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Political Reforms and Food Security

Hannah Pieters¹, Daniele Curzi², Alessandro Olper^{1,2} and Jo Swinnen¹

¹ LICOS – Centre for Institution and Economic Performance, University of Leuven (KULeuven), Leuven, Belgium

² Department of Economics, Management and Quantitative Methods (DEMM), University of Milan, Milan, Italy

hannah.pieters@kuleuven.be

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Summary

This paper studies the effect of a political regime transition on food security and more specifically on child mortality. Using a new estimation approach, the Synthetic Control Method, we find that a political reform towards a democracy does not systematically reduce child mortality. Of the 33 country case studies, we find a significant and positive relation between food security and political reforms for 4 countries, while for the remaining 29 countries no impact was found. These results are in contrast with the results from the traditional difference-in-difference estimations.

Keywords: food security, political reform, synthetic control method

JEL Classification codes: I18, O15, P16

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Hannah Pieters¹, Daniele Curzi², Alessandro Olper^{1,2} and Jo Swinnen¹

¹ LICOS – Centre for Institution and Economic Performance, University of Leuven (KULeuven), Leuven, Belgium

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1. INTRODUCTION

The food prices spikes of 2007/08 and 2010/11 have revived global awareness of the persistent problem of hunger and food insecurity in the world, and turned the spotlight back on the importance of food security for economic development and political stability. Despite the growing consensus of reducing hunger and child malnutrition, there is less consensus on the way forward.

Food insecurity and its drivers and determinants are widely studied and discussed in the literature. Food insecurity is a complex and multidimensional problem consisting of many causes at different levels of aggregation (individual, household, national and international). Based on the broad literature on food security, four main determinants can be identified (see e.g. Headey, 2012): economic status, health status and environment, education and demographic factors.

Among the various determinants, the impact of political reforms on food security has received few attention in the food security literature. In this paper, we test whether a transition from autocracy to democracy systematically affects food security at country level. The median voter model predicts that democracies redistribute from the rich to the poor. As a result, we assume that a political reform towards a democracy will have a positive effect on food security if the median voter in a democracy attaches more importance to food security issues compared to the ruling elite in an autocracy.

Only a few empirical works test for this positive relationship. Among these, Smith and Haddad (2000) mention democracy as a possible determinant of nutritional outcomes and report a positive correlation between democracies and food security. In the health literature, few papers investigate the relation between politics and health (see Kudamatsu, 2012, Besley and Kudamatsu, 2006, Franco et al., 2004). Besley and Kudamatsu (2006) explore the relationship between life expectancy and political reforms and conclude that there exists a robust and positive association. Kudamatsu (2012) restricts his analysis to sub-Saharan African countries and finds a negative relationship between democratization and infant mortality rate.

In this paper, we use the work of Besley and Kudamatsu (2006) and Kudamatsu (2012) as our basic framework in order to explore the role of political institutions and their influence on food security outcomes. Our work differs from theirs in three ways. *First*, we use as a proxy for food security the under-five mortality rate. *Second*, we try to replicate the results of Besley and Kudamatsu (2006) and Kudamatsu (2012) using the difference-in-difference approach, extending the sample to all African, Latin American and Asian countries. *Third*, we test the robustness of our results implementing a relatively new approach, the synthetic control method. This approach has three main advantages compared to the difference-in-difference approach. First, the synthetic control method constructs the counterfactual as a weighted average of the available control units and provides, therefore, a better fit than the difference-in-difference methodology. Second, the synthetic control method accounts for the presence of time variant unobservables, while the difference-in-difference approach only controls for time invariant unobserved heterogeneity (Abadie et al., 2010). Finally, the synthetic control estimator has the proposition that the results are both external and internal valid, as it succeeds to find a balance between large cross-country studies, which often lack internal validity, and case studies, that often cannot be generalized (Billmeier and Nannicini, 2009).

Our main results can be summarized as follows: using the difference-in-difference approach our estimation results confirm the findings of Besley and Kudamatsu (2006) and Kudamatsu (2012). In other words, we find a positive effect of a political regime switch from autocracy to democracy on our food security indicator. However, when we apply the synthetic control method this positive relation in general does not hold anymore.

2. DATA

2.1. Food security and health indicators

Food security is a very wide concept and it is impossible to define it with a single indicator. Among the various proxies for food security, we decided to use the under-five mortality rate in a country. Child mortality is derived from the life tables and represents the probability of dying before the age of 5 for a new born child. The indicator was collected from the UN Inter-agency Group for Child Mortality Estimation¹ (2013).

The main reason for this choice is the data availability: in order to measure the impact of a regime switch, we need yearly data over a long time period. Anthropometric indicators of food security – such as the wasting, stunting, underweight, undernourishment, etc. – are not available on a yearly basis over a long time period. Pelletier et al. (1994) reviewed a number of studies and found that there is a positive relation between anthropometric indicators and child mortality (see also Deaton and Dreeze, 2009). Although the actual contribution of malnutrition to child mortality is hard to quantify because of the large variability in causes of death. Caulfield et al. (2004) estimate that about 53-55 per cent of the child deaths worldwide are due to undernutrition. These findings are also confirmed in the ‘State of Food Insecurity’ report by the FAO (2005).

2.2. Political reform indicator

A key issue in studying how a regime transition toward democracy affects food security, is the definition of the exact year of each democratization episode. Indeed, there is not always concordance on the year in which democratization takes place. For the construction of the political reform indicator, we follow the same strategy as recent studies that have investigated similar questions at aggregated level (see e.g. Persson and Tabellini, 2008, Persson 2005, Giavazzi and Tabellini, 2005, Olper et al. 2014). Following Persson and Tabellini (2008), the political reform indicator is constructed based on the Polity2 index from Polity IV data (Marschall and Jagers, 2007). The Polity2 index assigns a value ranging from -10 to +10 to each country for each year, with higher values associated with better democracies. We classify a country as “democratic” if the Polity2 index is strictly positive, and “autocratic” otherwise². A reform into democracy occurs in a year when a country’s political regime indicator switches from 0 to 1. In order to avoid the use of very short reform episodes, we also introduce the criterion that the dependent variable is observed for at least 4 or 10 years before and after each regime transition.

2.3. Other explanatory variables

Besides political reforms, according to the literature, there are several variables that can affect a countries’ food security situation. In our regressions we will control for income, conflict, food supply, female education and the rural ratio.

The level of development defined as the real GDP per capita (Penn World Tables by Heston et al., 2013) can be viewed as one of the main determinants of food security at the national level. Indeed, a higher level of national income facilitates the purchase of food at international markets and allows governments to spend more on health and sanitation facilities, education programs, and etcetera. The relation between child mortality and national income is non-linear and will be therefore expressed in logs and squares.

The incidence of armed conflict is assumed to be positively correlated with the under-five mortality rate. The conflict dummy – which is based on the Armed Conflict Database by Gleditsch et al. (2002) – is equal to 1 if the country was involved in a conflict with at least 1,000 deaths. Violence and social conflicts typically have negative direct and indirect effects on food security.

¹ Organisations involved in the estimation: United Nations Children’s fund, World Health Organisation, the World Bank, United Nations Department of Economic and Social Affairs (Population Division) and United Nations Economic Commission for Latin America and the Caribbean (Population Division)

² The threshold is set at zero, since many large changes in the Polity2 are clustered around zero and thereby the identification of the causal effect can exploit the time variation in the data. In the case that the threshold value would be set higher, Polity2 would classify also very gradual changes in the underlying indicators of Polity2 that are unlikely to be significantly correlated with changes in political regimes.

Food supply is one of the four determinants of food security according to the FAO 1996 definition. Food supply is a necessary condition to ensure food security in a country. It is measured as the total amount of kilocalories per capita available per day resulting from own production, trade and foreign aid. The data are taken from the FAO food balance sheets (2013).

The percentage of rural population collected from the FAOSTAT database (2013) is included as an additional control in the regression. Nowadays, most of the poor and food insecure people are living in remote areas where the availability and access to food is rather limited. Therefore, we expect a negative relation between the percentage of rural population and the food security indicator.

The percentage of female children who have completed the last year of the primary school, or a higher level of education, is an indicator for the improvements in education levels in a country. Education is an important tool to reduce poverty and to fight food insecurity, as it creates better future income opportunities for children by targeting illiteracy and the lack of numeracy. The data is collected from the World Bank (2013).

3. EMPIRICAL STRATEGY

3.1. *Difference-in-difference*

In the first step of our empirical analysis we test the relation between the under-five mortality rate and the transition to democracy running the following regression:

$$y_{i,t} = \alpha_i + \rho_t + \beta D_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (1)$$

The difference-in-difference estimation method controls for both the country fixed effects α and time fixed effects ρ . In the regression we compare the average mortality rate y of the treated countries before and after the political reform with the averages of the control countries, namely those that remain an autocracy or a democracy. D is the democratization index in the regression equation which is equal to 1 for a democracy and 0 otherwise. For the treated countries the democratization indicator switches from 0 to 1. β is the average change of child mortality before and after transition for the treated countries compared to the average change in the control countries, over the same period. X contains a set of control variables as discussed in the previous section.

The estimates must comply with the following conditions (see Abadie, 2005, Persson and Tabellini, 2008, and Olper et al., 2014). First, in the absence of treatment the average under-five mortality rate must be the same for the treated and control countries conditional on the set of control variables. The condition would fail if a democratic transition would coincide with conflict, which might have long lasting effects on the mortality rate in former autocracies. To avoid this issue, one must increase the similarity between the treated and control countries by adding relevant control variables, such as conflict. The second issue is that the difference-in-difference estimation method does not account for heterogeneity of the political regime switches on child mortality. In the literature, it is suggested to interact the democratization index with other variables that characterize political regimes. Our dataset will not always be able to apply this method since the amount of possible interactions will be too large with respect to the amount of political regime changes. In addition, we include in each regression regional-trend effects to cope with spatial dependence. Finally, to control for autocorrelation, we will always cluster our regressions at country level.

3.2. *Synthetic control method*

After studying the relationship between child mortality and political regime transitions with the difference-in-difference estimator, we test the robustness of our results using an innovative approach, the synthetic control method (SCM), implemented for comparative case studies by Abadie and Gardeazabal (2003) and then further developed in Abadie et al. (2010). This method is in particular appropriate to study the evolution of aggregate outcomes for a treated unit affected by an event or intervention of interest. SCM compares the evolution of child mortality both for the treated unit (i.e. countries where democratization take place) and for a control group, the synthetic control, not affected by the intervention. The synthetic control group is built as a weighted combination of potential control units, with the aim to generate a synthetic control that proxies the main characteristics of the treated unit (Abadie et al., 2010). In this section we

summarize the main features of the SCM, following Billmeier and Nannicini (2013), who implemented such method to study the relation between trade liberalization and growth.

Formally, assume that we observe a panel of $I_C + 1$ countries over a period T , where only country i is affected by the treatment (in our case democratization) at time $T_0 < T$. The other countries I_C represent potential controls as they are not subjected to the democratization process and maintain the autocracy status for all the considered period. The treatment effect involving country i at time T_0 can be defined as follow:

$$\tau_{it} = Y_{it}(1) - Y_{it}(0) = Y_{it} - Y_{it}(0) \quad (2)$$

where $Y_{it}(1)$ and $Y_{it}(0)$ represent the potential outcome of the treated and untreated unit, respectively.

In this paper, the outcome refers to the under-five mortality rate associated to the democratization episode.

The SCM aims at estimating the treatment outcome vector $(\tau_{i,T_0+1}, \dots, \tau_{i,T})$ for $t > T_0$. Abadie et al. (2010)

propose with the SCM an innovative approach to estimate the treatment effect for the potential outcomes of child mortality of all countries using the following general model:

$$Y_{jt}(0) = \delta_t + X_j \theta_t + \lambda_t \mu_j + \varepsilon_{jt} \quad (3)$$

where δ_t represents an unknown and common factor to all the $j = 1, \dots, I_C + 1$ countries. X_j is a vector of observed relevant covariates that are not affected by the political reform and can be either time variant or invariant, while θ_t represents a vector time-specific parameters. Finally, μ_j is a vector of country-specific unobserved factors, with λ_t that accounts for unknown common factors and ε_{jt} that represents transitory shocks with zero mean. Note that all the variables included in X_j are referred to the pre-treatment period. The assumption that they are not affected by a political reform means that any possible “anticipation” effect has to be ruled out, namely, that these variables may change due to the anticipation of the future democratization reform.

The use of the synthetic control method is an improvement upon the difference-in-difference method for the following reasons. First, the counterfactual of the SCM fits, by construction, better the pre-treatment period between treated country and the counterfactual, as the counterfactual is a weighted average of the available control units. Second, the synthetic control method accounts for the presence of time variant unobservables, while the difference-in-difference approach only controls for time invariant unobserved heterogeneity (Abadie et al., 2010). A macro-economic shock that is correlated with both the democratization process and child mortality can affect each individual differently and thereby influencing the statistical inference of the difference-in-difference model. Third, the synthetic control estimator has the proposition that the results are both external and internal valid. Large cross-country studies are often not internal valid because of a lack of a good common support, while case studies have the proposition of being internal valid, but they can often not be generalized. The synthetic control method succeeds to find a balance between a good common support due the innovative construction of the counterfactual - and the generalization of the results as it can be tested on large set of countries (Billmeier and Nannicini, 2009).

4. ESTIMATION RESULTS

4.1. Difference-in-difference estimates

Table 1 reports the results of the specification of equation (1) and corresponds to the difference-in-difference estimation. In every regression, we control for country fixed effects, year fixed effects, regional-trend effects and all the covariates discussed above. Moreover, the standard errors are clustered within countries. The different regressions test for different assumptions about the treatment and the control group to assess the robustness of our results.

Table 1. Effect of political reforms on child mortality.

Dependent variable Variables	Under-five Mortality Rate				
	(1)	(2)	(3)	(4)	(5)
Democratization index	-16.40*** (4.670)	-17.68*** (4.527)	4.947 (8.311)	-25.11*** (4.695)	4.386 (17.23)
Log GDP per capita	-175.0*** (39.03)	-165.1*** (41.00)	-128.6** (48.43)	-221.3*** (49.59)	-146.0*** (53.19)
Log GDP per capita squared	12.37*** (2.430)	11.86*** (2.549)	7.604** (2.943)	14.38*** (2.973)	8.901** (3.305)
Conflict dummy = 1 if > 1000 battle-related deaths	2.830 (2.995)	-1.302 (3.255)	0.660 (2.886)	4.734 (3.598)	0.792 (3.999)
Percentage of females with primary education	0.123 (0.283)	-0.0184 (0.288)	-0.419 (0.371)	-0.0721 (0.262)	-0.358 (0.403)
Log Food supply per capita	-72.05*** (18.48)	-83.83*** (19.33)	-49.19** (20.76)	-50.82*** (17.94)	-47.63* (23.94)
Percentage of rural population	93.02* (48.97)	43.52 (47.03)	77.31 (65.68)	38.82 (48.30)	59.95 (66.36)
Constant	6420.6*** (634.4)	6832.7*** (693.2)	4475.9*** (795.9)	6313.8*** (684.4)	5069.9*** (866.9)
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Region trend effects	Yes	Yes	Yes	Yes	Yes
Observations	3651	3232	2032	2810	1705
Number of countries	85	79	57	67	43

Notes:

Standard errors clustered at country levels are reported in parentheses

* p<0.10, ** p<0.05, *** p<0.01

In column (1), we test whether a transition to an autocracy or to a democracy has an impact on food security. The results indicate that there is a negative and significant relation between a transition to democracy and child mortality. More in specific, the estimated effect suggests that a transition to democracy (autocracy) reduces (increases), on average, child mortality with 16 per 1,000 children.

As the reform effect might be asymmetric across democracies and autocracies, we split the sample into two sub-samples. The first subsample includes only political reforms towards democracies, while the second group is restricted to the countries switching to autocracies. The results using the two different subsamples can be found in regressions (2) and (3). Column 2 indicates that there is a negative and significant association between a political regime transition to democracy and child mortality: a reduction of 17 child deaths is resulting from a reform to a democracy. There is, however, no impact found of a political reform to an autocracy on child mortality (see column 3). These findings suggest that the reform effect is asymmetric. In other words, a transition to a democracy does not have the same impact as a switch to an autocracy.

Regressions (4) and (5) test whether the impact is stronger when considering only permanent regime transitions. Since our previous results showed that the reform effect is asymmetric, we split up the sample into a group with permanent transitions to democracy (column 4) and into a group only testing for permanent transitions to autocracies (column 5). The coefficient of democracy is significant for countries that undergo a transition from autocracy to democracy. The magnitude of a transition into a democracy is higher compared to regression (2), implying that the consolidation of a permanent democracy has a larger impact on child mortality. The result in column (4) shows that child mortality will be reduced by 25 per 1,000 children if a country switches permanently to a democracy. Column 5 shows that there is no impact of a permanent reform to autocracy on food security, implying that the reform effect is asymmetric for permanent transitions³ as well.

³ A transition is defined as permanent when the transition lasts for at least 10 years.

4.2. Synthetic control method

In a second step we test the robustness of our results using the SCM. We analysed 33 democratization episodes, selected according to the criteria described in the data section⁴. The control group contains only those countries which maintain the autocracy status for the considered period. In this section, we present the results graphically (Figures 1 and 2), which makes it possible to compare the trajectory of the outcome variable with the one of the synthetic control group. Figures 1 and 2 show that, the transition from autocracy to democracy does not have a systematic positive effect on the reduction of the under-five mortality rate. Thus, the implementation of the SCM lead to quite contrasting results with respect to the difference-in-difference. Indeed, among the 33 democratization episodes investigated we find a reduction in child mortality for 8 countries, for 17 countries we do not find any effect, while for 8 countries it has been not possible to find a control group that fitted the treated country characteristics in the pre-treatment period. Because of space constraints we discuss only those cases in which the positive effect of political reforms seems to be more evident and robust.

The figures show graphically the evolution of the outcome variable, under-five mortality rate, for the treated unit (solid line) and the synthetic unit (dashed line), for ten years of the pre-treatment period and ten years of the post-treatment period. Below each case study, we present the relative placebo test, that has the role of assessing the significance of the result. Indeed, one key limitation of the SCM is that, due to the small number of observations involved in these comparative case studies, the standard inferential techniques used to assess the significance of the results, cannot be used in implementing such method. To overcome this problem, Abadie et al. (2010) suggest the use of placebo tests, where the magnitude of the estimated effect is compared with those obtained by randomly assigning the treatment to any (untreated) country of the donor pool. The results can be considered robust if the effect of the treated country is larger than the majority of the placebo tests.

In Figure 1 we present the results about the democratic transition for 2 Central American countries (Guatemala and Mexico) and 2 African countries (Cape Verde), while in Figure 2 we show the results for the democratic transitions of 4 Asian countries (Philippines, Mongolia, Nepal and Bangladesh). From Figure 1 and 2, it emerges that for all the considered countries the transition from autocracy to democracy is associated with a reduction of child mortality. As in correspondence with the year of the treatment, the solid lines (which represent the outcome of the treated units) depart from the dashed line. The effect seems to be more strong in the cases of Cape Verde, Senegal and Philippines, while in the other 5 cases it appears to be weaker. However, to control for the robustness of our result, we perform a placebo test (figure below each case study). An effect can be considered significant if the thick line, which represents the treated unit, shows an effect that is larger than the majority of the other lines. Looking at the placebo tests, we can argue that only in the cases of Guatemala, Mexico, Senegal and Philippines, the placebo test confirms the positive effect of the democratic transition on the reduction of the child mortality. In the other 4 cases, the trajectory of the treated unit (thick line) seems to be similar to the trajectory of the untreated units (thin lines).

⁴ The countries used to run the 33 synthetic control experiments are (in parentheses the year of the democratization transition): Dominican Republic (1978); Honduras (1980); Bolivia (1982); El Salvador (1982); Brazil (1985); Uruguay (1985); Guatemala (1986); Philippines (1986); Korea (1987); Pakistan (1988); Chile (1989); Panama (1989); Paraguay (1989); Mongolia (1990); Nicaragua (1990); Nepal (1990); Benin (1991); Bangladesh (1991); Cape Verde (1991); Madagascar (1991); Zambia (1991); Guyana (1992); Mali (1992); Central African Republic (1993); Mexico (1994); Mozambique (1994); Malawi (1994); Ghana (1996); Djibouti (1999); Indonesia (1999); Nicaragua (1999); Senegal (2000); Nigeria (1999). Our donor pool is composed by the following countries: United Arab Emirates; Bahrain; Cote d'Ivoire; Cameroon; Cuba; Egypt; Jordan; Kuwait; Laos; Libya; Morocco; Mauritania; Qatar; Rwanda; Swaziland; Syria; Togo; Tunisia; Tanzania; Vietnam; Yemen.

Figure 1: Synthetic Control Estimation results and related placebo test for 2 Latin American and 2 African countries.

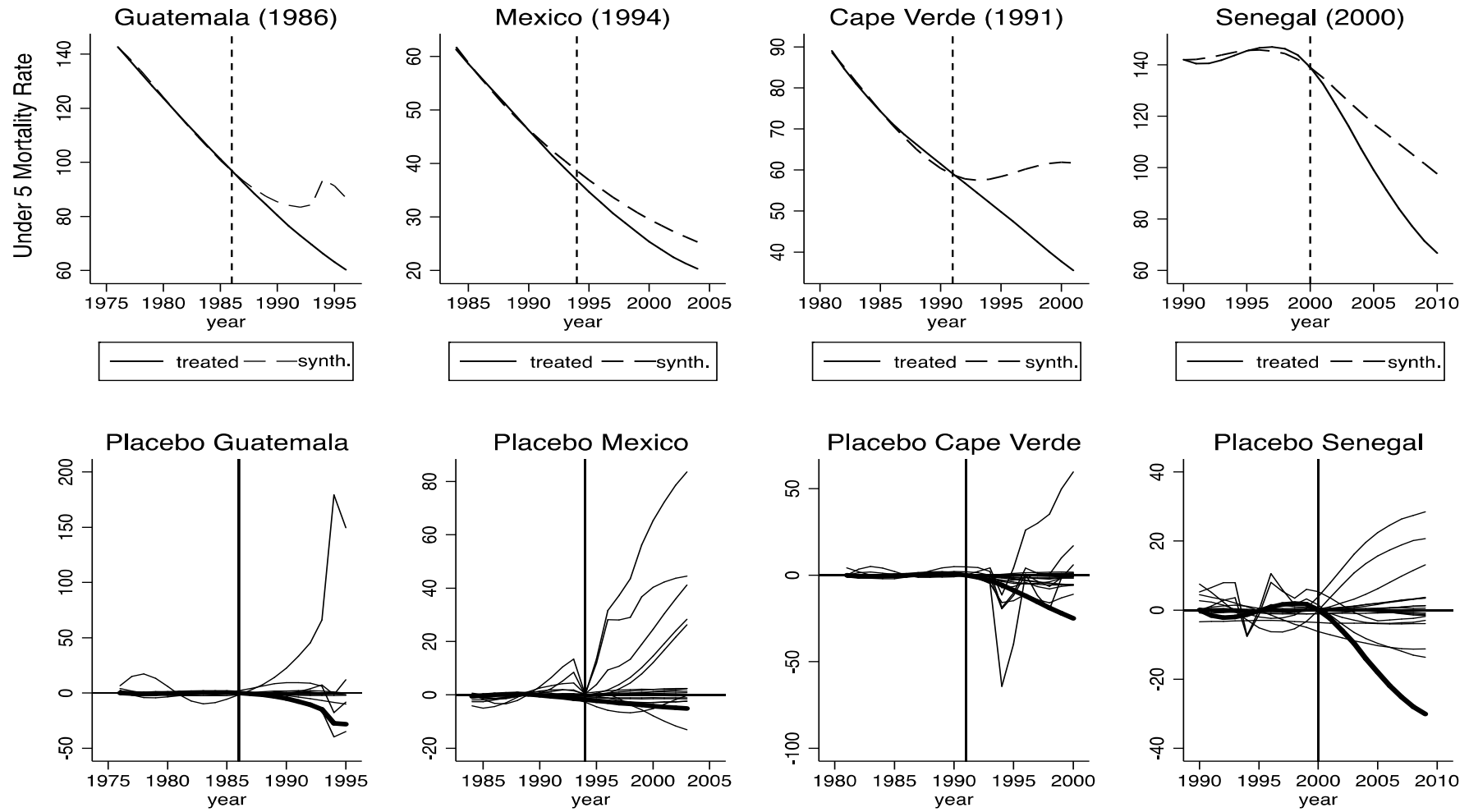
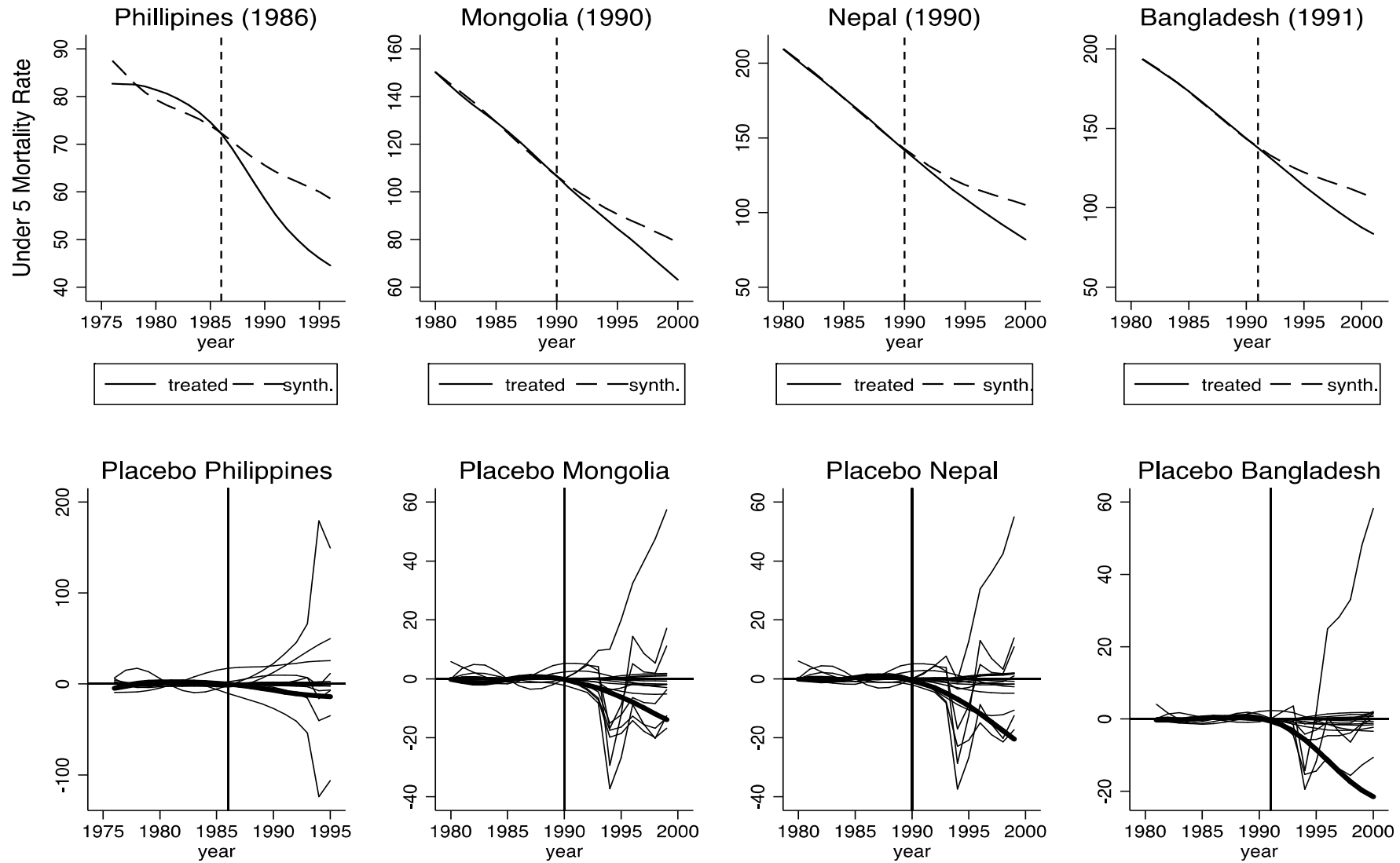


Figure 2: Synthetic Control Estimation results and related placebo test for 4 Asian countries



5. CONCLUSIONS

In this paper we study the impact of political reforms on food security and more in specific on child mortality. The difference-in-difference estimation shows that democratization significantly reduce child mortality, but that this effect is not symmetric. In other words, only transitions to democracy matter for child mortality. In addition, we find that the impact becomes higher for permanent transitions. From this perspective, our results are in line to the the findings of Besley and Kudamatsu (2006) and Kudamatsu (2012) and suggest that there is a positive effect of political reforms on child mortality.

The results of the SCM, on the other hand, give in contrast with the results of the difference-in-difference a less convincing picture of the impact of political reforms on child mortality. Indeed, in the 33 country case-studies investigated, we found a significant and positive effect of democratization only for four countries, while for the other 29 countries we did not find any effect.

The wedge between the results of the two methods can be attributed to the use of a weighted counterfactual in the SCM. By weighing the controls, we are able to take into account time variant unobserved heterogeneity. The difference-in-difference estimation, on the other hand, only controls for time invariant omitted variables and overestimates, thereby, the effect of political reforms on child mortality.

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