tr>
<td>Schooling (1995)</td>
<td>5.50</td>
<td>7.26</td>
</tr>
<tr>
<td>Inflation (1992)</td>
<td>65.20</td>
<td>53.32</td>
</tr>
</tbody>
</table>

Table 4: Placebo Test Results

<table>
<thead>
<tr>
<th></th>
<th>Growth of Exports</th>
<th>GDP per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Turkey</td>
<td>Chile</td>
</tr>
<tr>
<td>pre-intervention RSMPE</td>
<td>6.11</td>
<td>28.13</td>
</tr>
<tr>
<td>post-intervention RSMPE</td>
<td>11.24</td>
<td>24.42</td>
</tr>
<tr>
<td>post/pre-intervention RSMPE</td>
<td>1.84</td>
<td>0.87</td>
</tr>
<tr>
<td>Average GAP</td>
<td>2.67</td>
<td>-1.22</td>
</tr>
</tbody>
</table>