The income loss of a political crisis: Evidence from Madagascar

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Abstract

Madagascar, one of the poorest countries in the world, was affected by three crisis of political nature during the last three decades. With the present paper, we propose an assessment of the economic effect of the unexpected Malagasy 2009 political crisis that triggered a long-lasting period of instability in the country. In doing so, we employ the Synthetic Control Method consisting in finding the most credible counterfactual for the Malagasy economy from a subset of optimally weighted untreated countries. This empirical approach clearly shows that the output loss of this crisis is sizable since it entails a per capita income loss of around 25% eight years after the beginning of the crisis. Sensitivity analyses applied to check for the robustness of our main result confirm that the effect of the 2009 Malagasy political crisis was unusually large. We then conduct an in-depth analysis to get an understanding of the main mechanisms explaining this output loss and find that investments decreased substantially after the crisis. We believe that our approach unveils that political instability is one of the main brakes impeding Madagascar to prosper.

Keywords: political crisis, Madagascar, synthetic control method.

JEL classifications: C31, D74, F62, O11.

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1 Introduction

Even nowadays, Madagascar remains one of the poorest countries in the world. Its Gross Domestic Product (GDP, hereafter) per capita (US$ 1595 Purchased Power Parity in 2017[1]) and its human development level (HDI 0.519, ranked 161 over 189 countries) imply that a vast majority of Malagasy citizen (75%) lives under the poverty line of US$ 1.90.[2] As stressed by Razafindrakoto et al. (2020) such an economic performance could be perceived as a paradox because the country actually knew some periods of economic growth. However, it seems that each period of economic expansion was repeatedly accompanied by a phase of economic turmoil. Many alternatives explanations could be proposed to explain why a country fails in finding the good ingredients leading to long term economic growth and prosperity. In the case of Madagascar, the three main explanations identified by Acemoglu and Robinson (2012) could be invoked. First, geographic and climatic factors, such as the insular nature of its economy, its exposition to tropical cyclones and drought, could be seen as one of the brakes preventing economic growth (Strobl (2012) or Hsiang and Jina (2014)). Second, cultural traits, such as the lack of trust into the legal system (Alesina and Giuliano, 2015), are sometimes seen as incompatible with behavior, such as investment, that could foster financial development and economic growth. Last but not least, institutional factors, such as cabinet changes, *coup d'état* or more generally political instability, could be viewed as the root of the low economic performances of Madagascar (Acemoglu et al. (2005), Acemoglu and Robinson (2010)). Among these three factors, the current paper focuses on the third one by presenting new estimates of the economic effects of an unexpected and long-lasting political event, namely the Malagasy political crisis of 2009.

Historically, contrary to other developing countries, Madagascar is characterized by the "cyclical" pattern of its political crisis (Razafindrakoto et al. (2020). Indeed, over the last 30 years, the country has experienced four successful coups. However, if the political events of 1989 and 2002 have been followed by a period economic growth, evidence appears less clear-cut for the political crisis beginning in 2009. This crisis was particularly virulent especially because of its unpredictability and its length. Indeed, the 2009 Malagasy political crisis is the starting date of a political instability of four years. Consequences of the coup were probably dramatic for Malagasy citizen. The purpose of the present paper is to propose a quantitative evaluation of the macro-effects associated to this exceptional political event.

The evaluation of the effects of political instability on the economy is however a challenging task. Many papers rely on regression techniques from cross-sectional or panel data to investigate the nature of the causal effect. However, results emerging from such studies

[1]Data coming from the PENN World Table 9.1.

[2]This statistic is from the 2020 version of the World Development Indicators.

are sometimes accompanied by some limitations, especially if the focus is on a particular political event. Specifically, in its broadest sense political instability is difficult to measure from a worldwide perspective and attempts to do so are not free from measurement errors (de Haan (2007) or Jong-A-Pin (2009)). As a result, employing such variables in a regression could induce a bias in the estimates. Furthermore, it is quite evident that causation could go in both directions. If we could *a priori* imagine that a higher degree of political instability leads to a lower level of economic growth, we cannot exclude that it could be the later that actually causes the former. Given the endogenous nature of political instability in any growth equation, empirical researchers have to turn to more sophisticated techniques to deal with this issue.[3] Despite this, the current empirical literature is likely to be uninformative for a case study, as the one under scrutiny of this paper, because both positive (Campos and Nugent (2002) or Campos and Nugent (2003)) and negative effects (Jong-A-Pin (2009), Aisen and Veiga (2013) or Blum and Gründler (2020)) have been found. Moreover, although papers solving the identification problem with dynamic panel data models are well suitable to unveil the average effect of political crisis for a given sample of countries they are ill-equipped in identifying the effect of a given event in a given country.

By contrast, we here employ the Synthetic Control Method (SCM, hereafter) first introduced by Abadie and Gardeazabal (2003) and further developed in Abadie et al. (2010) and Abadie et al. (2015). According to Athey and Imbens (2017), the SCM is the "most important development in program evaluation in the last decade" and is a relevant tool to investigate the question of whether political crisis has a positive or a negative effect on growth which ultimately is an empirical one. The general idea of the SCM is as follow. As the effect of the a given event is only observed for a given treated economy, it is a requirement to construct a control group to unveil the potential economic effects of that event. To do so, the SCM identifies an ideal control group composed of unaffected economies that, once optimally weighted, mimics as close as possible the pre-treatment behavior of the outcome of interest. This doppelganger can then be used to estimate the effect of the event of interest. The SCM has many advantages for the investigation of the problem at hand since i) it is immune from identification problems outlined above, ii) it allows to follow a data-driven approach to construct the appropriate control group and iii) it imposes only a minimal set of identifying assumption. Given these characteristics the SCM is particularly suitable for answering the following question: What would be the level of per capita income in Madagascar in 2013 or 2017 if the 2009 political crisis did not occur?

Relying on data from the PENN World Table of Feenstra et al. (2015) and after restricting

[3]Examples of such empirical techniques includes Granger-causality (Campos and Nugent (2002) or Campos and Nugent (2003)) or generalized method of moments dynamic panel estimator (Jong-A-Pin (2009), Aisen and Veiga (2013) or Uddin et al. (2017).

our sample of potential control units to countries with similar characteristics than Madagascar (Abadie and Gardeazabal (2003) or Abadie et al. (2015)), our main results can be described as follows. First, the SCM succeeds in finding a good match for the Malagasy economy. In particular, the visual inspection of the time series behavior of actual real GDP per capita in Madagascar and the one of its synthetic control confirms that the later closely mimics the former. This visual inspection is then confirmed by several statistical measures leading us to be confident in interpreting the constructed synthetic group as an appropriate counterfactual for the Malagasy economy. Second, we find that the economic effects of the 2009 political crisis is sizable. In 2013, per capita income would be equal to US$ 1700 whereas its actual value is of US$ 1475. At the end of our sample period, namely 2017, the gap in per capita income between Madagascar and its counterfactual is even larger since it amounts to US$ 500. Recalling that Madagascar is among the poorest countries worldwide and given its low level of GDP per capita, our SCM so estimates an output loss of the 2009 political crisis eight year later of around 25%. Our empirical results clearly point toward a negative effect of political instability and are so more line with average results found by Jong-A-Pin (2009) and Aisen and Veiga (2013). Third, our results are shown to be robust to several alternative estimations. Thus, changing the date of the treatment, the length of the sample period, dropping iteratively one of the main contributor to synthetic Madagascar or placebo experiments do not alter the qualitative nor the quantitative patterns of our results. Rather, they further suggest that the economic effect of this particular event was exceptionally high.

We then provide and in-depth investigation of the channel at work after the 2009 political crisis. To do so, we repeat the SCM on the main component of real GDP and Foreign Direct Investment. Overall, estimating the SCM to these macro-variables provide each time a reliable time series counterfactual. This analysis however show that investment would have been higher in the absence of the crisis while consumption would have been lower. It is also shown that synthetic Madagascar is characterized by a higher level of government expenditures. A large part of the investment dynamic could be attributed to the increased uncertainty following such a political event. Consumption's reaction to crisis is somehow difficult to disentangle and we admit a possible reliance to informal sectors (Nordman et al., 2016) and incompressible consumption part due to the poverty level. Conversely, government expenditures low level could be attributed to a high dependence to external funds, reduced (or suspended) following the crisis.

To our point of view, our paper is linked to at least three strands of the economic literature. First, we add to the literature studying the macroeconomic effects of exceptional events. In doing so, the SCM approach have been used to investigate various important questions such as the macroeconomic effect of the Brexit (Blum and Gründler (2020) or Breinlich et al.

(2020)), the integration to the European Union (Campos et al., 2019), the Arab Spring in Tunisia (Matta et al., 2019), natural disasters (Cavallo et al. (2013) or Best and Burke (2019)), communism (Grier and Maynard (2016) or Absher et al. (2020)) and so on. We contribute to this literature by studying the 2009 political crisis of Madagascar. Second, our paper is part of the literature studying the macroeconomic effect of political instability (Aisen and Veiga (2013), Fosu (2002)). As outlined above, although sophisticated regression techniques have been employed to solve the inherent identification problem both positive and negative effects have been found so that an in-depth analysis of a given event, as we do here, remains relevant. Our contribution to this literature is to show that the magnitude of the cost of political instability (in its broadest sense) could be sizable. Third, we provide a contribution to the literature studying why some countries prosper and why others do not (Acemoglu and Robinson, 2012). We add to this literature by putting our attention on an African countries and by confirming that institutional aspects, here the political instability of Madagascar, matter for a country to grow.

We organize the rest of the paper as follows. Section 2 provide a brief history of the political situation of Madagascar. Section 3 presents the SCM and how we implement our approach. Then, section 4 describes our results and their robustness whereas section 5 focuses on an in-depth investigation of the effect of the 2009 Malagasy political crisis. Finally, section 6 concludes.

2 A brief history of the political situation of Madagascar

Madagascar, also known as the "Grande Ile" is the biggest island situated in the Indian Ocean with roughly 22 million people. Following the big wave of decolonization, the country gained its independence in 1960. However, rather than enjoying from a prosperous path of economic growth and development, as its neighbor Mauritius, the country diverges to become part of the Least Developed Countries (LDC). Historically, the political situation is somehow unstable. Following the independence, the leaders opted for communism till the end of the 80s with Ratsiraka's regime. Then, this trend was followed by a wave of democratization and economic liberalization, which begun with the eviction of Ratsiraka and followed by a period of transition. Thereafter, impulsed by the World Bank, the country followed the path of the well known structural adjustment programs. At the end of 1996, with the presumably modest outcomes of these programs to the country, another crisis came marking the return of Ratsiraka.

The year 2002 is a breaking point to the development path. In fact, Ravalomanana gain access to the power after an enormous political and civilian divide, plunging the country to a severe recession. The President Ravalomanana's era (from 2002 to 2009) was perceived as a period of rapid economic expansion (see also Figure 1) with large projects of infrastructure development structured around a new form of adjustment program: the Madagascar Action Plan (MAP). With a rapid adhesion of the international community and Ravalomanana's leadership (inherited from its career leading its own company), all indicators turned green for the *Grande île*. However, the political crisis "cycle" stroke again in 2009 with the longest transition period. In particular, after a rapid ascension, the newly elected mayor of Antananarivo, namely Andry Rajoelina, took the reign of the nation with its newly created political party TGV or Young Malagasies Determined.[4] Within a couple of months, Madagascar's political situation radically changed.

From our point of view, two features made the 2009 crisis exceptional: its suddenness and its length. First, many reasons explain its suddenness as the situation escalated rapidly from the second semester of 2008, and ending up with a *coup d'état* in March 2009. In fact, when we look at the data, the period from 2003 to 2009 was a period of exceptional growth in the Island. The GDP annual growth rates were no less than 3%. However, some internal affairs entrenched this period with a growing discontent on how freedom of speech and economic activities were captured by the regime, with a quasi-monopoly of the presidents' own companies. Consequently, a violent repression of a manifestation (February 7^{th}, 2009) claiming the freedom of speech, led by the mayor of Antananarivo, was the opportunity for the opposition and a large majority of the political sphere to reclaim the power (Galabert, 2009). The coup ended up with Ravalomanana leaving in a hurry the country in March 2009 and the beginning of the "*regime de transition*". Overall, the situation switched drastically within less than three months. Second, the 2009 flip, condemned by the majority of the international community ended up with a long period of transition, over four years. In fact, following the crisis, various events ended up lengthening the transitional period. *Primo*, in reaction to the crisis, the international community initiated negotiation processes to return rapidly to a democratic regime. These lengthy negotiations of nine months ended up dramatically with the "*Haute Autorité de la Transition*" (HAT) rejecting any form of shared governance with the former regime. This left the country in a form of "wait-and-see" situation. *Secundo*, the HAT decided by itself to govern the country, by engaging in constitutional reforms and elections. The reforms and retaliation from the international community (facing the failure of negotiations) took two years and a half before the organization of a new presidential election. *In fine*, the transition, supposedly lasting just for few months, took four years, with

[4]TGV goes to Tanora malaGasy Vonona, an allegory of the famous french "high-speed train".

presumably many consequences on the macroeconomic performance of Madagascar but also on many aspects the economic life. With the empirical approach of this paper we propose an estimation of the cost of this exceptional political event.

In December 2013, a supporter of Rajoelina, namely Rajoanarimampianina, is elected as President of the Republic of Madagascar. This election is an occasion for Madagascar to return to a democratic regime. Events following this latter election was in favour of a political inclusion with Ravalomanana's return to Madagascar, municipal elections (June 2014), abolition of death penalty and a tentative of national reconciliation. However, the success of Rajoanarimampianina's regime is tainted by corruption scandals and scars from the former regimes resulting a difficult economic recovery.

Figure 1 depicts the growth rate and GDP per capita of Madagascar between 1970 to 2017: the yellow orange line represents the economic growth, the blue line corresponds to the GDP per capita. When the 2002 crisis had a dramatic consequence to the economic growth (-12%), the economic recovery was fast. In contrast, following the 2009 crisis, the Malagasy economy plunges (-7% after the crisis) and no economic growth between 2013 and 2017 (nearly 0% of growth rate). The length of the crisis left the economy into a vegetative state. Various reasons could justify the low recovery but we are mainly convinced of the political reason. In particular, due to its insularity, Madagascar is prone to climatic phenomenons, such as tropical cyclones and droughts. However, we firmly believe that those events have a limited macroeconomic impact hitting only a limited geographical area of a country[5]. In fact, according to the natural disaster literature, the negative effect of tropical cyclone is mainly limited to some specific areas (Strobl, 2011). Furthermore, the cyclonic season between 2009 and 2013 was relatively clement. In particular, looking at data from Geiger et al. (2018), we observe that the mean tropical cyclones windspeed at landfalling between 2009 and 2013 was of 124 km/h against 176km/h between 2004 and 2008. Estimates from Geiger et al. (2018) show that highest windspeed generated by tropical cyclones amounts to 215 km/h during the 2009-2013 period against 272 km/h during the 2004-2008 period. In addition, we didn't find any major disaster hitting the island during the studied period since the cyclone Enawo only hit the country in March 2017. From our point of view, this constitutes some piece of evidence suggesting that instabilities is probably due to the political coup, followed by a transitional regime (which lasts four years).

[5]Cyclones hit essentially the North and North-east areas of Madagascar; when the South of the island is arid, augmenting the risk of droughts.

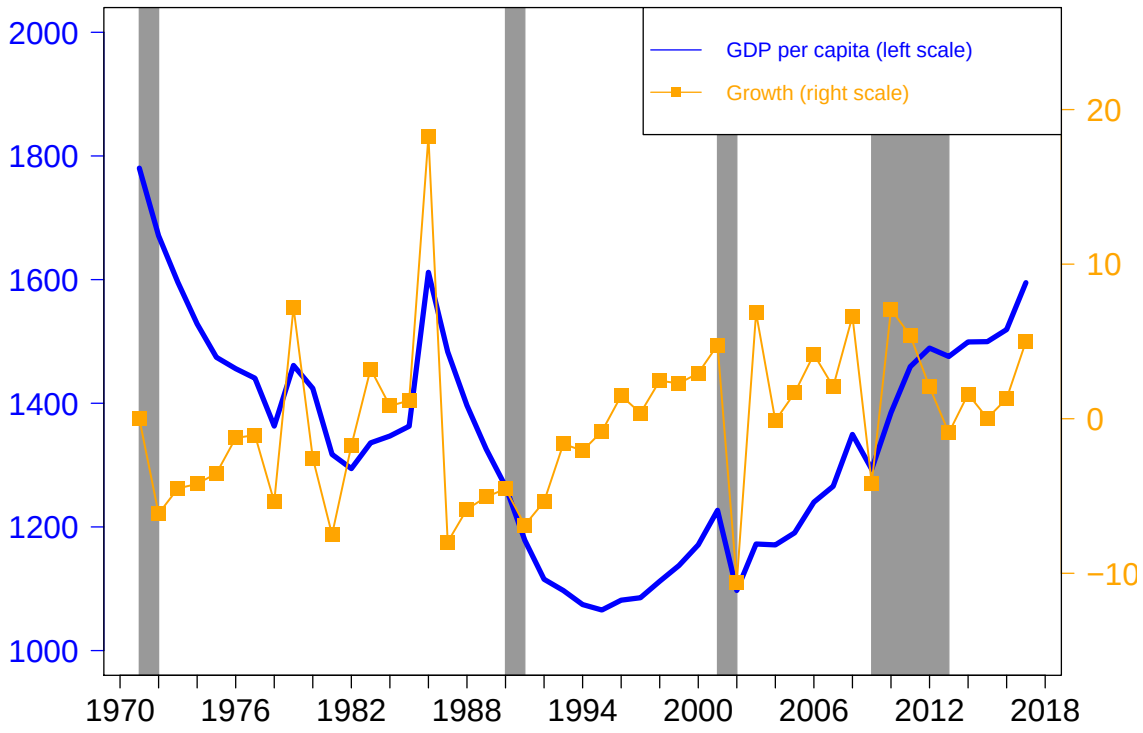

Figure 1: Economic performance and political crisis in Madagascar.
Sources: PENN World Database (Feenstra et al., 2015), Razafindrakoto et al. (2020) and author's own calculations.
Notes: Shaded areas report period of political crisis as identified by Razafindrakoto et al. (2020).

3 Methods and Data implementation

3.1 The Synthetic Control Method

The estimation of the causal effect of a given political crisis on economic growth or other related macro-variables is a challenging task. As an example, the exploitation of a cross-sectional data of countries is likely to be uninformative because it is difficult to exclude the existence of a bias in the coefficients. Two arguments could explain the existence of inconsistencies in the coefficients of a regression when a measure of political instability enters a growth equation. First, there is no consensus about a definition of what political instability is so that recovering it in a worldwide database is arguably challenging. As stressed by de Haan (2007) and Jong-A-Pin (2009), attempts to so are not free to measurement errors, a well known origin of coefficients bias in regression. Second, papers relying on regression techniques face an identification problem because of the potential endogeneity of any measure of political instability. In presence of unobserved heterogeneity, it is difficult to exclude that causation could go in both direction. However, even after solving this identification problem, the literature remains inconclusive since both positive and negative effects have

been found Consequently, when it comes at measuring the effect of a given political event in a particular country relying on a case study approach remain relevant. With such an approach, the main shortcoming relies on the fact that the counterfactual situation, namely what would have happened in the absence of the event, cannot be observed. Furthermore, as randomization is impossible in such a context, we have to turn to empirical toolkits that enable us to formally identify a credible control group (or counterfactual). In essence, this challenging task, namely constructing an appropriate control group, is similar to the main objective of the economic literature on econometric evaluation of policy programs (Imbens and Wooldridge, 2009). In the context of the evaluation of a causal effect in a case study context, many empirical approaches have been proposed. Certain are parametric such as the double difference approach[6] while others are non-parametric. The empirical methodology we employ in this paper belongs to the latter category. The SCM, originally introduced by Abadie and Gardeazabal (2003) and further developed in Abadie et al. (2010) and Abadie et al. (2015) constitutes a reliable empirical tool for analyzing the impact of a case study event such as the Malagasy political crisis of 2009.

Let us consider that we collect macro-data for $J+1$ countries. Among these $J+1$ units, the first one, namely Madagascar, experiences at a particular year, here 2009, an unexpected event: a political crisis. The others J units for which we collect data do not experience this event and so belong to the group of potential controls (often called the donor pool). Using a purely data-driven approach, the SCM allows the construction of an optimal control group by minimizing the pre-treatment differences of the outcome of interest between Madagascar and its best synthetic counterpart. More specifically, the synthetic control group is constructed as a weighted average of the J control units so that its pre-treatment dynamic behavior mimics as close as possible the one of Madagascar. Once the control group is identified, the causal impact of interest is simply the difference between the outcome of the treated unit and the one of its counterfactual.

More formally, we denote by X_0 a vector of dimension $x \times 1$ with elements corresponding to the values of observed characteristics useful for the prediction of the variable of interest. Then, let x_j be a vector of observable characteristics of size $x \times 1$ for each control country $j \in J$ while X_J is a matrix of dimension $x \times J$ that stack column by column each vector x_j. Consequently, a given row of X_j provides the sequence of values for the same variable and year depending on each control units j. Furthermore, we denote by $W = (w_1, \ldots, w_J)$ a vector of non-negative weights $w_j \geq 0$ verifying $\sum_{j=1}^{J} w_j = 1$. At this stage, it should be observed that any particular combination of w_j leads to a different synthetic control group

[6]For an extensive discussion on the use of different methods related to policy evaluation, please see Hsiao and Zhou (2019).

for the Malagasy economy. The SCM identifies the synthetic control group by defining the optimal vector of weight W^* as the one that minimizes the mean squared error between X_0 and $X_J W$:

$$W^* = \text{argmin} \left(X_0 - X_J W\right)' V \left(X_0 - X_J W\right) \text{ subject to } \sum_{j=1}^{J} w_j = 1, w_j \geq 0 \tag{1}$$

where V is a $k \times k$ diagonal, positive-definite matrix. Once the vector of optimal weights W^* is identified such that the weighted average of predictors for the most credible counterfactual equals (or mostly equals) the pre-treatment values of predictors for the treated, then it is possible to use it to calculate, without bias, what would happened to the outcome of interest of the treated unit if it had not been affected by the treatment (Abadie and Gardeazabal, 2003). It is noteworthy that during the pre-treatment period, the SCM proceeds to a year-by-year match between the predictors of the treated unit and the one of its synthetic control. As a consequence, the SCM solves for time-varying omitted variables bias. This is an important improvement insofar standard empirical tools such as difference-in-difference or panel fixed can only deal with omitted variables bias that are related to time-invariant factors.

Given the minimization program used in the SCM, the choice of predictors is non-trivial. In that respect, we are close to what have been done in the current SCM literature (Matta et al. (2019) or Campos et al. (2019)). More specifically, our set of predictors includes variables such as investment, consumption, exports, imports, government spending, residual trade and the growth rate of population. All these variables, except the last one, are expressed in share of real GDP. They are extracted from the 9.0 version of the new generation of the PENN World Table (Feenstra et al., 2015).[7] For our case, we focus on the 1991-2017 period, which corresponds to the era of liberalization of Madagascar. Indeed, the period before 1991 corresponds to a communist regimen. We however check the robustness of our results to this choice in the next subsection.

To identify the causal effect of the 2009 Malagasy political crisis, the SCM we employ rely on two main identifying assumptions. The first one requires that the treatment has no incidence on countries belonging to the donor pool. Put differently, this means that the political crisis under scrutiny here should not spillover, directly or indirectly, to the control units. In our point of view, this assumption is likely to hold because we are not aware of similar political crisis affecting our donor countries because of the one that affected Madagascar. However, in a context of a globalized world, we cannot totally exclude some indirect spillover effects due to the fact that Madagascar could have some trade relationships

[7] This database is freely available thanks to the following link; https://www.rug.nl/ggdc/productivity/pwt/pwt-releases/pwt9.0.

with some of the control countries. If such indirect spillover effects exist, they are likely to introduce a downward bias in the estimation so that the causal effect we unveil could underestimate the true impact of the 2009 political crisis. However, such a bias would be only weak insofar the synthetic control group is constructed as a weighted average of all control units. Furthermore, we believe that the insular situation of Madagascar as an island restricts the existence of possible spillover effects to other surrounding economies. The second assumption requires that the 2009 Malagasy political crisis should not be anticipated either by domestic economic agents or by countries of the control group. In our case, this means that the effect of the political crisis on real GDP is only observed after the treatment materializes. Again, if economic agents anticipate the effects of such political crisis, this is likely to lead to an underestimation of the true effect of the treatment. However, given the fact that this crisis but also its length was largely unexpected, we are confident about the non-violation of the latter hypothesis.

3.2 Donors Pool

A crucial part of the SCM is the choice of the donor pool used to identify the artificial Malagasy economy. In that respect, we follow some of the prescriptions provided in Abadie and Gardeazabal (2003). In particular, Abadie and Gardeazabal (2003) indicate that units that belong to the donor pool should share similar characteristics with the treated unit. Furthermore, Abadie et al. (2015) state that "it is important to restrict the donor pool to units with characteristics similar to the treated unit. Another reason to restrict the size of the donor pool and consider only units similar to the treated unit is to avoid overfitting". Guided by this advice, we consider as possible donor countries with a GDP per capita lower than US$ 4000 when the treated unit experiences the event, namely 2009 in our case.[8] To do so, we opt for a data-driven approach, where middle-income and low-income economies lie. It should be observed that it seems quite natural to us to choose our sample based on GDP per capita. We are however aware that, ex-ante, other approaches are also possible as for instance a focus on African countries.[9] Table 1 reports the complete list of the 45 countries of the donor pool corresponding to our applied restrictions.

Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Ivory Coast, D.R. of the Congo, Djibouti, Ethiopia , Gambia, Ghana, Guinea, Guinea-Bissau, Haiti, Honduras,India, Kenya, Lao People's DR, Lesotho, Liberia, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Pakistan, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone , State of Palestine, U.R. of Tanzania: Mainland,Sudan, Togo, Uganda, Viet Nam, Zambia, Zimbabwe.

Table 1: List of countries in the donorweight pool.
Sources: Authors' own calculation.

	Treated	Synthetic	All donor units
Consumption	0.72	0.72	0.77
Investment	0.10	0.14	0.16
Government purchases	0.15	0.17	0.15
Exports	0.09	0.09	0.09
Imports	-0.13	-0.12	-0.16
Rental rate	0.06	-0.01	-0.02
Population growth	2.91	2.91	2.37

Table 2: Sample means of predictors for the pre-2009 period.
Source: Author's own calculation.
Notes: Except for population growth, all variables are expressed in percentage of real GDP.

4 Main results

4.1 SCM to GDP per capita

Table 2 reports sample means of predictors for the pre-2009 period and compares the actual Madagascar to its most credible counterfactual. For comparison purpose, the third column provides the sample means of predictors for all countries of the donor pool. This table enables us to have a first idea about the goodness of the fit of the synthetic control. In most cases, the difference of sample means between Madagascar and the two reported alternatives is lower for the synthetic Madagascar than the simple average of donor countries. Furthermore, it should be observed that the match is "perfect" for some predictors such as the consumption share, the export share or the growth rate of population. Table 3 displays the main countries with a "higher than 2%" weight that define the counterfactual Madagascar identified by the SCM. Synthetic Madagascar is so composed by 32% of Niger, 24% of Ethiopia, 17% of Côte d'Ivoire and 17% of Tanzania. Taken together, these four countries account for 90% of the artificial Madagascar.

[8]See also Best and Burke (2019).

[9]However, the next section will show that once the SCM is employed only African countries have a weight higher than 15%.

Weight	Country
0.166	Côte d'Ivoire
0.239	Ethiopia
0.320	Niger
0.175	Tanzania

Table 3: Composition of the synthetic Madagascar: country weights.
Source: Author's own calculation.

The two panels of Figure 2 display results associated to the application of the SCM to real GDP per capita in Madagascar. In the left panel, the red dotted line corresponds to the time series of real GDP per capita of the synthetic Madagascar while the blue line is the one effectively. The right panel of Figure 2 depicts the difference between the two time series. In both panels, the vertical line indicates the year when we suspect the treatment to materialize. Inspection of this figure leads to two main comments. First, the visual inspection of real GDP per capita behavior of Madagascar and its synthetic counterpart for the pre-treatment period suggests that the latter closely mimics the dynamic behavior of the former. In particular, for the pre-2009 period the gap between the two time series is around 0 and oscillates between -US$ 50 and US$ 50 real GDP per capita (see the right panel of Figure 2). Such a behavior is indicative that the SCM succeeds in finding an appropriate doppelganger for the Malagasy economy. Second, if the path of the two time series is similar before 2009, the difference between them increases sharply thereafter. Our estimate show that real GDP per capita in Madagascar would have been higher if the political crisis did not occur in 2009. In 2013, real GDP per capita would be approximately equal to US$ 1700 whereas its actual value amounts to US$ 1475. The difference between the observed and the synthetic real GDP per capita is even larger in 2016 since the SCM estimates an output loss of US$ 500 for each Malagasy citizen. Given the relatively low level of per capita income in Madagascar, it is noteworthy that the estimated output loss is sizable. At the end of our sample period, the estimated income loss represents approximately 25% of the actual Malagasy per capita output. Overall, over the 2010-2017 sample period, the mean per capita income loss amounts to -17% while the median income loss is of -16%.

From our point of view, it is legitimate to raise questions about the magnitude of the per capita income loss unveiled in Figure 2. To do so, we contrast our estimated output loss with those found in studies employing a similar empirical approach. Matta et al. (2019), when applying the SCM to the Arab Spring in Tunisia, find an output loss of about 5.5%. In the case of civil war, Bove et al. (2016) finds a GDP reduction of about 9% on average while in some cases no significant effect can be found. Other papers apply the SCM to natural

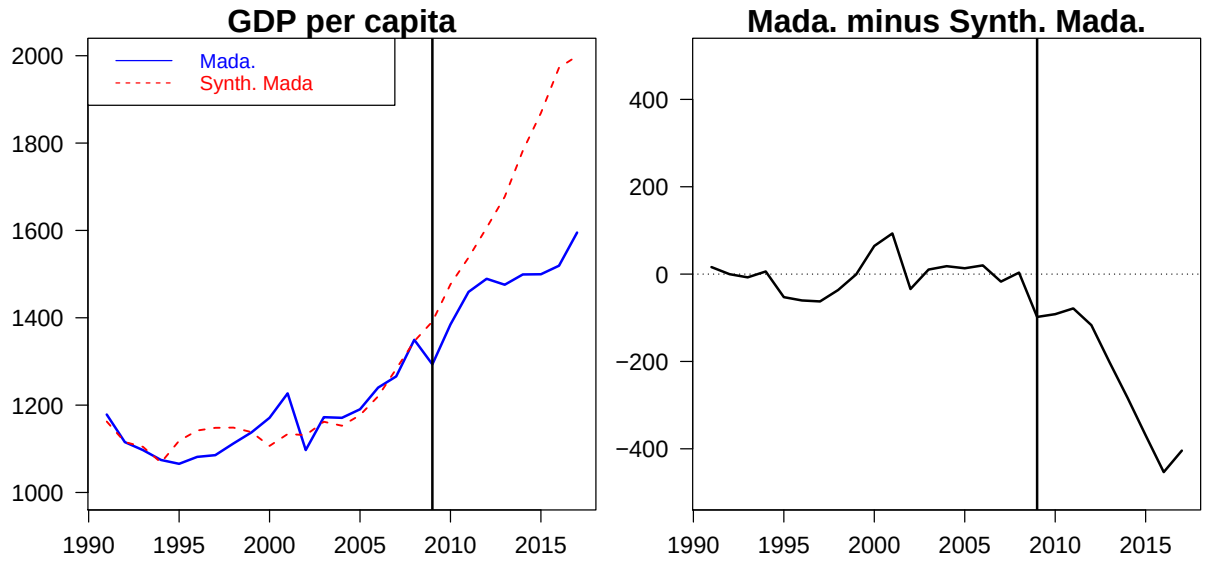

Figure 2: Real GDP per capita: Madagascar vs. synthetic Madagascar.
Sources: PENN World Database (Feenstra et al., 2015), author's own calculations.
Notes: Vertical lines correspond to the year of the treatment.

disasters such as earthquake or tropical cyclones. In that respect, Coffman and Noy (2012) find only a small income effect of hurricane Iniki for the Hawaiian island of Kauai while overall population is estimated to be lower in comparison to the counterfactual. To the best of our knowledge, a similar output loss than the one we estimate has been found for the 2010 earthquake that severely hit Haïti. For the 2010-2015 period, Best and Burke (2019) estimate an output loss of about 12%. Given the current SCM literature, it is noteworthy that the estimated output loss we find is the highest among events of political nature.

4.2 Robustness

Overall, the application of the SCM to the 2009 political crisis in Madagascar unveils that it induced an important and long-lasting per capita income loss for Malagasy citizen. As such a result could be sensitive to different modeling choice, we here check for its robustness along four dimensions. We first apply some placebo exercises to ensure that the 2009 political crisis has no effect on other countries. Second, we modify the control unit groups by iteratively dropping one of the main contributors of the baseline synthetic Madagascar. Third, we apply the SCM by changing the year of potential treatment. Finally, we apply the SCM to a longer sample beginning from 1971. The following subsection details these alternative exercises and presents the associated results.

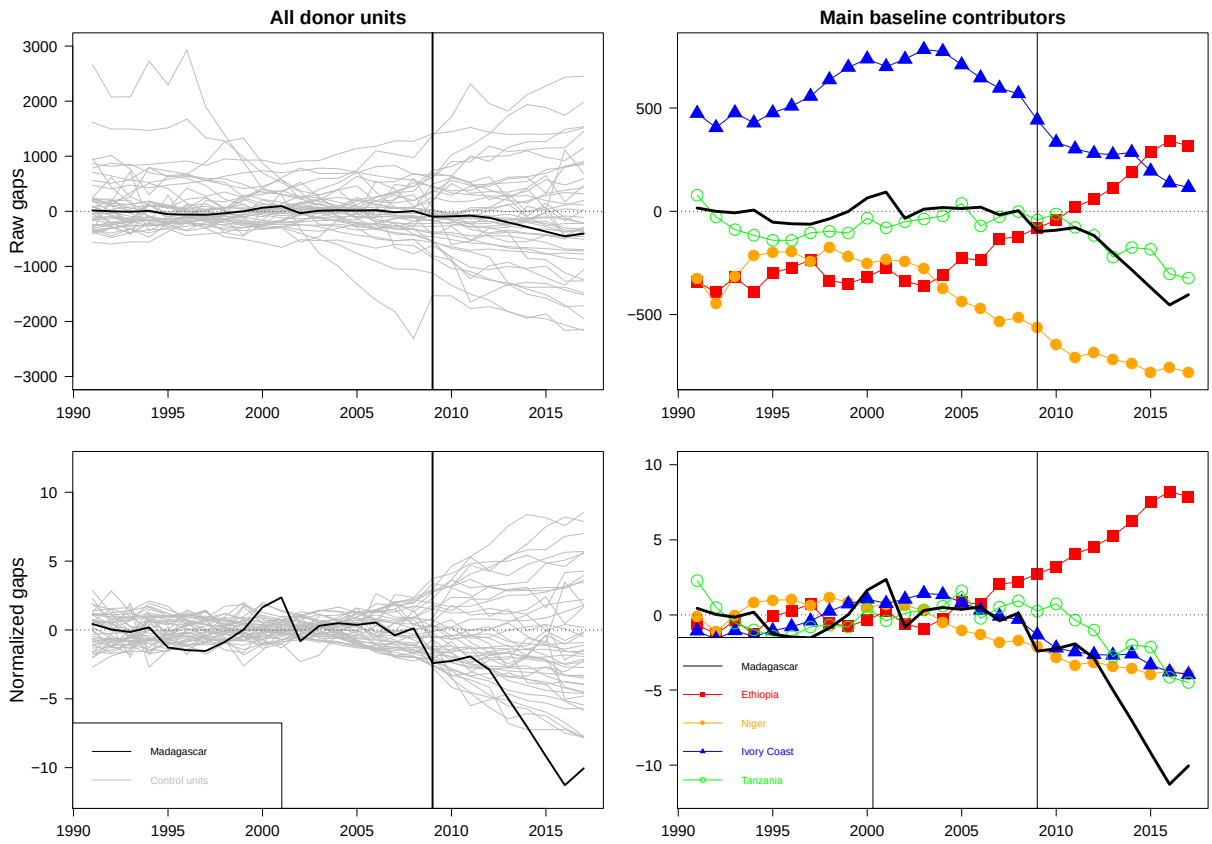

Figure 3: Placebo experiments.
Sources: PENN World Database (Feenstra et al., 2015), author's own calculations.

Placebo experiments In contrast to more "standard" econometric tools, standard statistical inference is not applicable for the SCM because we observe the effect of the treatment for only one unit. Instead, to gauge the reliability of our baseline results, we follow Abadie et al. (2010) and Abadie et al. (2015) and we employ a test based on permutations, the so-called placebo experiments. The basic idea of the placebo exercise is quite intuitive. For countries that are not affected by the treatment, here the 2009 Malagasy political crisis, we should not observe a significant difference between their pre- and post-treatment time series dynamics. To test this hypothesis, for each donor country, we apply the SCM to identify its most credible synthetic counterpart and we artificially simulate a treatment in 2009.

Figure 3 depicts the main outputs of our placebo experiments. We first apply our experiment to all countries belonging to the donor pool (column 1 of Figure 3) and then we report results obtained by focusing on the countries that are the main contributors to synthetic Madagascar in our baseline application, namely Ethiopia, Niger, Ivory Coast and Tanzania. Furthermore, to facilitate the visual inspection, we follow Born et al. (2019) and panels of the second row of Figure 3 report results of our placebo experiments by normalizing the

doppelganger gaps. In particular, each gap is normalized to its pre-2009 sample mean and its pre-2009 standard deviation.

The top-left panel of Figure 3 shows all non-normalized gaps obtained from our placebo experiments. Two comments are in order. First, this figure confirms that the SCM provides a good fit of pre-treatment real GDP per capita in Madagascar. Second, the dispersion of the "raw" gaps before and after the period treatment is indicative of a poor adjustment quality of the SCM for many of the donor units. Looking only at this first panel wrongly suggests that the impact of the Malagasy political crisis was not as large. However, normalizing the gaps ease comparability between the different applications of the SCM. Thus, the bottom-left panel of Figure 3, displays such experiment results. As can be seen, the Malagasy case appears among the one exhibiting the highest relative difference between its actual realization and its synthetic counterpart after 2009. This suggests that the effect of the treatment experienced by Madagascar is unusually high, especially at the end of the sample period. The right panels of Figure 3 repeat the exercises but focus only on the main contributors of baseline synthetic Madagascar. The top-right panel clearly shows that the fit of the synthetic countries to their observed time series is of lower quality than what it is for Madagascar. Except for the Tanzanian case, differences between the actual and the counterfactual time series is quite important. For instance, the pre-treatment gap obtained for Ivory Coast ranges between US$ 400 and US$ 800 while the one for Madagascar ranges from -US$ 50 and US$ 50.[10] Controlling for the normalization does not alter the results. The Malagasy case clearly stands out from those of its main baseline contributors as it is the country experiencing the highest income loss after the treatment took place.

To further assess the significance of the output gap, we also follow Abadie et al. (2010) and Abadie et al. (2015) by constructing, from the placebo experiments, the ratio of post-2009 to pre-2009 political crisis Mean Square Prediction Error (MSPE) for Madagascar and all donor countries. One advantage of focusing on this ratio is that it enables us to control for the pre-2009 fit of the synthetic control. A small ratio is indicative of a poor pre-2009 fit suggesting only small differences before and after the intervention. Instead, a large ratio suggests that the synthetic control closely mimics the pre-treatment observed time series and indicates strong differences for the post-treatment period. Corresponding results are displayed in Figure 4. As can be seen, with a ratio of 48.6, Madagascar is by far the country with the largest ratio, suggesting a strong doppelganger gap after the treatment and a good fit of the synthetic control before. Furthermore, the main contributors to baseline synthetic Madagascar have smaller ratio, ranging from 0.4 to 5.6, suggesting that the observed gaps before and

[10]It should be observed, that such statements holds after computing relative values. Thus, relatively to the observed value of real GDP per capita, the difference for Ivory Coast range from 22% to 43% while for Madagascar it ranges from -5% to 8%.

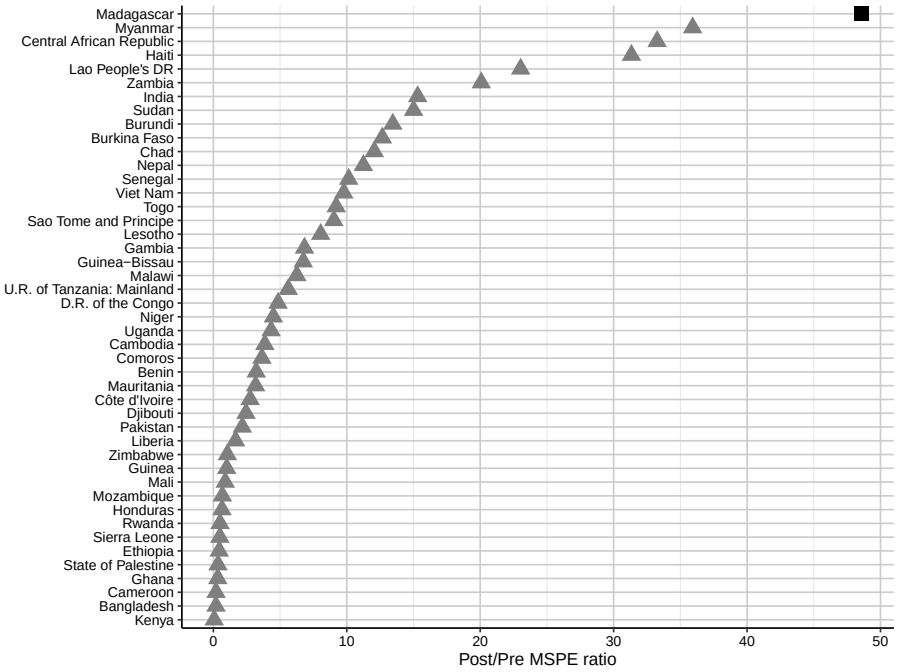

Figure 4: Relative measures of post- to pre-treatment MSPE for all donor countries.
Sources: PENN World Database (Feenstra et al., 2015), author's own calculations.

after the intervention are not as important. Put differently, looking at normalized statistics clearly suggests that Madagascar clearly stands out from donor countries and especially those that appear as the main contributors to its synthetic counterpart. This further indicates that we cannot find, in our application, evidence pointing toward a potential spillover effects of the 2009 Malagasy political crisis on its main donor. Such evidence leads us to be confident about the identification of a causal effect of the 2009 political crisis on real GDP per capita in Madagascar.

Iteratively dropping one contributor An important robustness check is to establish whether our baseline results are the same when the composition of the donor pool changes. We here investigate this issue by repeating the baseline SCM to Madagascar but we, each time, drop one of its baseline main contributors into the control unit group. To assess the results of such changes, the Figure 5 contrasts the gap obtained with the baseline application to those obtained with this experiment. Except from the case where Ethiopia does not belong to the donor pool, changing the composition of control units has nearly no incidence on the quality of the fit of the pre-treatment period. This being said, it should be observed that dropping one main contributor at a time has mainly no qualitative impact on the results. Furthermore, from a more quantitative point of view, it is clear from this experiment that our baseline result does not overestimate nor underestimate the impact of the 2009 political

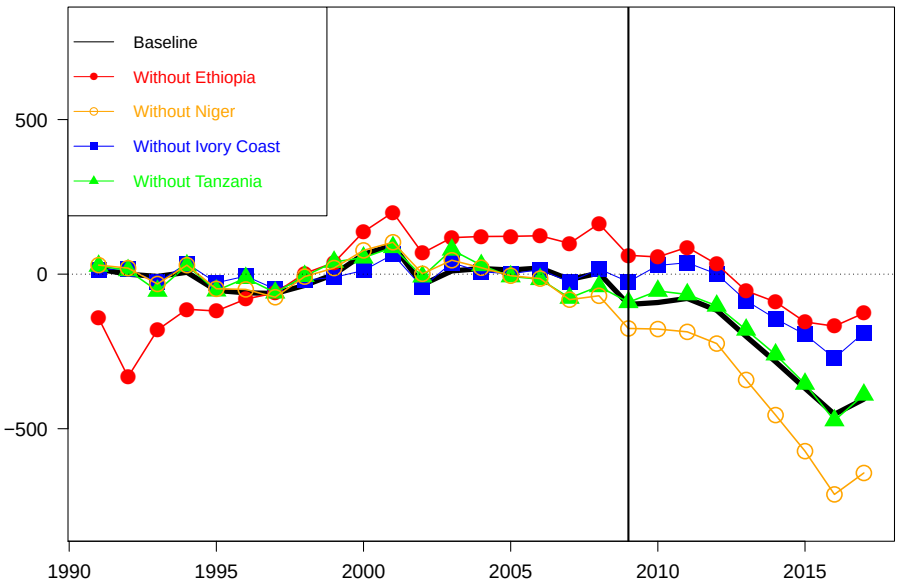

Figure 5: Robustness: dropping main contributors from the donor pool.
Sources: PENN World Database (Feenstra et al., 2015), author's own calculations.
Notes: Vertical lines correspond to the year of the treatment.

crisis. Indeed, the baseline post-2009 gap lies at the "middle" of the distribution.

Changing the time of the treatment As an additional robustness check about the magnitude of the effect of the 2009 Malagasy political crisis, we now apply the SCM by considering different year for the treatment. In particular, as the 2009 Malagasy crisis was accompanied by a long-lasting period of uncertainty about the government, we first employ as a possible date of treatment the year 2013, namely the one corresponding to the organisation of election and followed by Rajaonarimampianina's accession to the presidency. Then, as it is also known that a political crisis also hit Madagascar in 2002, we also use it as a potential treatment year. Figure 6 reports the results by comparing them to the baseline estimate. Inspection of this figure mainly leads to three comments. First, it appears that changing the date of the treatment has a minor incidence on the fit of the pre-treatment period. In particular, the mean gap (in absolute value) between actual Madagascar and the different version of its counterfactual is higher when we change the year of the treatment. However, it should be observed that the fit of the other two synthetic Madagascar remains good. Second, we observe no significant difference between actual Madagascar and its most credible doppelganger when we set the year of the treatment to 2002. This suggests that this political crisis had only a minor incidence on the economic performance of Madagascar. Finally, imposing a treatment year in 2013 does not alter the result qualitatively nor quantitatively. However, it is noteworthy that this synthetic Madagascar departs from actual Madagascar in

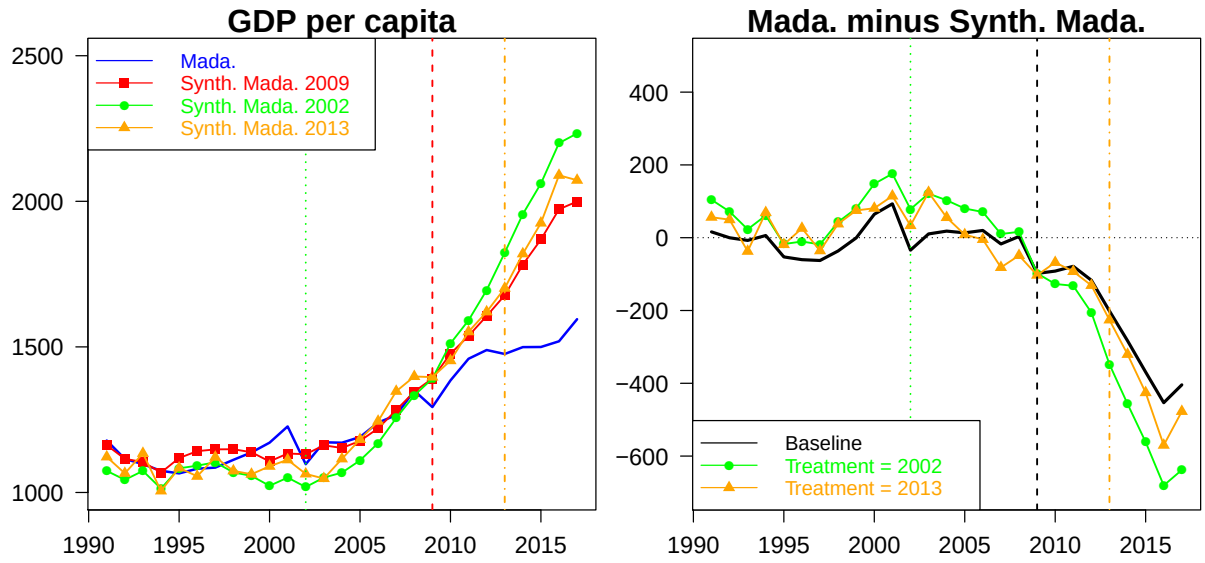

Figure 6: Robustness: Alternative dates of treatment.
Sources: PENN World Database (Feenstra et al., 2015), author's own calculations.
Notes: Vertical lines correspond to the year of the treatment.

2009, namely the year at which we identify the potential treatment. Such a behavior suggests that this alternative application of SCM has more difficulties in matching the observed value of Madagascar in 2009, 2010, 2011 and 2012. From our point of view, this reinforces the idea that the "true" treatment year is 2009.[11]

Longer time period In the baseline case, we choose to only keep data for the post-communism period in Madagascar. As a consequence, the baseline estimate only relies on variables from 1991. Here, we reconsider the main specification by including data from 1971 and so including also the communism period of Madagascar. We then repeat the SCM with this longer time frame. Figure 7 displays the results. Differences between the actual Malagasy real GDP per capita and its most credible counterpart are larger with the longer sample period since they are between -US$ 190 to US$ 150. Furthermore, the ratio of post- to pre-treatment MSPE amounts to 14.1 whereas the one of the baseline case was of 48.6. This suggests that the SCM cannot find a synthetic Madagascar of similar fit as in the baseline case. Despite this, Figure 4 clearly shows that the real GDP gap between actual and synthetic Madagascar increases sharply after the political event of 2009. More specifically, at the end of our sample period the gap between these two time series is around -US$ 600 against -US$

[11]Given the uncertainty about the Malagasy government during the 2009-2012 period, we think that it is more relevant to take 2009 as a year of potential treatment. Indeed, the length of the uncertainty can induce some particular behaviors of economic agents, especially from the investment side, that are likely to hide the true effect of the crisis.

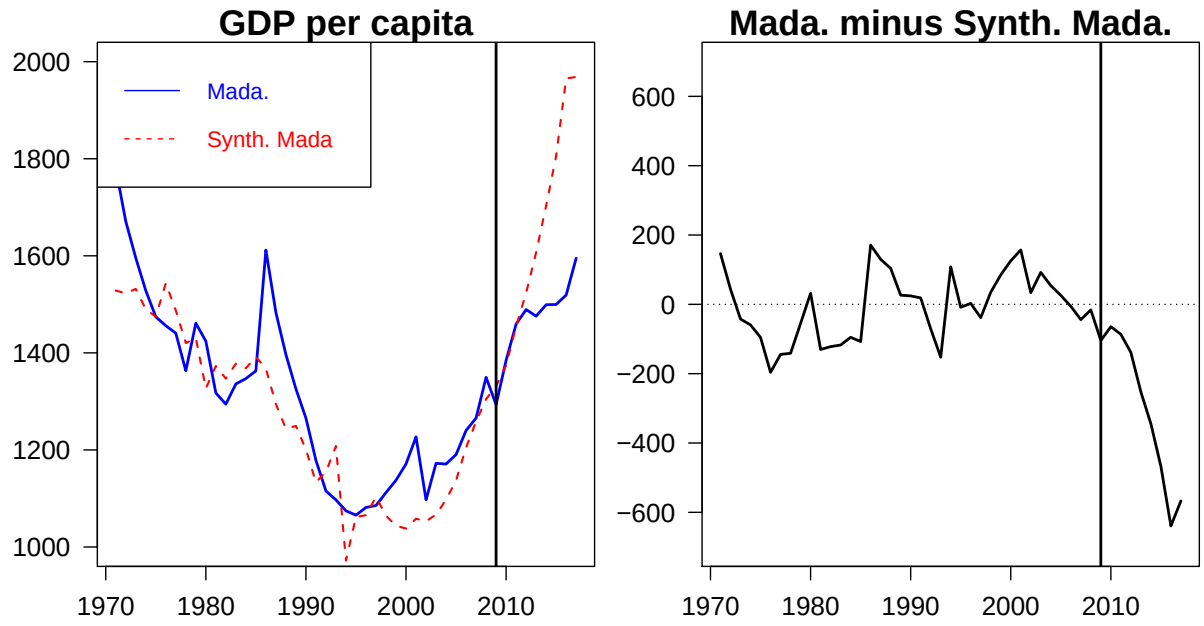

Figure 7: Robustness: Alternative sample period from 1971 to 2017.
Sources: PENN World Database (Feenstra et al., 2015), author's own calculations.
Notes: Vertical lines correspond to the year of the treatment.

500 for the baseline estimate. This further suggests that the choice of the sample period, even if it increases the quality of the fit, has no incidence on the quantitative nature of our results.

5 In-depth investigation

As suggested in Grier and Maynard (2016), it is possible that political situation does not affect every component of the economy at the same pace and manner. Therefore, as in Matta et al. (2019), we consider an in-depth investigation of our baseline scenario. More specifically, we repeat the SCM for each GDP components by focusing on three blocks: investments and Foreign Direct Investments (FDI)[12], consumption and government expenditures, and trade. For each variable studied as outcome, we study the effect of the crisis with the same predictors as for the GDP analysis except than we use the growth rate of per capita income instead of its level.

In doing so, we remain in the same framework, without introducing possible other covariates. We, therefore, only focus on the performances of our model before and after the treatment, and follow some suggestions of Botosaru and Ferman (2019), on the roles of covariates in the

[12]we choose to add the FDI components relative to the contribution of foreign capitals to Madagascar's GDP.

synthetic control method. The accuracy of our in-depth analysis is then considered reliable over the studied variables as soon as we unveil a good fit before 2009.

Figure 8 displays the results by contrasting each time the actual time series to its most appropriate counterfactual obtained from the SCM. Since outcomes of interest and their counterfactual seem to follow the same path over the pre-treatment period and diverge after 2009, we are confident about the appropriateness of the SCM.

5.1 Investments

Basically, such political reverse is likely to induce a contraction in both the internal and the external investment level. The main economic channel is based on a surge in uncertainty related to the economic environment. When policy uncertainty rise, with a perceived worsening economic situation, economic agents are more likely to follow a "wait and see" behavior and have the incentive to postpone their investment (Bernanke (1983), Bloom (2009) or Choi et al. (2020)). Furthermore, for foreign firms to invest in a country, large sunk costs associated to a high level of uncertainty is important for decision making (Handley (2014), Handley and Limão (2015) or Handley and Limão (2017)). For Madagascar, the level of uncertainty probably remained high during the 2009-2013 period, as the coup was followed by a transition regime. Furthemore, the country suffered sanctions from the international community. According to Figure 8, capital accumulation grows substantially during the period before the crisis, reaching its peak in 2008. However, the 2009 shock corresponds to a "trend-break" and the share of investments in GDP fall. The share of capital accumulation over GDP goes from 25% before the crisis to 15% in 2016. More importantly, the investment level do not reach its pre-2009 level. In contrast, the doppelganger predicts a growing trend. In particular, if the 2009 crisis did not happen capital accumulation would represent more than 30% of Malagasy GDP at the end of our sample period. The decrease observed in the actual value could be attributed to a diversion in the investment position of the country. In fact, as suggested in Breinlich et al. (2020), following a political coup, a country becomes less attractive to investors. Political instability prevents capital accumulation (Uddin et al., 2017) through its negative effect on productivity (Aisen and Veiga, 2013), reducing consequently the overall level of investment. Besides, as exposed in Ramiandrisoa and Rakotomanana (2016), Madagascar is suffering a form of institutional failure, characterized by weak contract enforcement, corruption and restrictive laws to investment. This situation is translated into capital flights burdening the level of investment. In what concerns FDI (net inflows % of the GDP), the actual time series shows a sharp decrease after 2009. However, at the end of our sample period, the counterfactual and the actual time series are very close. Here, it should be observed that the SCM has some difficulties in finding a good match of the actual FDI time

series especially after 2005. Overall, the visual inspection of the FDI time series seems to be in line with findings of Busse and Hefeker (2007), Jong-A-Pin (2009), about the prominent role of the political regime and institution on the determination of the level of uncertainty and investment.

All in all, our findings corroborate the idea that political instability, by increasing the level of economic uncertainty, leads to lower internal and external investments.

5.2 Consumption and Government Spending

Concerning the consumption level (Figure 8, mid-left), the outcome do not fairly change after the 2009 crisis. More specifically, the effect of the crisis on the consumption level seems weak. However, the counterfactual predicts an important decrease in the consumption share in the absence of the 2009 political crisis. This result, somehow unexpected could be rationalize. First, the share of consumption in Madagascar is fairly large (72% of the GDP), which is rather usual to a developing country. An increase in the share of consumption does not necessarily mean a better economic situation. It fairly depends on the composition and nature of the consumers basket. In fact, as suggested in Razafindrakoto et al. (2020), two reasons could justify the level of consumption in some developing states: a basket composed by incompressible consumption, and the high level of inequality within the island. The first is mainly justified by the high level of consumption within the GDP, when the second often justify the disconnection between consumption level and the GDP per capita. Besides, the 2009 crisis view a surge in informal activities (a 13% increase), partly offsetting the decrease viewed in the GDP level (World Bank, 2010). *In fine*, combination of these three phenomenons, helped to maintain the level of consumption to the GDP.

Following the Government spending (Figure 8, mid-right), our scenario seems more accurate. In fact, Malagasy's government budget rely to various sources: a large portion of external funds (aid and debts) and a limited amount of internal funds (as the fiscal pressure is at 10.3% in 2012). Result talks itself, as the government's expenditure following the crisis remains at 13% of GDP share, whereas the counterfactual predicts an increase of government purchases. At the end of the sample period, the gap between the two series is roughly of three point. Such a change is in accordance with numerous sanctions, incurred by the international community, to the so-called *"gouvernement de la transition"*. In fact, international sanctions came directly following the crisis, with the suspension of development aid, conditioned to the respect of democracy. Hence, heavy dependence of Madagascar to external funds could explain this finding. For instance, aid accounted for 40% of the government spending before 2009 (World Bank, 2009). As infrastructures development depend on governments' ability to access to external funding, this situation led to a drastic decrease in the government expenditure.

More specifically, such a disruption/reduction of development aid dampen multi-annual programs (e.g. infrastructure, governance) by drying out government resources (Masaki (2016)). Therefore, the room to maneuver was extremely diminished for the HAT which focuses on maintaining the level of expenditure stable rather than engaging new investments.

5.3 Trade

To understand the pattern of trade in a country, we decide to focus on two key elements: share of imports and share of exports (relative to GDP).

Basically, imports could be understood as an expression of internal demand toward foreign goods. A large portion of the economic life depending on imports is a two edged sword. In fact, a rapid economic growth could be followed by a rapid expansion of importation as a complement to a constrained internal production. However, it may cause a dependency toward imported goods leaving the country vulnerable to external shocks. As presented in bottom left of the Figure 8, the rapid expansion of Madagascar during the first years of 2000 was a period of mass augmentation of imported products, sustaining the need of infrastructure development. The share of imports rose to reach its peak at -20% of the GDP. Following the 2009 events, the import share reverted at -12% of the GDP and remained stable thereafter. In contrast, the doppelganger predicts an increase in the share of imports (-20%), perpetuating the path seen before the crisis. With the economy in a slow motion, the external sector were severely affected, with the Ariary plunging and resulting in reduction of importation. Besides, the aftermath of the crisis results on a reorientation of Malagasy economy toward its own production. A vibrant private sector, with a liberalized market (World Bank, 2010) associate to government control over price and taxes over petroleum products helped to maintain a fair amount economic activities, without having necessarily access to import goods.

Focusing now on exports (see Figure 8, bottom right), we want to highlight the productive capabilities of the island. Again, the resultant of the 2009 events is striking compared to what it would have been without a crisis. The following year after the crisis is the year of a large drop in the export share of Madagascar whereas the counterfactual predicts a stable trend. More interestingly, when before the crisis, the export may have been burden by the worldwide financial crisis, internal factors seem more prevalent during and after the crisis, causing a loss from a 10% share of export to 7% by the end of 2011. Besides, the counterfactual predicts an export share for Madagascar would have been at 10%. Even though Madagascar had increased its regional integration through various trade agreements (COMESA, SADC), the issue of the external sector remained dependent to the political situation, affecting therefore its trading performance. In fact, Madagascar's participation to these regional trade agreements was suspended in the aftermath of the crisis. Moreover, sanctions were issued by its principal

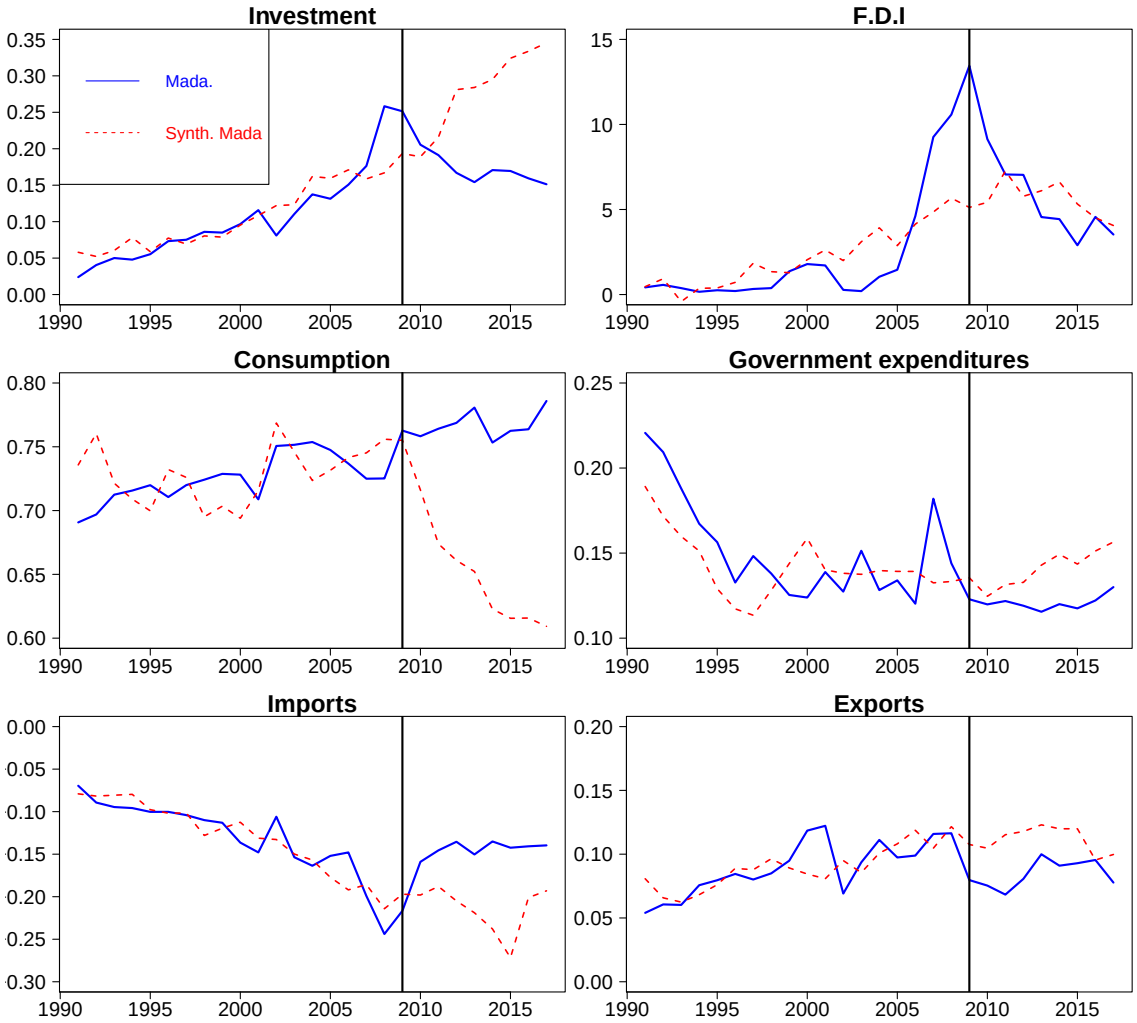

Figure 8: Results of SCM applied to real GDP components and foreign direct investment (FDI).
Sources: PENN World Database (Feenstra et al., 2015), author's own calculations.
Notes: Vertical lines correspond to the year of the treatment.

partners perpetuated this situation. These sanctions included, for example, a suspension of Madagascar to the African Growth and Opportunity Act (AGOA) which was one of main program helping Madagascar's export. According to Fukunishi (2013), the 2009 crisis cause a drop in the garment export from 31% to 45% with a drop of 78% associated to the US market. This result is in accordance with Fosu (2003), finding a detrimental effect of political instabilities to export performance in Sub-Saharan African countries. More importantly, this finding corroborates the recent finding of Dai et al. (2021), on the detrimental effect of trade sanctions on the volume of trade, lasting from five to eight years.

6 Conclusion

Political reverse is likely to lead to important changes in the economic life of a country. Notwithstanding the question of the effects of political crisis on growth for a LDC as Madagascar was still understudied. This article fills this gap. In doing so, we quantify the effects of the last major political shock to the Malagasy economy with the use of the SCM which consists in identifying the most credible counterfactual of Madagascar from a pool of control units.

Our results unveil the long-lasting and dramatic consequences of the 2009 political crisis on the level of per capita income. In particular, we find that real GDP per capita in Madagascar would have been higher if the 2009 political crisis did not occur. As an illustration we estimate an output loss of 25% in 2017 compared to the counterfactual path. This analysis remains robust through various placebo tests which further confirm that the effect of the crisis was unusually large. Subsequently, when we turn to an in-depth analysis by considering the main components of GDP, we find that a fall in investment has the potential to be the main economic mechanisms explaining the output loss.

Without being conclusive about the effect of political crisis in general, our paper indicates that the cost of political crisis is likely to be large. Furthermore, it should be observed that we follow a macroeconomic perspective without taking into account some of the social impacts of such crisis, which could be more profound. Indeed, the 2009 political crisis was accompanied by a large expansion of the informal sector and an increased in the poverty level. Since the micro-level consequences of such a disruption could be dramatic for the daily life of Malagasy citizen but also in the long term, our paper should be seen as a first step in the understanding of the 2009 political crisis. We believe that studying in more depth the micro effects of such an event would be valuable since it has the potential to complete the picture of the consequences of a political event. This is however beyond the scope of the present paper.

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