The Cuban Experiment: Measuring the Role of the 1959 Revolution on Economic Performance using Synthetic Control

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1 Introduction

On the eve of 1959, Cuban president Fulgencio Batista left Cuba running away from the attacks of guerrilla forces led by Fidel Castro. After six years of fighting to overthrow Batista’s government, the Revolution of 1959 ended decades of political instability and created the only long-term socialist experiment in Latin America.

One of the great challenges historians face when trying to understand the past comes from the undeniable fact that it is impossible to go back in time and change the course of a given event at a given time to see what history would be like if something different happened. For instance, suppose Fidel Castro and his comrades made a wrong turn with their boats and ended up being caught by Fulgencio Batista’s army, destroying completely any hope of revolution. Had this occurred, what would have become of Cuba? The existing radically

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1
different institutions would never have been implemented and, thus it is fairly reasonable to imagine a very different fate for the people of Cuba. The lack of a counterfactual path of history prevents us from establishing a causal link between one event and another. We intend to contribute to the study of economic history by introducing the Synthetic Control method as a novel tool for the construction of adequate counterfactuals that may help us to assess causality in history.

The Synthetic Control methodology was devised by Abadie and Gardeazabal (2003). Abadie and his associates carried out other studies using this method, such as a counterfactual estimate of what would have happened if Germany had not reunited in 1989 (Abadie et al. 2011). Except for this application, the method has never been applied to other historical episodes. This is the first reason we believe our findings might raise scholarly interest.

Cuba has lagged behind other Latin American countries in terms of GDP per capita levels according to several sources for at least the last 25 years (Heston et al., 2011; Brun- denius, 2009; Ward and Devereux, 2011). Cuban GDP records might not be accurate, but consumption patterns also indicate that Cuban real income stagnated in this period (Ward and Devereux, 2012). Most scholars assert that such underperformance is related to the end of market mechanisms and the adoption of socialist institutions after the 1959 Revolution (Mesa-Lago et al., 2000). However, the Cuban government and sympathizers of the regime often blame the economic embargo undertaken by the United States and allies against Cuba. No empirical research has tried to disentangle these and other possible hypotheses to explain the Cuban economic failure. Also, there are no counterfactual inferences about what would have happened if the Revolution of 1959 had not happened at all.

Therefore, we believe that there are enough reasons justifying our research topic and findings. Assessing Cuban economic performance implies raising counterfactual hypotheses. We have tried to measure the difference between actual Cuban GDP levels and counterfactual levels if there had not been any Revolution. Our explanation to this gap is that institutional change played a major role, but certainly these results deserve further scrutiny.
2 When was Cuba left behind?

Cuba used to have one of the highest GDP per capita from the 16th to 18th centuries. In spite of lagging behind Western European countries after the Industrial Revolution, Cuban economy kept growing from the 19th century onwards. From the beginning of the 20th century until the decade of 1950, the Cuban economy was in the front rank among Latin American countries, not only in terms of GDP, but also regarding several other indicators (Ward and Devereux, 2012, p. 126; Mesa-Lago, 2010, p. 368).

Cuban economy was based upon sugar and tobacco production since colonial times. With direct support of the United States, the country conquered its independence from Spain in 1898. During the 20th century, Cuban economy was still strongly based upon sugar production: it comprised 28-9% of the GNP and 81% of Cuban exports during the decades of 1940 and 1950. The country's economy also relied on tourism related activities such as night-clubs, hotels, and restaurants (Pérez-López, 1991; Mesa-Lago et al., 2000, p. 171; Suchlicki, 2006). The state did not used to intervene significantly in the economy up to the Revolution: Cuba had a low degree of state ownership, despite education and health services that were relatively developed in the island even prior to 1959 (Mesa-Lago et al., 2000, p. 171; McGuire and Frankel, 2005). Exceptionally, the State started to regulate labor markets in 1933 and began to stimulate manufacturing sectors during the 1940s and the 1950s. From 1950 to 1958, average economic growth rates were low (around 1% per year), partly due to the armed conflict between guerillas and government that was initiated in 1953, but there were still positive growth rates (Mesa-Lago et al., 2000, p. 171-173). At that time, Cuban GDP per capita ranked between second and fourth in Latin America depending on the source taken (UP, 1961; BIRD, 1951; Oshima, 1961). In 2007 Cuba was ranked between 9th and 11th place (Mesa-Lago, 2010, p. 371).

But when exactly was Cuba left behind in comparison to other Latin American countries? Was it before or after the adoption of a socialist regime? Graph 1 shows that the gap between GDP per capita in Cuba and the rest of Latin America increased during the 20th century.
According to data collected by Bértola & Ocampo (2010).

Figure 01: PPP GDP per capita (constant 1990 US$)

Regarding other welfare measures, Ward and Devereux (2011) show that personal consumption level in 2007 was similar to the one in 1985. Therefore, “if the revolutionary regime raised living standards then this must have occurred during the first twenty-five years of revolutionary rule” (p. 7). We argue, however, that income level would have been higher had there been no Revolution even if we take the first quarter century of the regime. In order to locate when exactly the income divergence between Cuba and other Latin American countries started, we use the Synthetic Control methodology, which is described in the following section. As expected, our results point out to 1959 as the beginning of the divergence – neither before nor after the Revolution. Cuban GDP level changed its trajectory mainly due to the institutional change.

In order to identify the effects of the institutional change in Cuba, we assume that almost all countries in Latin America were colonies of extractive nature in the past, and consequently
had extractive institutions (Acemoglu et al., 2001, 2005; Engerman and Sokoloff, 1997, 2011). Cuba is by no means an exception to that fact. Therefore, if our main premise is valid, Latin American countries should have developed reasonably similar institutions until 1959. This fact allows us to interprete the Cuban Revolution as a “treatment” (in fact, from now on we will refer the Cuban Revolution as a treatment applied to Cuba’s economy) that has radically changed country’s institutions in relation to other Latin American countries. Consequently, those other countries are candidates that can be used as controls in assessing of the impact that socialist institutions had on Cuba’s economic performance.

3 Empirical Strategy

The ideal experiment to assess the effect of the socialist revolution in Cuba on its GDP per capita would be straightforward: We would have to design an experiment where we would observe two Cubas, one where the revolution prevailed and one where no revolution occurred in 1959. Then we would simply compare both series of GDP per capita, from 1959 until today, and determine the effect. Unfortunately, we only observe the GDP per capita of the actual world, where Cuba became a socialist country on January 1th 1959. The GDP per capita of the possible world, a Cuba with market institutions from 1959 onwards, is a latent variable. What the Synthetic Control method tries to create is this latent variable.

The method consists in trying to build the latent variable using information of countries that were not affected by a socialist revolution in 1959. The information is a set of variables that are, by hypothesis, correlated with the variable we would like to examine. This set of variables is the used to assign weights to each country based on a constrained optimization process that minimizes the distance between a vector of characteristics of the country affected by the revolution (treated unit) and of the countries that were not affected (control units). The synthetic GDP per capita will be a linear combination of the GDP per capita of all the control units given their respective weights.

In this particular case, the identification assumption of synthetic control is that the
structural process which generate the outcome variable (GDP per capita) for Cuba and other Latin American countries is the same and is not subject to structural shocks over the outcome variable during the period of investigation (for more details see Abadie et al., 2011). Since Latin American countries were mainly colonies of extractive nature, their institutions are relatively similar (Acemoglu et al., 2001, 2005) and, for this reason, their responses do shocks are assumed to be relatively homogenous which goes in line with our identification assumption.

Formally, and following closely Abadie and Gardeazabal (2001) and Abadie et al., (2011), let \( C \) be the number of control units which are candidates to compose the synthetic unit; \( P = (p_1, p_2, \ldots, p_C)' \) is a vector representing the weight that each candidate control unit has in building the synthetic control; \( X_1 \) is a \((K \times 1)\) matrix where \( K \) is the number of pretreatment variables associated with the treated unit (in our case, Cuba), \( X_0 \) is a \((K \times C)\) matrix containing the pretreatment variables associated with all the candidates to control units. The inputs of \( X_1 \) and \( X_0 \) are the average of each covariate variable through the pretreatment period. Also, let \( W \) be a diagonal matrix on which every diagonal component is associated with a given pretreatment variable and represents the weight that variable has in explaining the key or interest variable. The weights \( P = (p_1, p_2, \ldots, p_C)' \) are obtained solving the following constraint optimization problem:

\[
\min_{p \in P} \quad (X_1 - X_0P)' W (X_1 - X_0P) \\
\text{s.t.:} \quad p_i \geq 0, \text{ where } i = 1, \ldots C \\
\quad \sum_{i=1}^{C} p_i = 1
\]

The problem's solution gives a vector \( P^* \) consisting of the optimal weights that each control unit will have when building the Synthetic Cuba. Once we obtain the weight vector, we create the latent variable for the synthetic control unit which, in our case, is the GDP per capita of Cuba without socialism. Such variable is simply a weighted average of every control unit’s GDP per capita where the weight is the one that has been obtained through
the constrained optimization process. This new variable can be compared to the treated unit’s variable.

Formally, let $Y_0$ be a $(T \times 1)$ vector where each component stands for the observation of the treated unit’s GDP per capita for each one of $T$ periods of analysis, and $Y_1$ is a $(T \times C)$ matrix which contains the same variable, but for each control unit $C$ for all $T$ periods. The key variable of the synthetic control unit, $Y_0^s$ and the treatment’s impact, $\delta$, are defined by:

\[
Y_0^s = P \cdot Y_1 \quad (1)
\]
\[
\delta = Y_0 - Y_0^s \quad (2)
\]

4 Data

Data used in our work comes from different sources. The main source, however, is the Montevideo Oxford Latin American Research Center (Moxlad). We’ve also used data from CIA World Fact Book, Polity IV Project.

The covariates used in order to obtain the synthetic GDP per capita are the following: Electricity measured in millions of GWth per hour per capita, railways measured in kilometers built per country size (measured in Km²), terms of trade expressed by the ratio between the value of export and imports, school enrollment (primary and secondary) as a proportion of the population, illiteracy rate, life expectancy, the economically active population (EAP) in agriculture and industry as a proportion of total EAP, country size measured in Km², Polity IV index of political institutions (ranging between -10 and +10). The measure for GDP per capita is GDP measured in PPC at 1990 prices constructed by Bértola and Ocampo (2010).

The criteria used for selecting those variables were twofold: availability and predictive power. National account and financial data for developing countries are difficult to find for periods prior to 1950. For this particular reason we used variables that we believed were correlated with GDP per capita. Railways and Electricity are supposed to be a proxy of physical
capital stock. Terms of trade tries to capture the country’s external condition. Economic Active Population (EAP) employed in Agriculture and Manufacture represents the job market’s condition. Primary and Secondary School Enrollment aims to be measures of human capital. Polity Index tries to proxy the countries institutional quality. Other institutional measures are not included, because they are not available to most Latin American countries during the period of our investigation. Finally, Land Size data increase the accuracy of finding which countries are more similar to Cuba. Physical and human capital, external economic condition, labor distribution, and institutions are, rather arguably, correlated with a country’s GDP per capita.

The countries used were those from Latin America whose data were available. They are the following: Argentina, Brazil, Chile, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Peru, Uruguay and Venezuela.

The whole period of our investigation goes from 1959 to 1974. It is important to highlight that the Synthetic Control estimates the total impact of some treatment on a given variable. We are unable to identify the effect on Cuba’s GDP per capita when the institutional change occurs on the margin. Also, according to Abadie et al. (2010) in order to ensure consistent estimations, it is not recommended that the post-treatment period be large relative to the pretreatment period. For this reason we decided to stop in 1974. In addition, the years that followed 1974 were marked by periods of economic and political turmoil (for example, the oil and debt crisis, the tightening of the USA trade embargo, and the crumbling of the Soviet Union) and some additional institutional changes in Cuba.

5 Results

In this section we report our results. We divide them in two subsections. In the first, we report the results of the optimization process and compare the synthetic to the actual Cuban GDP per capita. In the second one, we describe and report and explain inference tests.
5.1 Comparing Cuba and Synthetic Cuba

Table 1 shows the weight attributed to each control unit by the optimization process. Only three of the 13 candidate countries tested as controls for the creation of Synthetic Cuba received a weight greater than zero. The country that received the greatest weight was Mexico (54.5%).

<table>
<thead>
<tr>
<th>Countries</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>0.545</td>
</tr>
<tr>
<td>Guatemala</td>
<td>0</td>
</tr>
<tr>
<td>Honduras</td>
<td>0.152</td>
</tr>
<tr>
<td>El Salvador</td>
<td>0.303</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>0</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>0</td>
</tr>
<tr>
<td>Colombia</td>
<td>0</td>
</tr>
<tr>
<td>Venezuela</td>
<td>0</td>
</tr>
<tr>
<td>Peru</td>
<td>0</td>
</tr>
<tr>
<td>Brazil</td>
<td>0</td>
</tr>
<tr>
<td>Chile</td>
<td>0</td>
</tr>
<tr>
<td>Argentina</td>
<td>0</td>
</tr>
<tr>
<td>Uruguay</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2 shows the pretreatment average of each variable for Cuba and Synthetic Cuba. The optimal weights were able to give a very good approximation of Cuba’s actual GDP per capita average. Also, the synthetic covariates GDP, Terms of Trade, Electricity, Secondary School Enrollment are quite similar to the real ones. The biggest discrepancy between actual and synthetic data was Land Area. This makes sense, since the country that received the largest weight for the composition of Synthetic Cuba was Mexico - the third largest country in the control set. We test different combinations of pretreatment variables and we found similar results in pretreatment variables fit and the Root Mean Squared Error (RMSPE).
Table 02 - pretreatment period averages of Cuba and Synthetic Cuba variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cuba</th>
<th>Synthetic Cuba</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP per capita (PPP 1990 - Log)</td>
<td>7.4678</td>
<td>7.4720</td>
</tr>
<tr>
<td>GDP (PPP 1990 - Log)</td>
<td>22.54</td>
<td>22.94</td>
</tr>
<tr>
<td>Terms of Trade</td>
<td>1.2451</td>
<td>1.1064</td>
</tr>
<tr>
<td>Railway length per Km²</td>
<td>0.0393</td>
<td>0.0138</td>
</tr>
<tr>
<td>Electricity (millions of GWth per hour) per capita</td>
<td>0.1235</td>
<td>0.1004</td>
</tr>
<tr>
<td>EAP in Agriculture (% of Total Population)</td>
<td>0.4130</td>
<td>0.6766</td>
</tr>
<tr>
<td>EAP in Industry (% of Total Population)</td>
<td>0.1289</td>
<td>0.0987</td>
</tr>
<tr>
<td>Enrollment, primary (% of Total Population)</td>
<td>0.1047</td>
<td>0.0776</td>
</tr>
<tr>
<td>Enrollment, secondary (% of Total Population)</td>
<td>0.0037</td>
<td>0.0038</td>
</tr>
<tr>
<td>Illiteracy Rate</td>
<td>34.6667</td>
<td>64.6590</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>44.43</td>
<td>36.97</td>
</tr>
<tr>
<td>Land Area (km²)</td>
<td>110,861</td>
<td>1,090,694</td>
</tr>
<tr>
<td>Polity Index</td>
<td>1.67</td>
<td>-4.50</td>
</tr>
</tbody>
</table>

Figure 2 shows both the actual and the Synthetic trajectories of Cuba’s GDP per capita. It can be seen that both series follow a similar path prior to 1959. After the institutional change, however, one can notice a clear widening gap between both series. At 1959, the trajectory of the Synthetic GDP per capita begins to outgrow the series of actual Cuba which would mean, at a first glance, that socialist institutions had a negative impact on the country’s GDP per capita.
Figure 3 shows the difference between the actual Cuban GDP per capita series and the synthetic one. As in Figure 2, we can see that during the pretreatment period the gap oscillates around zero. From 1959 onwards, however, it is clear that Synthetic Cuba experienced higher growth rates of GDP per capita at least until 1970. From 1970 to 1974, the gap narrows\(^1\).

\(^1\)As a robustness check we extended the analysis until 1980. The gap remains relatively constant. We report this result in the Appendix.
Figures 2 and 3 clearly indicate that 1959 represented a turning point in Cuba’s economy. The counterfactual Cuba, the one where no socialist revolution occurred, performed much better in terms of GDP per capita growth. Below we run inference tests in order to see if our results are consistent.

5.2 Inference Tests

The first test we’ve done is the Placebo Permutation Test designed by Abadie (2011). The test consists in applying the synthetic control method to all countries in the candidate controls set as if they had been treated with the Cuban Revolution in 1959. Then we compute the difference between the observed GDP per capita trajectory of each control unit, as well as Cuba’s GDP per capita trajectory, and its synthetic version. Plotting all the gaps from the placebos and Cuba gives us an empirical distribution of the estimated effect of the placebo interventions. This allows us to calculate the probability of estimating an effect as high as
the effect we’ve found in Cuba. If the difference between the actual and synthetic Cuban GDP per capita is at one of the extremities of the distribution, then we can say the effect on Cuba is large relative to the placebos and the probability of finding such effect by random chance is low - in fact, we can determine the exact probability of that happening.

Figure 4 show the empirical distribution. The distribution has all countries in the set of controls with the exception of Venezuela and Honduras. They were excluded from the distribution due to the fact that they have a Root Mean Squared Error twice the size of Cuba’s\(^2\). As we can see, starting at 1959, Cuba’s GDP per capita gap is below all the other gaps. Since we have 11 control countries, the probability of estimating an effect as high as the Cuban one is \(1/12 = 0.083\), which means the effect we’ve found is significant at 10% level.

![Figure 04 – Placebo Permutation Test](image)

The second test looks at the distribution of the ratio between the RMSPE of the post-

\(^2\)Abadie et al. (2011) suggest this procedure when placebos reports RMSPE relatively higher then the treated unit. For all the Root Mean Squared Predicted Errors of the placebos, see Table 03 in the Appendix.
treatment period (1960-1974) and the RMSPE of the pretreatment period (1929-1959) for every placebo and also Cuba. The higher the ratio, the larger is the difference between the the pre and post-treatment periods. Again, if Cuba’s ratio is relatively large when comparing to placebos, the probability of finding such effect by random chance is low. Figure 5 shows the distribution of the ratios. Cuba’s ratio is the highest one and, given that we have now 13 control units, the likelihood of obtaining a ratio as high as Cuba’s is $1/14 = 0.07$.

**Figure 05 - Post/Pre 1959’s Revolution Mean Square Predicted Error**

The third and final test concerns the timing of the treatment and it is called Temporal Placebo test. It consists on changing the period where we believed the treatment has occurred, in our case the Revolution. The Cuban Revolution was a guerrilla type war and began in 1953, when Fidel Castro and his supporters landed on Cuba. The war lasted 6 years, culminating in the victory of the revolutionary army on January first, 1959. It is therefore plausible to speculate that Cuba’s economic performance was affected by the war rather than the institutional changes implemented by Fidel Castro. If we change the year of the
treatment and the gap between the Synthetic and Cuba’s GDP per capita begins to widen prior to 1959, then our results are either spurious or there is some other unknown element, for instance, the war, that was responsible for the widening of the gap.

Figure 6 shows the result of the Temporal Placebo test. The dotted line represents the GDP per capita of Synthetic Cuba when we’ve established that the treatment happened in 1953 - the year the war broke out. The black solid line represents Synthetic Cuba’s GDP per capita if the treatment is set to have occurred in 1959 - the year the revolutionaries came to power. Finally, the grey solid line is the actual Cuba’s GDP per capita. Looking at figure 6 we can see that clearly it is not the case that the war is the event which affected Cuba’s GDP per capita performance. Both synthetic series follow closely the real trajectory of Cuba’s GDP per capita until 1959. In fact, the pretreatment RMSPE for the 1953 and 1959’s synthetics are 0.1228 and 0.1108, respectively, which means that both give similar approximations of the actual GDP per capita.

**Figure 06 – Temporal Placebo (treatment changed to 1953)**
6 The Primacy of Institutions

We have argued that the gap between actual Cuba and synthetic Cuba, our counterfactual estimates, were caused by the institutional change brought by the Revolution. However, other differences could explain why Cuba diverged from other Latin American countries after the Revolution besides institutions. After ruling out the “war effect” hypothesis, there are three other remaining possible explanations: (a) a decrease in human capital stock, (b) the economic embargo imposed by the United States and allies, and (c) the erratic economic policies undertaken by Castro’s regime. In this section, we present qualitative evidence showing that institutional change was the main cause of Cuban underperformance. In addition, we argue that the other three reasons listed above, if they had any importance, did not affect Cuban growth as much as institutions.

6.1 Institutional Change and the Revolution

Rising unemployment, visible inequalities, political instability and intrusive American policies were ingredients to raise revolutionary sentiments among Cuban nationalists. As mentioned earlier, a guerrilla was created by Fidel Castro and Ernesto “Che” Guevara to overthrow the incumbent government and change political and economic organization of the island in 1953. In 1959 the rebel forces managed to depose Batista’s government. Fidel Castro became the prime minister and carried out several institutional changes. The first step was a slow collectivization process started in 1959, with the enactment of the First Agrarian Reform. Also, there was an attempt to diversify the economy: a Central Planning Board was set (JUCEPLAN) as well as a new development strategy, which defended import substitution though industrialization, diverting resources from the sugar sector for two major purposes: (a) to achieve self-sufficiency in food production; and (b) to foster the creation and development of industries with the objective of reducing the country’s economic reliance on sugar (Mesa-Lago et al., 2000, pp. 175-177; Green, 1994).

However, the main institution imposed by the Cuban regime since its beginning was a
set of measures that could be defined by the expression “Push to Communism”. It rested upon the desire to build a country with the voluntary participation of all citizens, collective work and the establishment of a “social salary”. According to Guevara, such measures would constitute the pillars upon which a country guided by a different logic than market economy would rest (Green, 1994).

The Cuban government policies in the first years of the revolution resulted in a disruption of the job market and in inefficiencies due to perverted economic incentives. In the second half of 1960, market mechanisms were definitely eroded by government measures. However, that period also experienced the expansion of public services: the rise of the minimum wage and the extension of social services in rural areas caused a decrease in inequality but a reduction of investment as well (Mesa-Lago, 1973; Mesa-Lago et al., 2000). After some years, it was clear that the process of collectivization had been too fast and that the state was not ready to take over the market. Central planning resulted in arbitrary investment decisions and widespread inefficiency (Mesa-Lago et al., 2000, pp. 183-186).

Despite erratic economic policies carried out by the Cuban government within the period 1959-1974, as we will detail in the following subsections, there were some common features of the Cuban economy that persisted during the entire period. The collectivization process and the changes in the markets for labor and goods were the main features of the institutional change carried out by the 1959 Revolution. Market mechanisms were clearly underutilized during the entire period, which resulted in widespread inefficiency, despite advances in social areas such as health and education. Institutional change carried out by the Revolutionary government certainly had enduring effects on the Cuban economy.

6.2 Human capital

Decrease in human capital rather than institutional change could possibly be a structural explanation for the Cuban economic underperformance. Differently from Acemoglu, Johnson and Robinson (2005), Glaeser et al. (2004) has emphasized the primacy of human capital over institutions with respect to economic growth. However, even in the beginning of the 20th
century, Cuba already had good health and educational indicators compared to other Latin American countries\(^3\). Cuban educational indicators were above Latin American average, as we can see in Figure 7, but there was a decrease in the literacy growth rates during the decades of 1940 and 1950. In 1950, 78% of the population was literate. A decade later, the literacy rate was 79% and in 1970, the literacy rate rose to 89%. During the entire period, Cuba presented literacy rates that lagged behind Argentina, but greater than those presented by important Latin American countries such as Brazil and Mexico. Therefore, the Revolution in 1959 had a positive impact in literacy, since Castro invested heavily in social policies such as literacy campaigns, despite earlier achievements prior to the Revolution.

**Figure 07 - Literacy Rates in selected Latin American countries during the 20th century**

![Graph showing literacy rates for selected Latin American countries](image)

*Source: Astorga, Bergés and FitzGerald (2005), p. 790*

Notes: LA6 comprises the following countries: Argentina, Brazil, Chile, Colombia, Mexico and Venezuela. LA13 comprises the following countries: Bolivia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, Panama, Paraguay, Peru and Uruguay.

Further evidence that education was a priority in Cuba are the records of average years

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\(^3\)Data on literacy and life expectancy can be found in Astorga, Bergés and FitzGerald (2005) to the entire Latin America since 1900. Concerning health, McGuire and Frankel (2005) show that the pre-revolutionary Cuba experienced a rapid mortality decline, despite slow economic growth and high income inequality.
of schooling collected by Barro and Lee (2011). Figure 8 shows that Cuba achieved good results on educational attainment compared to other Latin American countries – 10.6 years of schooling with respect to the population over 15 years old in 2010. Educational attainment is a well-known proxy of human capital levels.

**Figure 08 - Average Years of Schooling of selected Latin American countries (with respect to the population aged 15 and over)**

![Graph showing years of schooling for various Latin American countries](source)

Source: Barro and Lee (2000)

Cuba continued to have higher literacy rates and average years of schooling with respect to most Latin American countries. Hence, the Cuban Revolution did not lead to a decrease of human capital stock of the country. Actually, human capital is Cuba’s most important asset, according to Brundenius (2009, p. 45). If we assume that the human capital stock would be approximately the same of its actual levels or even lower had Cuba not had a revolution, then the differences between the actual levels of GDP per capita and our model’s counterfactual findings cannot be attributed to human capital. In this case, Acemoglu et al. (2005) are probably right to say that institutional change may be a better explanation to income divergences in the long-run – the Cuban case seems to confirm that.
6.3 Economic embargo

Right after the Revolution, the clear anti-American path chosen by the Cuban government resulted in the imposition of a partial economic embargo by the United States in October 1960 (Pérez Jr., 1995, p. 325). The embargo was an answer to the nationalization of American investments in the island. The partial embargo enacted by the Eisenhower administration was tightened by the Kennedy administration in February 1962. The Organization of American States also imposed a collective embargo in 1964, which was not obeyed only by Mexico (Mesa-Lago et al., 2000, p. 202). Many defenders of the regime and the Cuban government argue that the embargo harmed the Cuban economy. It might have been a truly important source of problems to the Cuban economy, especially after the end of the Soviet Union in 1991. However, the Soviet bloc gave significant economic support to Cuba from the 1960’s to the fall of the Soviet Union.

There was no complete alignment between Cuba and other socialist countries from 1959 to 1968. Cuba fostered a foreign policy that was relatively independent from the Soviet Union or China during that period. However, it did not prevent Cuba and the USSR from signing a trade agreement in 1960. This agreement ensured demand for Cuban sugar after the suspension of US import quotas that followed the nationalization of refineries owned by Americans (Mesa-Lago et al., 2000). Trade agreements were also made with the German Democratic Republic and Czechoslovakia. China and the Soviet Union agreed to buy Cuban sugar at world prices and, in fact, Soviet imports of Cuban sugar more than compensated the loss of Cuban exports to the United States (Mesa-Lago, 1974; Mesa-Lago et al., 2000, p. 178). In addition, the USSR supplied oil, machinery and chemicals. A 100 million dollars credit line was open to supply capital goods and build factories. Moreover, Cuba deepened its political and economical ties with the USSR after the invasion of Czechoslovakia, since Castro publicly supported the invasion in 1968 (Mesa-Lago, 1973; Staten, 2003).

Mesa-Lago states that, despite Cuban leaders blame the American embargo for the economic problems, the real cause lies elsewhere:
“Without diminishing the adverse effects of the embargo, the fundamental cause of said problems has been the economic policies of the past half century: collectivization and centralization of virtually the entire economy, seven changes of economic organization and four in development strategy, and a drastic cut in individual incentives” (Mesa-Lago, 2010, p. 375).

In terms of economic performance, this institutional change was clearly more important than the embargo imposed by the United States. Despite Cuban dependency to United States resulted in some short run losses in the beginning of the embargo (Pérez Jr., 1995, p. 346), trade losses were compensated by agreements with the USSR and other socialist countries during the period we analyzed. According to Pérez Jr. (1995, p. 384), the socialist bloc insulated Cuba from the effects of the embargo. In the next subsection, we argue why the last hypothesis, the erratic economic policies cited by Mesa-Lago (2010), is not the main cause of the Cuban failure but only a consequence of institutions.

6.4 Political instability and erratic economic policies

Mesa-Lago et al. (2000, p. 174) divide the entire period prior to 1985 in several sub-periods in terms of economic policy: (a) liquidation of capitalism and market erosion (1959-60); (b) Stalinist central planning model (1961-63); (c) debate over alternative socialist models (1964-66); (d) adoption and radicalization of a Guevarist model (1965-70) and; (e) a moderate Soviet model of economic reform (1971-1985). This periodization shows that economic policies went back and forth a plenty of times during the period. Some might argue that this instability may have harmed Cuban economic growth. Indeed it did, but it was a consequence of the institutional change.

During the first stage, several institutional changes carried out by the Cuban governments had pervasive effects on Cuban economic performance, as we have already mentioned earlier. These problems led Castro to search for pragmatic solutions. The Cuban government forgot the idea of a “new socialist man” and followed the Soviet planning model giving material
incentives to the workers and hence diminishing some of the sources of inefficiencies. However, the adoption of a Stalinist model of planning was not fruitful as well. One of the main measures taken by the government at this time consisted of diverting resources from the sugar sector in order to diversify production. It was a costly measure, which led Castro to rethink his policies again.

Aware that the arbitrary decision to industrialize had been a mistake, the Cuban government created a “Prospective Sugar Plan” (1965-1970) supported by USSR technical knowledge. From 1964 to 1966, there was a strong political debate concerning what would be the right socialist model between pragmatists and Guevarists. The latter, who defended strong centralization and full collectivization of the means of production, won the battle. This led Cuba to adopt a more radical version of the Guevarist model from 1966 to 1970, which caused decline in efficiency, strong price distortions, rising work absenteeism and supply shortage. The clear lack of success of this new Guevarist attempt led the Cuban government to readopt a moderate Soviet model from 1971 to 1985 (Mesa-Lago et al., 2000, pp. 195-263).

At the end of the 20th century, with the fall of the Berlin Wall and the end of the Soviet Union, Cuba faced severe economic difficulties. Only in 1996, the Cuban economy started to recover under different policies created in order to face this new stage without foreign help (Mesa-Lago et al., 2000). The end of the Cold War resulted on severe economic hardships to the Cuban population, with disappointing growth performance during the past 25 years (Brundenius, 2009; Mesa-Lago, 2010).

Rather than conjunctural reasons such as economic policies, structural factors seem to be more important to explain Cuban economic stagnation. In the Cuban case, recurrent changes in economic policies were a result of the adoption of inefficient institutions. All economic policies were costly because none of them could work without market mechanisms and some individual incentives. The recurrent changes were attempts to find an unreachable solution.
7 Final Remarks

In this paper, we argued that the Cuban GDP level started to diverge from its historical tendency and from other Latin American countries exactly in 1959. In order to identify when Cuba was left behind, we used the Synthetic Control Method, creating a counterfactual Synthetic Cuba. This Synthetic Cuba was built using earlier Cuban GDP records and data from other Latin American countries, whose weights were defined by the method’s optimization process.

We claimed, as many scholars have already done, that the institutional change caused by the Revolution was the main cause of the divergence from 1959 onwards. We also dismissed the claims that war, human capital, economic embargo and economic policies pursued by the Cuban government were the main causes of the Cuban economic failure. The latter hypothesis could be an explanation, but clearly the economic policies undertaken by Castro were erratic because all of them failed due to lack of market mechanisms. Therefore, at least in the Cuban case, institutions explain the unsuccessful results of Cuba in terms of GDP per capita levels.

We believe that our study found additional evidence that institutions play an important role on a country’s economic performance. In terms of empirical strategy, we were also able to overcome some difficulties such as the reverse causalities and omitted variables problems that were pointed out by Glaeser and his associates (2004). We also have not used proxy variables to capture institutional changes, avoiding criticism relating to those uses. Also, we did not need to use and “defend” the validity of instruments for institutions. Thus our findings stand immune to the common criticism that studies of this sort face.

Finally, the tests performed give robustness to our findings and show that the gap between the Synthetic and actual Cuban GDP per capita could be attributed to the institutional change that happened in 1959. Our tests rule out the possibility that the effect is merely random or that is a consequence of the destruction caused by the revolutionary war.

Further research must investigate the effects of the trade embargo imposed by the United
States. Despite Cuba has replaced the embargo’s losses by increasing trade with the Soviet bloc, it is possible that our results are underestimated if we consider that Cuba had gains of trade changing its trading partners. On the other hand, our results may be overestimated if commerce with the Soviet bloc did not overcome the losses imposed by the embargo. Although most studies assert that the embargo was not a problem during 30 years (Mesa Lago et al., 2000; Pérez Jr., 1995), we still need better counterfactuals of how these political problems regarding trade affected Cuban economic performance.

Although we suggest that institutions are fundamental to the prosperity of a country, we are not underestimating the relevance of human capital. Good institutions are not only important to a country’s higher productivity of physical capital, but also human capital. Cuba may have had “good” educational levels after 1959, but the country’s labor market institutions did not ensure adequate conditions to labor appropriation of its productivity. These institutions may have restricted the positive effects of human capital in wealth and income.

Summing up, the Revolution in Cuba resulted in a drastic change in the country’s institutions. Arguably it can be stated that the abolition of private property and the institution of central planning were among the most drastic of those changes. Cuban institutions, which did not relied at all on markets, had an enduring influence on Cuban economic performance. Institutional change through the end of market mechanisms and the collectivization process is probably the main reason of the country’s economic failure. As Ward and Devereux (2011) assert, despite some social achievements, it does not seem that history will absolve the Cuban regime.
Appendix

Table 03 - Root Mean Squared Error Report

<table>
<thead>
<tr>
<th>Countries</th>
<th>Pretreatment RMSPE</th>
<th>Ratio of RMSPE</th>
<th>Ratio higher than 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuba</td>
<td>0.1108</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
<td>0.1698</td>
<td>1.53</td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>0.0718</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>0.0798</td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td>Nicaragua</td>
<td>0.1084</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>Venezuela</td>
<td>0.2382</td>
<td>2.15</td>
<td>*</td>
</tr>
<tr>
<td>Argentina</td>
<td>0.1936</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td>Honduras</td>
<td>0.2588</td>
<td>2.34</td>
<td>*</td>
</tr>
<tr>
<td>Colombia</td>
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</tr>
<tr>
<td>Uruguay</td>
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<tr>
<td>Mexico</td>
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<tr>
<td>Costa Rica</td>
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<td></td>
</tr>
<tr>
<td>Brazil</td>
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<td>1.23</td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td>0.0511</td>
<td>0.46</td>
<td></td>
</tr>
</tbody>
</table>

Extending the analysis to 1980

Figure 09 - GDP per capita of Cuba and Synthetic Cuba (until 1980)
References


