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CRISIS RESILIENCE IN LATIN AMERICA: DOLLARIZATION OR FLEXIBLE
EXCHANGE RATES – WHICH OFFERED THE BEST PROTECTION DURING THE 2008
GLOBAL FINANCIAL CRISIS?

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Abstract

This study evaluates the performance of dollarized economies in Latin America during the 2008 Global Financial Crisis, focusing on Ecuador and El Salvador, to assess the effectiveness of dollarization as a crisis-resilient monetary regime. The analysis uses the Synthetic Control Method alongside Difference-in-Differences to compare these countries to counterfactual non-dollarized scenarios across three key economic indicators. Results show that dollarization did not outperform the counterfactual, with El Salvador significantly underperforming. The findings emphasize the limitations of dollarized monetary regimes in providing resilience during crises in Latin America, particularly for economies lacking structural reforms and institutional readiness when adopting the dollar.

Keywords: Ecuador; El Salvador; dollarization; global financial crisis; current account balance; logarithm GDP per Capita; inflation

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1 Introduction

Collapsing banks, out-of-control hyperinflation, government-mandated frozen accounts, rising unemployment, and violent protests that left people dead - this was Ecuador in 1999 (Beckerman 2001). The country was in chaos, teetering on the brink of economic and social collapse. In the midst of this turmoil, President Jamil Mahuad proposed a radical solution to pull Ecuador back from the brink: dollarization. The plan? Abandon the local currency, the sucre, and fully adopt the U.S. dollar (USD).

Dollarization was unprecedented-not just in Latin America (LatAm), but worldwide, with the exception of Panama, which had used the dollar alongside its local currency since 1904. Ecuador's move meant relinquishing its monetary sovereignty and placing its economic destiny in the hands of the U.S. Federal Reserve (Fed) (Larrea 2004). Announced in January 2000, the decision was as polarizing as it was desperate. The controversy was so intense that, just days later, the military and police sided with demonstrators to remove Mahuad from office.

But despite public skepticism, the results were immediate and largely positive. Inflation fell, investor confidence soared, and Ecuador began to regain stability (Beckerman 2001). Inspired by these results, El Salvador followed suit just a year later in 2001-not out of economic crisis, but as a calculated move to leverage the strength of the USD for long-term stability, inflation control, and attracting foreign investment.

In the years following dollarization, both countries experienced remarkable economic growth, in line with a broader LatAm boom from 2003 to 2007. During this period, regional GDP grew at an average annual rate of 4.5 percent, peaking at 5.7 percent in 2007, driven by a global commodities boom and robust export activity (ECLAC 2010). However, the 2008 global financial crisis (GFC) exposed the vulnerabilities of dollarization. While non-dollarized countries in LatAm responded with tailored monetary policies to cushion the blow, Ecuador and El Salvador were tied to the monetary policy decisions of the Fed, which prioritized U.S.

domestic conditions over their unique economic challenges. Despite this constraint, dollarized economies also enjoyed some advantages. The USD shielded Ecuador and El Salvador from currency fluctuations that non-dollarized countries experienced during the crisis. This duality raises a critical question: How effective is dollarization as a monetary regime in times of global economic turmoil?

This study seeks to answer this question by analyzing the economic performance of Ecuador and El Salvador during the 2008 GFC using three key indicators: logarithm (log) GDP per capita, current account balance (% of GDP) (CA), and inflation. Using the Synthetic Control Method (SCM), the research constructs a counterfactual scenario for both countries - a hypothetical reality in which they retained their own currencies. The Difference-in-Differences (DiD), combined with graphical analysis, is then applied to quantify and visualize the specific impact of dollarization on each variable. By comparing actual and counterfactual outcomes, this analysis provides a nuanced assessment of the strengths and weaknesses of dollarization as a monetary regime during the 2008 GFC.

Prior research has primarily concentrated on specific economic variables, deriving conclusions from direct comparisons between dollarized and non-dollarized countries using data from the time surrounding the GFC. For example, Cristo and Gómez-Puig (2014) evaluated investor confidence using the Emerging Markets Bonds Index (EMBI), Martínez et al. (2013) examined sovereign bond spreads, and Castro and Campos (2017) analyzed foreign direct investment (FDI) levels. In contrast, this paper employs a novel approach to evaluate the resilience of dollarization as a monetary regime during periods of economic crisis. It constructs a counterfactual scenario based on each country's economic conditions prior to the introduction of the USD, and then creates an overall picture of the country's resilience by analyzing the

movements of the three key variables during the 2008 GFC. This contribution will be further elaborated in the next section of this paper, the literature review.

To provide an short overview of the structure of this paper, it is organized as follows: Following the literature review, Section 3 presents the data and methodology used to assess the impact of dollarization. Next, the results section begins with an examination of counterfactual weights for both countries and evaluates the impact of dollarization during the 2008 GFC using DiD estimates and graphical analyses of the three key variables. These findings are then contextualized within the economic conditions of the time, explaining the observed movements, integrating them with the existing literature, and addressing the limitations of the paper. The final section summarizes the findings on dollarization as a crisis mitigating monetary regime during the 2008 GFC and concludes the paper.

2 Related Literature

The literature offers several methods for studying the effects of different monetary regimes, with traditional approaches such as DiD and Regression Discontinuity Design being widely used since the 20th century. In recent years, however, the SCM has gained prominence for its effectiveness in evaluating interventions with small treatment groups, offering a more robust and transparent alternative to traditional methods.

SCM was first introduced by Abadie and Gardeazabal (2003) in their analysis of the economic impact of terrorism in the Basque Country. Its methodology gained prominence through Abadie et al. (2010), who formalized SCM and applied it to evaluate California's Proposition 99, a tobacco control program. This application demonstrated SCM's ability to overcome key limitations of older methods such as DiD by providing greater transparency, robustness, and suitability for cases with limited treatment groups. Since then, SCM has been widely adopted in a variety of fields. In public health, for example, Kreif et al. (2015) used it to evaluate the Advancing Quality pay-for-performance policy aimed at reducing hospital mortality.

In the context of dollarization, SCM has been applied less extensively due to its relatively recent development and the fact that Ecuador and El Salvador dollarized their economies almost 25 years ago. Among the limited number of studies, Hallren (2014) applied the SCM to Ecuador and showed that while dollarization reduced inflation, it did not significantly increase income growth in the country. Similarly, Cachanosky and Ramseur (2020) examined the long-term effects of dollarization in Ecuador and El Salvador and found that dollarization stabilized inflation and exchange rates but did not significantly boost long-term economic growth. They also noted the trade-offs, such as limited policy flexibility and mixed outcomes for trade and investment.

However, SCM's ability to analyze the effects of dollarization during the 2008 GFC is limited because the crisis affected all economies simultaneously. Instead, other methods have been used to compare the impact of the crisis on dollarized and non-dollarized economies. Nevertheless, the literature on the impact of dollarization during the 2008 GFC in LatAm remains limited, with results often contradictory and varying depending on the variables examined.

Cristo and Gómez-Puig (2014) examined the stability of dollarized economies during the GFC using the EMBI in a cointegrated vector framework. Their results suggest that investor confidence remained higher in dollarized economies, which was reflected in more stable EMBI values. However, non-dollarized economies were better able to adjust their currency values to maintain trade competitiveness. Martinez et al. (2013) similarly analyzed sovereign bond spreads using a panel data framework for seven LatAm countries. They found that while dollarized economies benefited from tighter spreads, their lack of flexibility in managing spreads made them more vulnerable to capital flight during crises.

On another front, Castro and Campos (2017) used a dynamic panel analysis to show that non-dollarized countries in LatAm maintained higher levels of FDI during the GFC. In contrast,

Ecuador and El Salvador experienced sharper declines in FDI inflows, reflecting the rigidity of their monetary regimes. Meanwhile, Rosas Rojas et al. (2019) found that dollarized economies experienced lower inflationary pressures than those with flexible exchange rates, resulting in greater price stability during the downturn.

The current body of literature on this topic primarily examines the period surrounding the 2008 GFC, drawing conclusions based on the results of individual variables analyzed to determine which monetary regimes performed better during the crisis. However, this approach often focuses on isolated variables, such as EMBI, FDI or inflation, and fails to provide a comprehensive understanding of the broader economic effects. Moreover, it fails to take into account the specific influence of the USD on these economies at the time of its adoption, which may lead to inaccurate conclusions about the suitability of dollarization as a strategy for crisis resilience.

This paper addresses these gaps by analyzing the potential economic trajectories of dollarized countries under a counterfactual scenario in which dollarization never occurred, abstracting from the influence of the USD at the time of its adoption. In addition, the problem of focusing on a single variable is resolved by selecting three distinct variables that, when analyzed together, provide a broad economic perspective on the impact of dollarization. By integrating these approaches, this study offers a novel and comprehensive analysis of the viability of dollarization as a monetary regime, particularly its resilience during the 2008 GFC in LatAm.

3 Methodology and Data

This study examines the economic performance of dollarized and non-dollarized countries in LatAm, with a particular focus on those operating under floating exchange rate regimes. While a compelling alternative would be to compare fully dollarized economies—a characteristic unique to LatAm—with fixed exchange rate regimes, it should be noted that no country in the

region maintains a fixed exchange rate against the USD. Such regimes are more prevalent in other regions, including the Middle East (e.g., Saudi Arabia, the United Arab Emirates, and Jordan) and Hong Kong. In light of the pronounced institutional and regional dissimilarities between LatAm and these other regions, this study narrows its focus to LatAm, where countries exhibit similarities in terms of economic development, institutional frameworks, and geopolitical influences. For these reasons, this study focuses exclusively on LatAm and analyzes the economic performance of dollarized versus floating exchange rate regimes during the 2008 GFC.

To evaluate this performance, this study focuses on three key variables: Log GDP per capita, CA, and inflation. Log GDP per capita captures economic growth and resilience, illustrating how these economies weathered the downturn and subsequent recovery. The CA reflects trade dynamics and external stability, which are critical during a global crisis when external shocks can disproportionately affect economies that lack monetary flexibility. Inflation provides insights into price stability, highlighting how dollarized economies have managed cost pressures without access to independent monetary policy. Together, these variables provide a comprehensive perspective on crisis performance across critical economic dimensions.

The following sections outline the methodology and data sources used in this study.

3.1 Synthetic Control Method

The SCM creates a weighted combination of non-dollarized LatAm countries to construct counterfactual scenarios for Ecuador and El Salvador as if they had not adopted the USD. This is achieved by minimizing a combined loss function that integrates multiple covariates through a system of equations designed to ensure an optimal fit between observed and synthetic pre-dollarization outcomes. The method estimates the evolution of the three key economic variables in the absence of dollarization, thereby providing crucial insights into the period surrounding the 2008 GFC. This paper employs the extended framework proposed by Cattaneo, Feng, and

Titunik (2021) to enhance the precision and robustness of the analysis. For a comprehensive account of the model, see Appendix 9.1.

In order to estimate the weight composition of the counterfactual, the model presented in this paper includes nine variables across multiple specifications, built sequentially from S1 to S9. The baseline specification (S1) includes only the raw series or residuals and a constant term for the key economic variable of interest, with additional covariates introduced step by step in subsequent specifications. This iterative approach systematically refines the synthetic counterpart, ensuring the robustness of the SCM.

3.2 Data and Methods

This section outlines the data sources and the process of imputation for the variables that form the basis of the SCM. The SCM is based on the following nine discrete variables: GDP per capita in logs of USD (real, with base year 2010), GDP growth (year-over-year [YoY] variation from GDP), inflation (YoY variation from the Consumer Price Index [CPI]), unemployment rate, population in logs, industrial production in logs of USD (real, with base year 2005), CA, FDI and broad money, with the last four measured as percentage of GDP. Data were collected from 16 LatAm countries¹. Ecuador and El Salvador serve as treatment units as they have adopted the USD. Non-LatAm countries were excluded from the donor pool to ensure a focused comparison of the effects of dollarization during the GFC within the LatAm region. In addition, Panama (due to the use of the USD with its local currency), the Caribbean (due to their structurally different economies), and the unique case of Venezuela were also excluded from the analysis.

The data covers a quarterly panel from 1995Q1 to 2013Q2. Starting from 1995Q1 ensures sufficient pre-dollarization data to construct robust counterfactuals for Ecuador and El

¹ Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru, and Uruguay.

Salvador, which adopted the dollar between 1999Q4 and 2000Q1 and between 2000Q4 and 2001Q1, respectively. The onset of the crisis is identified between 2008Q2 and 2008Q3. For the DiD analysis, the pre-crisis period covers the five years from 2003Q3 to 2008Q2, while the post-crisis period covers the five years from 2008Q3 to 2013Q2. This design enhances the robustness of the results and allows sufficient time for both countries to adjust to dollarization, which may have affected the DiD results.

All data are drawn exclusively from authoritative sources, with separate datasets used for different economic indicators. However, the availability of macroeconomic time series is often inconsistent, particularly for emerging markets, specific countries, or time periods. To address these inconsistencies and complete the panel of macroeconomic variables, data were obtained from multiple providers and interpolation methods applied. The interpolation approach facilitated the conversion of annual data into a quarterly frequency and enabled the estimation of missing values, resulting in a more detailed and comprehensive dataset for analysis.

GDP data and industrial production data were both sourced from the World Bank's Global Economic Monitor dataset. CPI data were obtained from the International Monetary Fund's (IMF) International Financial Statistics dataset, while CA data were derived from the IMF's Balance of Payments dataset. Unemployment, FDI, and broad money data were obtained from the World Bank's World Development Indicators. Population data were sourced from the World Bank's Population Estimates and Projections dataset. Since data for unemployment, population, FDI and broad money were only available on an annual basis, piecewise cubic Hermite interpolation² was used to fill the gaps for both countries. A detailed explanation of the

² The interpolation was done separately for the pre- and post-dollarization periods. Pre-dollarization data were used exclusively for the pre-dollarization interpolation and similarly for the post-dollarization period. For Ecuador and El Salvador, as treatment units with different pre- and post-dollarization periods, the data were adjusted accordingly, resulting in two separate datasets tailored to each country.

procedures for dealing with missing variables is provided in Section 9.2 of the Appendix, where each variable is discussed separately in the case of missing data.

3.3 Difference-in-Differences

The DiD methodology, following the approach outlined by Card and Krueger (1994), allows to isolate the specific impact of dollarization on the analyzed variable during the 2008 GFC, while controlling for the broader effects of the crisis that affected the country under study. The actual data for Ecuador and El Salvador, as dollarized economies, serve as the treated group in each analysis, while their counterfactuals, constructed using the SCM, represent the non-dollarized control group for each country. The model takes the following form:

$$Y_{it} = \alpha + \beta_1 \text{Dollarized}_i + \beta_2 \text{Post2008}_t + \beta_3 (\text{Dollarized}_i * \text{Post2008}_t) + \varepsilon_{it}$$

The outcome variable Y_{it} represents the economic performance measure for unit i at time t . The term α denotes the baseline outcome for the control group during the pre-crisis period. Dollarized_i is a dummy variable indicating whether the unit is dollarized (1 for actual data; 0 for counterfactual), while Post2008_t is a dummy variable representing the post-crisis period. For the trend analysis, $\text{Post2008}_t = 1$ covers 2008Q3–2013Q2, with $\text{Post2008}_t = 0$ for the pre-crisis period of 2003Q3–2008Q2. The interaction term $\text{Dollarized}_i * \text{Post2008}_t$ captures the incremental effect of dollarization during and after the crisis, with β_3 being the coefficient of interest representing this effect. Finally, ε_{it} is the error term, accounting for unobserved factors.

As the validity of the DiD estimates is dependent upon the parallel trends assumption, a robustness check is conducted using a placebo regression. This procedure examines the pre-crisis period to identify any potential deviations from the parallel trend assumption, thereby evaluating the reliability and robustness of the DiD results.

4 Results

4.1 Synthetic Control Method Weights

The composition of the weight structure of the donor pool for Ecuador's counterfactual inflation in the absence of dollarization is described in Table 1. As specifications progress from S1 to S9, with the inclusion of additional covariates, the distribution of weights among donor countries shifts significantly. In the first specification (Inflation), Argentina receives a dominant weight of 92.154%, indicating that Ecuador's pre-dollarization inflation was most similar to Argentina's. The inclusion of the second covariate, GDP growth, changes the weight structure significantly. As additional covariates are introduced, the weights adjust more subtly, reflecting a refined tuning of the model. The final weight structure in S9 is used to estimate Ecuador's counterfactual inflation. These weights remain consistent across all three variables analyzed for Ecuador, reflecting the advanced SCM approach that minimizes the combined loss across all covariates considered to produce robust results. For a detailed breakdown of the weight composition of the other two variables across S1 to S9, see Appendix Section 9.3.

| Country | S1 (INF) | S2 (+GDPG) | S3 (+CA) | S4 (+UR) | S5 (+GDP) | S6 (+POP) | S7 (+M2) | S8 (+FDI) | S9 (+IP) |
|------------|-------------|---------------|-------------|-------------|--------------|--------------|-------------|--------------|-------------|
| Argentina | 92.154 | 51.844 | 51.845 | 51.843 | 51.843 | 51.843 | 51.837 | 51.836 | 51.836 |
| Belize | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Bolivia | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Brazil | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Chile | 0.000 | 11.950 | 11.952 | 11.953 | 11.954 | 11.953 | 11.944 | 11.943 | 11.943 |
| Colombia | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Costa Rica | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Guatemala | 0.000 | 28.077 | 28.075 | 28.075 | 28.075 | 28.076 | 28.091 | 28.093 | 28.093 |
| Honduras | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mexico | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Nicaragua | 7.846 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 |
| Paraguay | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Peru | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Uruguay | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Table 1: Weights SCM Ecuador Inflation³

³ INF represents inflation, GDPG denotes GDP growth, CA refers to the current account balance, UR indicates the unemployment rate, GDP stands for log GDP per capita, POP represents log population, M2 refers to broad money, FDI denotes foreign direct investments, and IP represents industrial production.

A similar pattern is observed in Table 2 for El Salvador's inflation. Countries like Belize and Paraguay, which initially hold significant weight in S1, lose prominence in later specifications. This shift indicates that while these countries initially exhibited inflation behavior similar to El Salvador, their relevance diminishes as the model incorporates a broader range of covariates. The evolving weight distribution highlights the refinement process, where the counterfactual increasingly captures the nuanced economic dynamics and structural characteristics of El Salvador in the absence of dollarization, with 9 out of 14 countries receiving a weight. As in the case of Ecuador, the donor weights in S9 remain constant across all three variables, thus ensuring a consistent and robust application of the SCM. Further details on the weight composition for the other two variables across specifications S1 to S9 are provided in Appendix Section 9.3.

| Country | S1 (INF) | S2 (+GDPG) | S3 (+CA) | S4 (+UR) | S5 (+GDP) | S6 (+POP) | S7 (+M2) | S8 (+FDI) | S9 (+IP) |
|------------|-------------|---------------|-------------|-------------|--------------|--------------|-------------|--------------|-------------|
| Argentina | 1.526 | 1.275 | 1.275 | 1.275 | 1.276 | 1.277 | 1.277 | 1.277 | 1.277 |
| Belize | 52.967 | 8.630 | 8.630 | 8.630 | 8.629 | 8.628 | 8.629 | 8.629 | 8.629 |
| Bolivia | 1.601 | 11.034 | 11.033 | 11.033 | 11.032 | 11.032 | 11.033 | 11.037 | 11.037 |
| Brazil | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Chile | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Colombia | 0.000 | 11.953 | 11.953 | 11.952 | 11.956 | 11.957 | 11.957 | 11.957 | 11.957 |
| Costa Rica | 0.782 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Guatemala | 0.000 | 38.203 | 38.203 | 38.204 | 38.198 | 38.195 | 38.193 | 38.191 | 38.191 |
| Honduras | 5.602 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mexico | 11.221 | 3.314 | 3.314 | 3.314 | 3.314 | 3.315 | 3.315 | 3.314 | 3.314 |
| Nicaragua | 0.000 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 |
| Paraguay | 20.082 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Peru | 0.000 | 17.814 | 17.815 | 17.815 | 17.818 | 17.819 | 17.821 | 17.818 | 17.818 |
| Uruguay | 6.221 | 7.669 | 7.669 | 7.670 | 7.669 | 7.669 | 7.669 | 7.669 | 7.669 |

Table 2: Weights SCM El Salvador Inflation

The diversity of Ecuador's and El Salvador's donor pools contributes to the construction of distinct, robust counterfactuals for each country. These counterfactuals arguably encapsulate the unique economic landscapes that Ecuador and El Salvador might have faced in the absence of dollarization. Accordingly, the counterfactuals developed in S9, with their covariate structures and weight distributions, serve as the respective baselines for the DiD analyses. This allows for a comprehensive assessment of the impact of dollarization on each country during the 2008 GFC.

4.2 Evaluating Dollarization's Effects During the 2008 Global Financial Crisis

The precise impact of dollarization during the 2008 GFC is outlined in Table 3. This table presents the DiD estimates, residual diagnostics, and a placebo test to verify the parallel trends assumption for the three key variables analyzed in both Ecuador and El Salvador. All referenced numerical results in the subsequent analysis are derived directly from this table. The following discussion integrates numerical findings with graphical analysis to offer a comprehensive evaluation of the outcomes for each variable in both countries.

| | log GDP per Capita | | Current Account Balance (% of GDP) | | YoY Inflation | |
|---|----------------------------------|----------------------------------|---------------------------------------|----------------------------------|----------------------------------|----------------------------------|
| | Ecuador | El Salvador | Ecuador | El Salvador | Ecuador | El Salvador |
| DiD Estimates | Coefficient (t-Value) | Coefficient (t-Value) | Coefficient (t-Value) | Coefficient (t-Value) | Coefficient (t-Value) | Coefficient (t-Value) |
| Intercept | 6.720 (397.085)*** | 5.814 (464.053)*** | 0.017 (3.216)*** | 0.010 (0.253) | 32.651 (72.733)*** | 1.327 (3.165)*** |
| Dollarized | 0.046 (1.942)* | -0.089 (-5.000)*** | 0.003 (0.436) | -0.046 (-7.590)*** | -27.588 (-43.456)*** | 1.641 (2.767)*** |
| Post2008 | 0.028 (7.651)*** | 0.203 (11.460)*** | -0.011 (-1.44) | 0.000 (0.011) | -1.218 (-1.918)* | -1.387 (-2.339)** |
| Dollarized*Post2008 | 0.028 (0.415) | -0.119 (-4.736)*** | 0.020 (-1.834)* | 0.001 (0.073) | -1.245 (-1.387) | 3.397 (4.050)*** |
| Adjusted R ² | 0.649 | 0.7861 | 0.176 | 0.583 | 0.981 | 0.498 |
| F-Statistic | 49.63*** | 97.810*** | 6.611*** | 37.880*** | 1323*** | 26.780*** |
| DiD Residuals | Value | Value | Value | Value | Value | Value |
| Q1 | -0.069 | -0.044 | -0.016 | -0.014 | -1.171 | -1.048 |
| Median | 0.003 | 0.001 | 0.001 | -0.001 | 0.019 | -0.381 |
| Q3 | 0.054 | 0.042 | 0.011 | 0.012 | 0.748 | 0.258 |
| Placebo Test for Parallel Trends | Coefficient (t-Value) | Coefficient (t-Value) | Coefficient (t-Value) | Coefficient (t-Value) | Coefficient (t-Value) | Coefficient (t-Value) |
| Interaction Term | -0.005 (-6.710)*** | -0.005 (-9.830)*** | 0.005 (5.767)*** | -0.003 (-3.462)*** | -0.1258 (-1.756)* | 0.005 (0.078) |

Table 3: DiD Estimates, Residuals, and Placebo Test for Parallel Trends for Ecuador and El Salvador (2008 GFC)⁴

The interaction term from the DiD analysis for Ecuador's inflation indicates that dollarization did not lead to a more stable inflation trajectory after the crisis. This finding is supported by the

⁴ Significance levels are denoted as follows: *** for $p < 0.01$, ** for $p < 0.05$, and * for $p < 0.10$.

robustness check, which confirms that the pre-crisis movements between the two scenarios do not show a statistically significant divergence, thus fulfilling the assumption of parallel trends underlying the DiD analysis. The residual analysis provides further evidence of the model's robustness, with a median residual close to zero (0.019), a relative narrow interquartile range (Q1: -1.171, Q3: 0.748), and a high adjusted R^2 value (0.981), indicating that the model explains a substantial proportion of the observed variation in inflation. The highly significant F-statistic (1323) serves to enforce the model's considerable explanatory power. Figure 1 provides further confirmation of these findings. However, in the period immediately following the crisis, the rate of inflation in real Ecuador declined at a more precipitous rate than in the counterfactual. Nevertheless, over the long term, no significant difference is observed in the overall inflation trajectory between the dollarized and non-dollarized scenarios.

Similarly, the robustness check for inflation in El Salvador confirms no significant violation of the parallel trends assumption, thereby validating the DiD results. However, the interaction term Dollarized*Post2008 for inflation (3.397, $t=4.050$) is highly significant, indicating that inflation in dollarized El Salvador increased by an average of 3.4% post-crisis compared to what would have occurred in the absence of dollarization, suggesting greater resilience in the real scenario. The residual analysis provides further evidence of the model's robustness, with a median residual of -0.381 and an interquartile range spanning from Q1: -1.048 to Q3: 0.258, and the adjusted R^2 is 0.498, indicating a moderate fit. The highly significant F-statistic (26.78) serves to underscore the model's explanatory power. Figure 1 provides further insight into these findings. Following the crisis, inflation in the counterfactual scenario declined at a similar rate but persisted nearly three times longer, eventually entering and remaining in the deflation zone, even as inflationary pressures began to recover. Despite this recovery, the counterfactual was unable to close the initial gap with real inflation in dollarized El Salvador, resulting in a sustained divergence between the two scenarios.

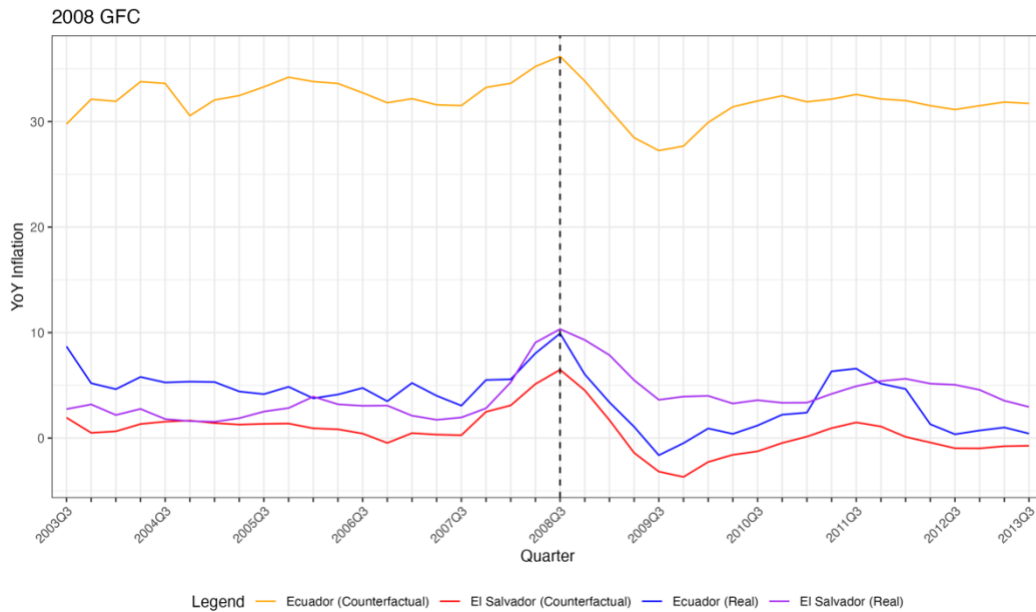


Figure 1: YoY Inflation for Ecuador and El Salvador⁵

The DiD estimates for Ecuador's log GDP per capita indicate that the economic growth trajectory of dollarized Ecuador did not diverge significantly from that of its counterfactual in the post-crisis period. This is evidenced by the interaction term, which is statistically insignificant. However, the robustness check suggests that Ecuador's dollarization was significantly underperforming relative to the counterfactual prior to the crisis. This is evidenced by a trend deviation of -0.005 per quarter, which undermines the parallel trends assumption required for the validity of the DiD results. As illustrated in Figure 2, this underperformance is apparent prior to the crisis. However, during the 2008 GFC, Ecuador showed greater stability in the immediate term as it experienced a less severe downturn. In the long run, there is no evidence that dollarized Ecuador outperformed the counterfactual in the long run.

As with Ecuador, the placebo regression for El Salvador demonstrates a statistically significant deviation from the parallel trends assumption, with a pre-crisis trend of -0.005 per quarter. This pre-existing divergence questions the results of the DiD results, indicating that part of the observed post-crisis underperformance may be attributable to these pre-existing differences rather than solely to dollarization. Figure 2 illustrates that the post-crisis real log GDP per capita

⁵ The dashed black line indicates the onset of the 2008 GFC.

of dollarized El Salvador diverges to a much greater extent from its counterfactual than it did in the pre-crisis period, with the gap widening significantly over time. This movement is reflected in the highly significant DiD results, which show an 11.9% underperformance in log GDP per capita relative to the counterfactual. This highlights the potential long-term negative effects of dollarization. However, given the violation of the parallel trend’s assumption, this number should be interpreted with caution.

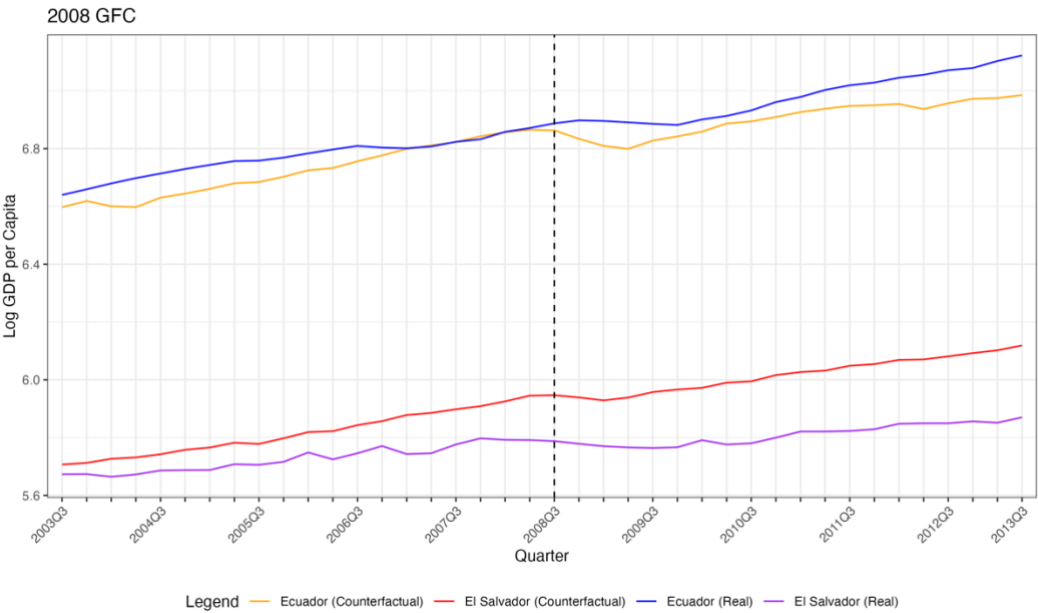


Figure 2: Log GDP per Capita for Ecuador and El Salvador

Upon examination of the CA illustrated in Figure 3, it becomes evident that the parallel trends assumption is invalid for Ecuador, rendering DiD estimates unreliable for this variable. In the period preceding the crisis, Ecuador's real current account was slightly below its counterfactual, but then rose significantly above it, indicating a notable divergence. Furthermore, the real CA demonstrates a considerably higher degree of volatility, with frequent spikes and drops, indicating that the two trajectories do not share the same underlying trends. In light of this violation, the analysis employs a graphical approach to interpret the effects of dollarization on the CA. Post-crisis, the real CA experiences a sharp decline, followed by a rapid recovery. In contrast, the counterfactual shows only a slight drop and then a strong increase. From mid-2009, the counterfactual turns downward, while the real CA follows a positive trajectory, albeit

with significantly higher volatility. However, both trajectories eventually return to their pre-crisis levels. These differences highlight the differential impact of dollarization on the path and volatility of Ecuador's CA during the 2008 GFC. However, as both scenarios eventually return to pre-crisis levels, neither turns out to be better in the long run.

For El Salvador, as for Ecuador, the parallel trend assumption is violated, invalidating the DiD results, as shown in Figure 3. While the counterfactual trajectory consistently remains above the actual CA throughout the pre-crisis period, a clear divergence emerges in the second half of this period. The real CA trends increasingly into negative territory, while the counterfactual hovers near the 0% level, maintaining a relatively stable trajectory. Moreover, the counterfactual shows only slight volatility, whereas the real scenario experiences significant fluctuations. In the period immediately following the crisis, the real CA experiences a sharp increase, which is significantly more pronounced than the corresponding rise in the counterfactual. However, this divergence is short-lived, as the real CA then embarks on a positive trajectory, returning to levels similar to those at the onset of the crisis. The counterfactual CA also returns to pre-crisis levels but follows a smoother and less pronounced negative trajectory, with notably lower volatility throughout the period.

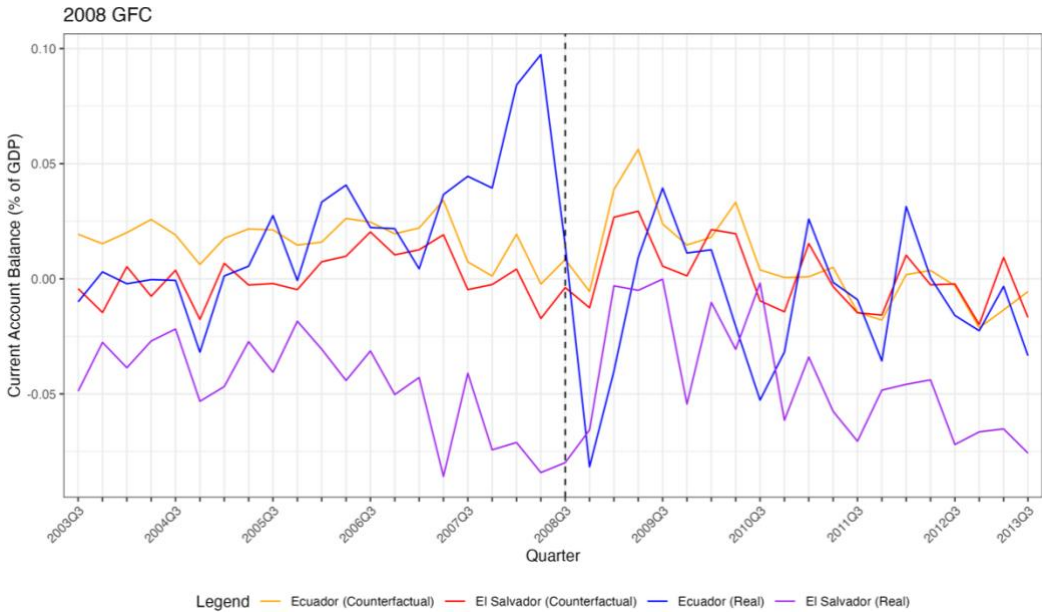


Figure 3: Current Account Balance (% of GDP) for Ecuador and El Salvador

An review of the three figures reveals that the counterfactuals for Ecuador and El Salvador exhibit remarkably similar movements across all three variables analyzed. This alignment is evident even in the volatile CA variable, despite the fact that the two counterfactuals were constructed with entirely different weight compositions. This consistency underscores the reliability of the SCM and justifies the exclusive focus on LatAm. The shared patterns reflect common regional dynamics and policy responses among non-dollarized economies, even during the GFC. The divergence between the observed trajectories and their counterfactuals highlights the transformative impact of dollarization, which fundamentally reshapes economic dynamics and distinguishes dollarized economies from their non-dollarized counterparts. The SCM demonstrates its ability to create independent yet reliable benchmarks by producing consistent counterfactual trends with distinct donor pool weights. This enhances confidence in the validity of the model and the conclusions drawn in this study.

5 Discussion

The first part of this section provides an economic interpretation of the movements in the three variables for Ecuador and El Salvador during the 2008 GFC. It aims to explain the economic rationale behind the results presented in the previous section, drawing on Figures 1 to 3 as necessary.

In the case of Ecuador, dollarization, combined with institutional and fiscal reforms, helped stabilize the economy after crises marked by hyperinflation and banking instability. By 2003, dollarization had eliminated currency risk, significantly reduced inflation, and set the stage for sustained growth.

Ecuador's heavy reliance on crude oil (25-30% of GDP) and agricultural exports such as bananas and shrimp (10% of GDP) shaped its economic trajectory around the 2008 GFC (World Bank 2024a, 2024b, 2024c).

Prior to the crisis, inflation in Ecuador followed a parallel trajectory to the counterfactual but remained at much lower levels as dollarization anchored inflation to the stable USD. At the same time, rising oil prices boosted log GDP per capita growth in both scenarios. However, currency flexibility in the counterfactual allowed for faster growth and mitigated the effects of temporary oil price declines (e.g., 2006Q2-2007Q1) by improving the competitiveness of non-oil exports through depreciation (EIA 2024). However, this advantage came to an end as the counterfactual could no longer withstand the currency appreciation pressures triggered by the crude oil price boom starting in 2007Q2. As a result, real log GDP per capita slightly outperformed the counterfactual during this period. The impact of oil on the Ecuadorian economy is also reflected in the CA. Dollarization ensures the full realization of oil export revenues, as crude oil is typically priced in USD, pushing up the CA as oil prices rise, especially during the intense boom period. In contrast, the counterfactual initially remained stable before experiencing a downturn during the oil boom as currency appreciation pressures exceeded the capacity of the monetary regime to manage them. This appreciation reduced the competitiveness of non-oil exports, increased imports, and ultimately pushed the CA into negative territory.

In the immediate aftermath of the crisis, inflation fell sharply in the dollarized scenario, driven by Fed's policy and the direct transmission of falling oil prices. In contrast, the counterfactual experienced a more gradual decline in inflation as country-specific monetary policies, such as interest rate cuts or targeted interventions, were tailored to mitigate the effects of the crisis. At the same time, Ecuador's CA fell significantly in the dollarized scenario due to the collapse in oil prices and its reliance on external borrowing, as it lacked tools such as seigniorage to generate fiscal stimulus. However, the elimination of exchange rate risk and the country's oil reserves allowed Ecuador to attract foreign financing, particularly from China, with repayment tied to future oil revenues (Herrera-Vinelli and Bonilla 2019). In the counterfactual, securing

external financing was more difficult due to currency risks. However, the ability to generate seigniorage revenues provided a means to finance fiscal stimulus, which contributed to the counterfactual CA experiencing only a small decline during this period. A substantial fiscal stimulus in actual Ecuador, financed by external borrowing, helped stabilize log GDP per capita. This, combined with the confidence of international markets in the USD, which provided predictable terms of trade, made the economy more resilient to the immediate effects of the crisis. In contrast, the counterfactual experienced a sharper decline in log GDP per capita, partly because the use of seigniorage revenues to finance fiscal reforms was constrained by the risk of exacerbating inflationary pressures and partly because of the potential for increased exchange rate volatility. However, the counterfactual's monetary flexibility facilitated a faster recovery, with a weaker currency boosting export competitiveness and interest rate cuts stimulating domestic demand.

As oil prices recovered in mid-2009, the dollarized scenario showed resilience in terms of log GDP per capita, supported by external borrowing and recovering export revenues. However, it did not outperform the counterfactual in the long run, as reflected in the DiD estimates. Similarly, the rebound in oil prices led to a strong increase in CA in both scenarios, although the counterfactual's CA gains were muted for the same reasons observed during the 2008 oil price boom. In the long run, both scenarios converged back to their pre-crisis values, suggesting no significant long-term outperformance of dollarization. Inflation also rose along with oil prices after 2009. The dollarized scenario experienced greater volatility due to fluctuations in oil prices, while the counterfactual maintained more stable inflation through the use of monetary policy. In the long run, however, inflation in the two scenarios did not diverge significantly, as reflected in the DiD results, which did not show statistically significant differences.

When considered collectively, the post-crisis movements across all three variables suggest that Ecuador's dollarized economy demonstrated performance characteristics comparable to those of a non-dollarized economy in the long run.

Unlike Ecuador, El Salvador adopted dollarization to attract foreign investment and enhance economic stability. However, in the absence of complementary reforms such as export diversification and fiscal consolidation, dollarization risked exacerbating structural vulnerabilities and economic challenges rather than delivering the expected benefits.

El Salvador's heavy reliance on price-sensitive exports such as textiles and coffee (40 % of exports) and remittances (20 % of GDP) shaped its economic trajectory around the GFC (World Bank 2024d; World Bank 2024e; World Bank 2024f; World Bank 2024g).

The pre-crisis inflation trends for the counterfactual and real El Salvador were similar, although the real scenario showed slightly more volatility due to its inability to cushion external price changes. Toward the end of the period, inflation rose in both scenarios due to the global oil price boom. However, the counterfactual experienced a smaller increase as a slight currency depreciation offset inflationary pressures, maintained external stability and helped keep the CA close to 0%. In contrast, dollarization amplified the effect of rising oil import costs and pushed the CA down. In addition, remittances in the dollarized scenario, received in USD, mainly fueled imports rather than supporting local goods, further constraining the CA. For log GDP per capita, remittances also played a key role as real El Salvador consistently lagged the counterfactual. This divergence stemmed from the currency depreciation in the counterfactual, which converted remittances into a weaker currency, boosting local goods and investment and leading to stronger long-term growth. In contrast, the fixed exchange rate under dollarization reduced export competitiveness, further widening the gap in log GDP per capita over time.

The GFC further exacerbated El Salvador's structural vulnerabilities, which were already evident before the crisis. While both the dollarized and counterfactual scenarios experienced an initial sharp decline in log GDP per capita, the recession lasted three times longer in the dollarized case due to the inability to generate seigniorage revenues for fiscal stimulus. Despite the stabilizing influence of the USD, structural weaknesses limited access to external financing, leaving El Salvador dependent on Fed policy and the pace of global recovery. As log GDP per capita recovered in both, the gap steadily widened, with the counterfactual outperforming due to its monetary flexibility, which allowed for greater economic stabilization and growth.

In the immediate post-crisis period, the CA increased significantly in both scenarios, driven by falling oil prices. However, the increase was more pronounced in the dollarized scenario, as the direct transmission of the oil price decline was not offset by currency adjustments. In the counterfactual, slight depreciation mitigated the improvement in CA, as higher import costs partially offset the benefits of cheaper oil. Declining remittance inflows also affected the CA in both cases, as job losses among Salvadorans in the US reduced the amount of money sent home. As oil prices recovered and remittances increased, the CA returned to pre-crisis levels in both scenarios, although the dollarized scenario experienced greater volatility due to its inability to adjust to global price changes. Neither scenario outperformed the other in the long run.

Inflation fell sharply at the onset of the crisis in both scenarios, driven by plunging oil prices and collapsing demand. In the counterfactual, the decline was more pronounced, as global deflationary forces outweighed inflationary pressures from devaluation and seigniorage. In contrast, the dollarized scenario, anchored by the USD, saw a slower adjustment, with both inflationary and deflationary shocks being mitigated. As inflation returned to a positive path, the counterfactual rebounded more sharply due to the amplified import costs from currency depreciation. Overall, dollarization provided greater inflation stability, avoided deflationary risks, and supported a steadier recovery.

However, when examining post-crisis trends in all three variables, the evidence suggests that El Salvador's dollarized economy underperformed its non-dollarized counterfactual during the 2008 GFC. Although these differences were already evident before the crisis, the downturn significantly exacerbated them.

The economic results presented in this paper are broadly consistent with the existing literature. For Ecuador, dollarization stabilized log GDP per capita through external borrowing (Cristo and Gómez-Puig 2014) but reduced fiscal flexibility relative to the counterfactual seigniorage-based stimulus (Martinez et al. 2013). In El Salvador, while dollarization provided inflation stability (Cristo and Gómez-Puig, 2014; Rosas Rojas et al., 2019), its rigidity exacerbated structural vulnerabilities and hindered recovery, highlighting the counterfactual's monetary flexibility (Martinez et al. 2013; Castro and Campos 2017). However, the literature largely overlooks the specific impact of the USD on these economies at the time of its introduction. Moreover, the narrow focus of individual papers on isolated variables, such as EMBI, FDI, or inflation, makes it difficult to fully understand the overall impact of the USD on economic stability during the 2008 GFC in LatAm, and thus to assess the broader viability of dollarization as a crisis-resilient monetary regime through a single study.

This study, like all research, has limitations. A key challenge lies in the SCM's construction of the counterfactual, which reflects the economic characteristics of the donor pool five years prior to dollarization, rather than five years prior to the 2008 GFC. This approach may overlook subsequent events affecting the donor pool, potentially changing the weight composition and thus limiting the accuracy of the counterfactual during the GFC. Another limitation is the choice of variables used to construct the counterfactual, as different variables affect the weights of the donor pool. Dimensions such as social, political, and governance factors that are important in

representing a country's complex economic situation could be included. Data availability was also a challenge, with gaps in some LatAm countries requiring interpolation. While this was done carefully, it may not fully capture economic nuances. In addition, this study focuses on only two countries, Ecuador and El Salvador. Their different economic structures and adoption contexts-Ecuador's crisis-driven adoption and El Salvador's proactive approach-limit the generalizability of the findings to other countries with different economic conditions and adoption motivations. Finally, the 2008 GFC is the only crisis analyzed. Although it provides valuable insights, the COVID-19 pandemic, being too recent for a full analysis, presents an opportunity for future studies to assess dollarization under a different global shock.

While these limitations must be acknowledged, they do not undermine the study's findings. Instead, they underscore the complexity of studying dollarization in crisis contexts and provide avenues for future research. Addressing these challenges could improve our understanding of different currency regimes and their effectiveness during periods of economic turmoil.

6 Conclusion

This paper analyzed how dollarized monetary regimes in LatAm performed during the 2008 GFC relative to non-dollarized economies, and thereby assessed their effectiveness as monetary regimes for crisis resilience. Focusing on Ecuador and El Salvador, the study evaluated their performance using three key economic indicators: log GDP per capita, CA, and inflation. By combining SCM and DiD, the analysis shows that while dollarization eliminated exchange rate volatility, its outcomes strongly depended on a country's economic structure and institutional readiness.

In Ecuador, dollarization acted as a stabilizing force during the GFC, supported by inelastic exports, access to foreign credit, and fiscal reforms implemented alongside the USD. While these factors helped Ecuador mitigate the immediate impact of the crisis, its long-term recovery did not outperform the counterfactual due to a lack of monetary flexibility.

El Salvador's experience, in contrast, highlights the limitations of dollarization in mitigating crises in fragile economies. Although the country maintained price stability and eliminated exchange rate volatility, its reliance on remittances, lack of export diversification, and inability to use monetary instruments left the economy vulnerable and resulted in a significant long-term underperformance relative to the counterfactual during the 2008 GFC. This shows that without strong institutional and economic foundations, dollarization can exacerbate structural weaknesses rather than foster resilience.

Taking all the results of this study together, it can be concluded that dollarization as a monetary regime does not mitigate the effects of crises any better than flexible exchange rate regimes, as having a domestic currency performs as well or even better than having the USD. Dollarization should therefore be considered only as a last resort, in extreme crisis conditions when no other viable solution exists. Ecuador's adoption in 2000 illustrates this, as dollarization helped the country recover from severe economic turmoil, but at the cost of losing its monetary policy tools. It should never be adopted solely for potential benefits such as exchange rate stability or investor confidence. El Salvador's experience highlights this risk, as the lack of structural reforms and institutional readiness exacerbated the drawbacks of losing monetary tools and ultimately outweighed the hoped-for benefits.

The findings of this paper are particularly relevant in light of recent developments in LatAm, as Argentina's President Milei is actively advocating the adoption of the USD as the solution to the country's ongoing economic crisis. Earlier this year, he said, "We are very close to being able to dollarize" (Janiot 2024, 23:48), signaling the government's seriousness about the move. However, this study shows that dollarization should only be pursued as a last resort, as the loss of monetary policy tools can severely limit a country's ability to respond to future crises and may ultimately do more harm than good. Argentina's decision to dollarize or retain monetary independence will undoubtedly shape future monetary economic policy debates in LatAm.

7 List of References


- Abadie, Alberto, Alexis Diamond, and Jens Hainmueller. 2010. "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program." *Journal of the American Statistical Association*, 105(490): 493–505.
- Abadie, Alberto, and Javier Gardeazabal. 2003. "The Economic Costs of Conflict: A Case Study of the Basque Country." *American Economic Review*, 93(1): 113–132.
- Beckerman, Paul. 2001. "Dollarization and Semi-Dollarization in Ecuador." *World Bank Publications*. <https://doi.org/10.1596/1813-9450-2643>.
- Cachanosky, Nicolás, and Jonathan Ramseur. 2020. "20 Years of Dollarization in Ecuador: A Synthetic Control Analysis." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3678055>.
- Card, David, and Alan B. Krueger. 1994. "Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania." *American Economic Review* 84 (4): 772–93.
- Castro, Paulo G., and Ana C. Campos. 2017. "FDI and the Subprime Crisis: An Analysis for Asian and Latin American Countries." *International Business Research*, 10(11): 206–218.
- Cattaneo, Matias D., Yingjie Feng, and Rocio Titiunik. 2021. "Prediction Intervals for Synthetic Control Methods." *Journal of the American Statistical Association*, 116(536): 1865–1880.
- Economic Commission for Latin America and the Caribbean (ECLAC). 2010. *Latin America and the Caribbean in the World Economy: A Crisis Generated in the Centre and a Recovery Driven by the Emerging Economies*. Santiago: United Nations.
- Hallren, Ryan. 2014. "The Impact of Dollarization and Currency Boards on Income and Inflation: A Synthetic Control Analysis." *ERN: Monetary Policy Objectives; Policy Designs; Policy Coordination (Topic)*. <https://doi.org/10.2139/ssrn.2486253>.
- Herrera-Vinelli, L., Bonilla, M. Ecuador-China Relations: the Growing Effect of Chinese Investment on Ecuadorian Domestic Politics, 2007–2016. *J OF CHIN POLIT SCI* 24, 623–641 (2019). <https://doi.org/10.1007/s11366-018-09588-6>.
- International Monetary Fund (IMF). 2009. "IMF Executive Board Approves Precautionary Stand-By Arrangement for El Salvador of About \$800 Million." *IMF*, January 16. <https://www.imf.org/en/News/Articles/2015/09/14/01/49/pr0910>. (accessed November 23, 2024).
- Janiot, Patricia. 2024. "Javier Milei: ¿Hacia Dónde Se Dirige Argentina? #Milei #Javiermilei #Argentina #Patriciajaniot." *YouTube video*, 43:59. Published January 26, 2024. Accessed November 29, 2024. <https://www.youtube.com/watch?v=tUE4CaQlrSE>.

- Kreif, Nadia, Richard Grieve, Dominik Hangartner, Amy Turner, Simona Nikolova, and Matt Sutton. 2015. "Examination of the Synthetic Control Method for Evaluating Health Policies with Multiple Treated Units." *Health Economics*, 25: 1514–1528. <https://doi.org/10.1002/hec.3258>.
- Larrea, Carlos. 2004. "Ecuador's Dollar Doldrums." *NACLA Report on the Americas*, 38(4): 47. <https://doi.org/10.1080/10714839.2004.11724508>.
- Marí del Cristo, María L., and Marta Gómez-Puig. 2014. "Dollarization and the Relationship between EMBI and Fundamentals: Latin American Countries." *UB Riskcenter Working Paper Series*, 2014/02.
- Martinez, Luis B., Antonio Terceño, and Matilde Teruel. 2013. "Sovereign Bond Spreads Determinants in Latin American Countries: Before and During the XXI Financial Crisis." *Emerging Markets Review*, 17: 60–75.
- Rosas Rojas, Erik, José Lapa Guzmán, and Juan C. Baltazar Escalona. 2019. "Exchange Rate Volatility, Inflation Targeting, and Global Financial Crisis: Evidence for Latin American Economies." *Revista Economía y Política*, 30: 153–173.
- U.S. Energy Information Administration (EIA). 2024. "Crude Oil Prices: West Texas Intermediate (WTI) - Cushing, Oklahoma." *Federal Reserve Bank of St. Louis*. Accessed December 14, 2024. <https://fred.stlouisfed.org/series/DCOILWTICO>.
- World Bank. 2024a. "Merchandise Trade (% of GDP) - Ecuador." *World Bank Open Data*. Accessed November 22, 2024. <https://data.worldbank.org/indicator/TG.VAL.TOTL.GD.ZS?locations=EC>.
- World Bank. 2024b. "Fuel Exports (% of Merchandise Exports) - Ecuador." *World Bank Open Data*. Accessed November 22, 2024. <https://data.worldbank.org/indicator/TX.VAL.FUEL.ZS.UN?locations=EC>.
- World Bank. 2024c. "Agriculture, Forestry, and Fishing, Value Added (% of GDP) - Ecuador." *World Bank Open Data*. Accessed November 22, 2024. <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=EC>.
- World Bank. 2024d. "Merchandise Trade (% of GDP) - El Salvador." *World Bank Open Data*. Accessed November 22, 2024. <https://data.worldbank.org/indicator/TG.VAL.TOTL.GD.ZS?locations=SV>.
- World Bank. 2024e. "Manufacturing Exports (% of Merchandise Exports) - El Salvador." *World Bank Open Data*. Accessed November 22, 2024. <https://data.worldbank.org/indicator/TX.VAL.MANF.ZS.UN?locations=SV>.
- World Bank. 2024f. "Agriculture, Forestry, and Fishing, Value Added (% of GDP) - El Salvador." *World Bank Open Data*. Accessed November 22, 2024. <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=SV>.

World Bank. 2024g. "Personal Remittances Received (% of GDP) - El Salvador." *World Bank Open Data*. Accessed November 22, 2024. <https://data.worldbank.org/indicator/BX.TRF.PWKR.DT.GD.ZS?locations=SV>.

8 Affidavit

"I herewith declare that I have composed the present thesis myself and without use of any other than the cited sources and aids. Sentences or parts of sentences quoted literally are marked as such; other references with regard to the statement and scope are indicated by full details of the publications concerned. The thesis in the same or similar form has not been submitted to any examination body and has not been published. This thesis was not yet, even in part, used in another examination or as a course performance. Furthermore, I declare that the submitted written (bound) copies of the present thesis and the version submitted on a data carrier are consistent with each other in contents."

Place, Date: Sisbon, 16/12/2024 Signature: 

9 Appendix

9.1 Synthetic Control Methodology

Following Abadie and Gardeazabal (2003), the SCM constructs a synthetic version of the treated country by creating a weighted combination of control countries that closely matches the pre-treatment characteristics of the treated country. This is achieved by minimizing the mean squared error between the treated country's outcomes and a weighted average of the control (donor) countries' outcomes before dollarization. The objective function to minimize is:

$$\frac{1}{T_0} \sum_{t \leq T_0} (Y_t^{Treat} - Y_t^{DP} W^*)^2$$

where Y_t^{Treat} is the observed outcome variable of the treated, dollarized economy. Y_t^{DP} is a $(T \times J)$ matrix containing the outcome variable series of each country in the donor pool (countries that did not dollarize). Note that T_0 represents the time period up until dollarization

occurred. W^* is the $(J \times 1)$ vector of non-negative weights, summing to 1, assigned to each country in the donor pool. These weights are chosen to construct a synthetic control that best approximates the pre-treatment outcome variable trajectory of the treated country. The weights W^* are computed conditionally on V :

$$W^*(V) = \min_{w \in W} (X_1 - X_0 W)' V (X_1 - X_0 W)$$

where X_1 is a $(K \times 1)$ vector containing the pretreatment predictors of the treated country, X_0 is a $(K \times J)$ matrix of the same predictors for each of the donor countries, and V is a $(K \times K)$ diagonal matrix with non-negative entries measuring the relative importance of each predictor. The optimal V^* is the one, which minimize the discrepancy between the treated country and its synthetic control in terms of pre-treatment characteristics, equation 1.

So far, we have focused on the basic synthetic control method, which focuses on the outcome variable. Cattaneo, Feng, and Titiunik (2021) extend this framework to improve the match between the synthetic control and the treated unit by incorporating additional characteristics, adding equations for these characteristics. This involves including supplementary equations for these additional characteristics and minimizing the combined loss. See Cattaneo, Feng, and Titiunik (2021) for more details. The estimated weights and intercepts within the multi-equation synthetic control framework are obtained by solving the following optimization problem:

$$(\widehat{w}', \widehat{r}') \in \arg \min_{w \in W, r \in \mathbb{R}} \sum_{l=1}^M \sum_{t=1}^{T_0} v_{t,l} (Y_{1t,l} - Y_{2t,l} w_2 - \dots - Y_{(N+1)t,l} w_{N+1} - r_l)^2$$

In this extended framework, M features of the treated unit are considered, denoted as $\mathbf{A}_l = (a_{1,l}, \dots, a_{T_0,l})' \in \mathbb{R}^{T_0}$ for all $l = [1, \dots, M]$. Each feature \mathbf{A}_l is predicted using $J + K$ variables, separated into two groups:

- $\mathbf{B}_l = (\mathbf{B}_{1,l}, \mathbf{B}_{2,l}, \dots, \mathbf{B}_{J,l}) \in \mathbb{R}^{T_0 \times J}$
- $\mathbf{C}_l = (\mathbf{C}_{1,l}, \dots, \mathbf{C}_{K,l}) \in \mathbb{R}^{T_0 \times K}$

Each $\mathbf{B}_{j,l} = (b_{j1,l}, \dots, b_{jT_0,l})'$ and $\mathbf{C}_{k,l} = (c_{k1,l}, \dots, c_{jT_0,l})'$ is a vector that spans the pretreatment time period, providing predictors for \mathbf{A}_l .

The objective of the synthetic control method is to find a vector of common weights $\mathbf{w} \in W \subseteq \mathbb{R}^J$ and coefficients $\mathbf{r} \in R \subseteq \mathbb{R}^{KM}$ that enable a linear combination of \mathbf{B}_1 and \mathbf{C}_1 to approximate \mathbf{A}_1 as closely as possible across all features $l \leq 1 \leq M$. This objective is achieved by solving the following optimization problem:

$$\hat{\beta} := (\widehat{\mathbf{w}}, \hat{\mathbf{r}})' \in \underset{\mathbf{w} \in W, \mathbf{r} \in R}{arg \ arg} (\mathbf{A} - \mathbf{B}\mathbf{w} - \mathbf{C}\mathbf{r})'(\mathbf{A} - \mathbf{B}\mathbf{w} - \mathbf{C}\mathbf{r})$$

where

$$\mathbf{A} = \begin{bmatrix} A_1 \\ A_2 \\ \vdots \\ A_M \end{bmatrix} \mathbf{B} = \begin{bmatrix} B_1 \\ B_2 \\ \vdots \\ B_M \end{bmatrix} \mathbf{C} = \begin{bmatrix} C_1 & 0 & \dots & 0 \\ 0 & C_1 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & C_M \end{bmatrix}$$

Cattaneo, Feng, and Titiunik (2021) extend the synthetic control framework by introducing conditional prediction intervals to account for statistical uncertainty. However, computing these intervals, especially with multiple features, involves complex computations that are beyond the scope of this work. In this analysis, the simplex constraint is applied, which requires that the weights sum to 1 and that each weight is non-negative, as in the basic model of Abadie and Gardeazabal (2003). It is important to note that the pre-treatment period spans five years for Ecuador and six years for El Salvador, which strengthens the SCM by providing many data points to accurately match the pre-treatment trajectory of the treated country. This longer period increases confidence that any observed post-treatment differences are due to dollarization rather than random fluctuations.

9.2 Missing Data

| Gross Domestic Product | | | |
|-------------------------------|-------------------|---------------|--------------|
| Country | Period | Procedure | Source |
| Chile | 1995 Q1 – 1995 Q4 | Interpolation | WDI (Yearly) |
| Colombia | 1995 Q1 – 1999 Q4 | Interpolation | WDI (Yearly) |
| Guatemala | 1995 Q1 – 2000 Q4 | Interpolation | WDI (Yearly) |
| Honduras | 1995 Q1 – 1999 Q4 | Interpolation | WDI (Yearly) |
| Nicaragua | 1995 Q1 – 2005 Q4 | Interpolation | WDI (Yearly) |
| Uruguay | 1995 Q1 – 1996 Q4 | Interpolation | WDI (Yearly) |

Table A1: Missing data for Gross Domestic Product

| Industrial Production | | | |
|------------------------------|-------------------|-----------|--------|
| Country | Period | Procedure | Source |
| Belize | 1995 Q1 – 2013 Q2 | None | None |
| Guatemala | 1995 Q1 – 2000 Q4 | None | None |
| Honduras | 1995 Q1 – 1999 Q4 | None | None |
| Paraguay | 1995 Q1 – 2004 Q4 | None | None |
| Nicaragua | 1995 Q1 – 2005 Q4 | None | None |
| Uruguay | 1995 Q1 – 2001 Q4 | None | None |

Table A2: Missing data for Industrial Production

| Consumer Price Index | | | |
|-----------------------------|-------------------|---------------|-------------------|
| Country | Period | Procedure | Source |
| Argentina | 1995 Q1 – 2003 Q4 | Interpolation | Fred (Yearly) |
| Argentina | 2004 Q1 – 2013 Q2 | Interpolation | INDEC (Quarterly) |

Table A3: Missing data for Consumer Price Index

| Current Account Balance (% of GDP) | | | |
|---|-------------------|---------------|-----------------------------------|
| Country | Period | Procedure | Source |
| Belize | 1995 Q1 – 2000 Q4 | Interpolation | IMF, Balance of Payments (Yearly) |
| Colombia | 1995 Q1 – 1995 Q4 | Interpolation | IMF, Balance of Payments (Yearly) |
| Costa Rica | 1995 Q1 – 1998 Q4 | Interpolation | IMF, Balance of Payments (Yearly) |
| El Salvador | 1995 Q1 – 1998 Q4 | Interpolation | IMF, Balance of Payments (Yearly) |
| Honduras | 1995 Q1 – 2003 Q4 | Interpolation | IMF, Balance of Payments (Yearly) |
| Paraguay | 1995 Q1 – 1999 Q4 | Interpolation | IMF, Balance of Payments (Yearly) |
| Uruguay | 1995 Q1 – 1999 Q4 | Interpolation | IMF, Balance of Payments (Yearly) |

Table A4: Missing data for Current Account Balance (% of GDP)

| Unemployment Rate | | | |
|--------------------------|-------------------|---------------|---------------------------------------|
| Country | Period | Procedure | Source |
| Belize | 2000 Q1 – 2000 Q4 | Interpolation | ILOEST (Yearly) |
| Belize | 2003 Q1 – 2003 Q4 | Interpolation | ILOEST (Yearly) |
| Bolivia | 1998 Q1 – 1998 Q4 | Interpolation | ILOEST (Yearly) |
| Bolivia | 2003 Q1 – 2003 Q4 | Interpolation | ILOEST (Yearly) |
| Brazil | 2000 Q1 – 2000 Q4 | Interpolation | IMF, Prices Production Labor (Yearly) |
| Costa Rica | 1995 Q1 – 2000 Q4 | Interpolation | IMF, Prices Production Labor (Yearly) |
| Ecuador | 2002 Q1 – 2002 Q4 | Interpolation | ILOEST (Yearly) |
| Guatemala | 1995 Q1 – 2002 Q4 | Interpolation | ILOEST (Yearly) |
| Honduras | 2000 Q1 – 2000 Q4 | Interpolation | ILOEST (Yearly) |
| Nicaragua | 1995 Q1 – 2000 Q4 | Interpolation | ILOEST (Yearly) |
| Nicaragua | 2002 Q1 – 2002 Q4 | Interpolation | ILOEST (Yearly) |
| Peru | 1995 Q1 – 1995 Q4 | Interpolation | IMF, Prices Production Labor (Yearly) |

Table A5: Missing data for Unemployment Rate

| Foreign Direct Investments (% of GDP) | | | |
|--|-------------------|---------------|--------|
| Country | Period | Procedure | Source |
| El Salvador | 1994 Q1 – 1994 Q4 | Interpolation | None |
| El Salvador | 1996 Q1 – 1996 Q4 | Interpolation | None |

Table A6: Missing data for Foreign Direct Investments (% of GDP)

9.3 Synthetic Control Weights

| Country | S1 (CA) | S3 (+GDPG) | S3 (+INF) | S4 (+UR) | S5 (+GDP) | S6 (+POP) | S7 (+M2) | S8 (+FDI) | S9 (+IP) |
|------------|------------|---------------|--------------|-------------|--------------|--------------|-------------|--------------|-------------|
| Argentina | 0.000 | 15.608 | 51.845 | 51.843 | 51.843 | 51.843 | 51.837 | 51.836 | 51.836 |
| Belize | 8.037 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Bolivia | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Brazil | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Chile | 0.000 | 9.224 | 11.952 | 11.953 | 11.954 | 11.954 | 11.944 | 11.943 | 11.943 |
| Colombia | 87.038 | 1.911 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Costa Rica | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Guatemala | 4.925 | 0.000 | 28.075 | 28.075 | 28.075 | 28.075 | 28.091 | 28.093 | 28.093 |
| Honduras | 0.000 | 50.853 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mexico | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Nicaragua | 0.000 | 0.000 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 |
| Paraguay | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Peru | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Uruguay | 0.000 | 22.404 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Table A7: Weights SCM Ecuador Current Account Balance (% of GDP)

| Country | S1 (CA) | S3 (+GDPG) | S3 (+INF) | S4 (+UR) | S5 (+GDP) | S6 (+POP) | S7 (+M2) | S8 (+FDI) | S9 (+IP) |
|------------|------------|---------------|--------------|-------------|--------------|--------------|-------------|--------------|-------------|
| Argentina | 0.000 | 0.000 | 1.275 | 1.275 | 1.276 | 1.277 | 1.277 | 1.277 | 1.277 |
| Belize | 2.664 | 0.000 | 8.630 | 8.630 | 8.629 | 8.628 | 8.629 | 8.629 | 8.629 |
| Bolivia | 0.000 | 0.000 | 11.033 | 11.033 | 11.032 | 11.032 | 11.033 | 11.037 | 11.037 |
| Brazil | 0.000 | 29.148 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Chile | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Colombia | 0.000 | 10.882 | 11.953 | 11.952 | 11.956 | 11.957 | 11.957 | 11.957 | 11.957 |
| Costa Rica | 8.198 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Guatemala | 4.275 | 58.659 | 38.203 | 38.204 | 38.198 | 38.195 | 38.193 | 38.191 | 38.191 |
| Honduras | 30.532 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mexico | 0.000 | 0.000 | 3.314 | 3.314 | 3.314 | 3.315 | 3.315 | 3.314 | 3.314 |
| Nicaragua | 0.000 | 0.000 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 |
| Paraguay | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Peru | 4.676 | 1.311 | 17.815 | 17.815 | 17.818 | 17.819 | 17.821 | 17.818 | 17.818 |
| Uruguay | 49.655 | 0.000 | 7.669 | 7.670 | 7.669 | 7.669 | 7.669 | 7.669 | 7.669 |

Table A8: Weights SCM El Salvador Current Account Balance (% of GDP)

| Country | S1 (GDP) | S2 (+GDPG) | S3 (+INF) | S4 (+UR) | S5 (+CA) | S6 (+POP) | S7 (+M2) | S8 (+FDI) | S9 (+IP) |
|------------|-------------|---------------|--------------|-------------|-------------|--------------|-------------|--------------|-------------|
| Argentina | 13.398 | 15.606 | 51.845 | 51.843 | 51.843 | 51.843 | 51.837 | 51.836 | 51.836 |
| Belize | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Bolivia | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Brazil | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Chile | 0.000 | 9.222 | 11.951 | 11.953 | 11.954 | 11.954 | 11.944 | 11.943 | 11.943 |
| Colombia | 37.985 | 1.911 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Costa Rica | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Guatemala | 0.000 | 0.000 | 28.075 | 28.076 | 28.075 | 28.075 | 28.091 | 28.093 | 28.093 |
| Honduras | 0.000 | 50.860 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mexico | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Nicaragua | 0.000 | 0.000 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 | 8.129 |
| Paraguay | 48.617 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Peru | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Uruguay | 0.000 | 22.401 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Table A9: Weights SCM Ecuador log GDP Per Capita

| Country | S1 (GDP) | S2 (+GDPG) | S3 (+INF) | S4 (+UR) | S5 (+CA) | S6 (+POP) | S7 (+M2) | S8 (+FDI) | S9 (+IP) |
|------------|-------------|---------------|--------------|-------------|-------------|--------------|-------------|--------------|-------------|
| Argentina | 0.000 | 0.000 | 1.276 | 1.276 | 1.276 | 1.277 | 1.277 | 1.277 | 1.277 |
| Belize | 4.869 | 0.000 | 8.629 | 8.629 | 8.629 | 8.628 | 8.629 | 8.629 | 8.629 |
| Bolivia | 0.000 | 0.000 | 11.033 | 11.032 | 11.032 | 11.032 | 11.033 | 11.037 | 11.037 |
| Brazil | 21.607 | 29.151 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Chile | 2.216 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Colombia | 23.445 | 10.884 | 11.957 | 11.956 | 11.956 | 11.957 | 11.957 | 11.957 | 11.957 |
| Costa Rica | 16.758 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Guatemala | 11.118 | 58.654 | 38.198 | 38.199 | 38.198 | 38.195 | 38.193 | 38.191 | 38.191 |
| Honduras | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Mexico | 0.000 | 0.000 | 3.314 | 3.314 | 3.314 | 3.315 | 3.315 | 3.314 | 3.314 |
| Nicaragua | 0.000 | 0.000 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 |
| Paraguay | 19.988 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Peru | 0.000 | 1.312 | 17.817 | 17.817 | 17.818 | 17.819 | 17.821 | 17.818 | 17.818 |
| Uruguay | 0.000 | 0.000 | 7.669 | 7.669 | 7.669 | 7.669 | 7.669 | 7.669 | 7.669 |

Table A10: Weights SCM El Salvador log GDP per Capita