Dollarization and Default Risk: A Welfare Analysis

Juan Sebastian Lopez Almirante
Princeton University

Pablo Andres Neumeyer
Universidad Torcuato Di Tella

February 6, 2025

Preliminary, click here for latest version

Abstract

The welfare costs of dollarization trade off the benefit of lower inflation against the cost of the loss of seignorage, the cost of the initial open market operation to purchase the money supply, and the increased probability of default induced by the first two. We evaluate the welfare costs of dollarization in a small open economy model of defaultable debt with money and international reserves calibrated to Ecuador which dollarized in 2000. The welfare cost of dollarization in an economy with 20% of debt-to-GDP can be as high as 1.75% of permanent consumption. This cost can be expressed in terms of a break-even permanent level of inflation that increases non-linearly between 40% and 275% with the stock of initial debt. We also compute conditional default probabilities between a dollarized and a local currency economy and find that dollarization can lead to increased default incentives, particularly in the short run highlighting that the initial stocks of debt, reserves and money matter.

JEL codes: E21, E42, E43, E58, F33, F34, H63.

Keywords: dollarization, sovereign debt default, welfare

*

*Contact information: Lopez Almirante lopez.almirante@princeton.edu and Neumeyer pan@utdt.edu. We thank Francisco Roldán and seminar participants at BSE, IMF, DebtCon7 and SED for their commnents.

1 Introduction

Emerging countries that cannot commit to a low-inflation regime consider adopting a low-inflation foreign currency instead of their own as way of putting an end to chronic inflation. Dollarization is the adoption of the United States dollar as a national currency in a country other than the United States. Ecuador and El Salvador are two emerging economies that became fully dollarized in the early 2000s. The literature on dollarization stresses the loss of seignorage as one of the costs of this shortcut to monetary stability (Fischer (1982)). However, dollarization requires a large open market operation by which the government buys back the whole stock of national currency using its international reserves or issuing foreign debt. If foreign debt is issued, dollarization causes a large initial increase in the stock of foreign debt of the small open economy. Moreover, money demand is now a demand of US dollars that the economy cannot costlessly supply, and thus, the economy's budget constraint requires real money demand growth to be financed through trade surpluses or foreign debt. Thus, dollarization and foreign debt dynamics appear to be intertwined.

In this paper, we perform a welfare analysis of dollarization as well as a study of the effect of dollarization on default incentives. We develop a small-open economy model with limited enforceability of foreign debt contracts in the spirit of Eaton and Gersovitz (1981) and Arellano (2008). The economy is allowed to dollarize or maintain the national currency. We find that dollarization increases default incentives only in the short run and when the economy is forced to issue to debt to finance the initial open market operation to buy back the stock of national currency. However, in the long run, the unfavorable cost of borrowing leads to incentives to delever and the dollarized economy does not default more often than the national currency economy.

We introduce a pair of conditional probabilities to measure the effect of dollarization on default incentives. Default incentives in both the dollarized and local currency economies can be thought of in terms of default sets which specify the levels of output for which each economy defaults. From these default sets, we define two conditional probabilities which measure the extent to which dollarization increases and decreases default incentives with respect to the benchmark economy. The former is the probability that the dollarized economy defaults given that the national currency economy does not default. The latter, on the other hand, is the probability that the dollarized economy does not default given that the national currency economy defaults. We will show that when output is low and debt is high, these probabilities point to dollarization increasing default incentives. On the other hand, as output increases default becomes costly and dollarization lowers default incentives.

Finally, we perform a welfare analysis of dollarization. To this end we compute the welfare cost in terms of permanent consumption as well as the break-even permanent inflation rate that would be necessary for dollarization to be welfare-enhancing. We find that the welfare cost of dollarization in an economy with initial debt of 20% of GDP is 1.75% of permanent consumption.

The Ecuadorian experience. This paper was motivated by the Ecuadorian dollarization which occurred in 2000. The balance of payments in a dollarized economy such as Ecuador can be written as

$$\Delta M^*_{t+1} = TB_t + TR_t + \Delta NFL_t$$

where ΔM^*_{t+1}, TB_t, TR_t and ΔNFL_t represent changes in US dollar cash balances, the trade balance, net transfers (remittances minus debt service) and increase in net foreign liabilities respectively. Figure 1 presents each component of the previous equation between 2000 and 2018 as well as the stock of US dollars in terms of GDP.

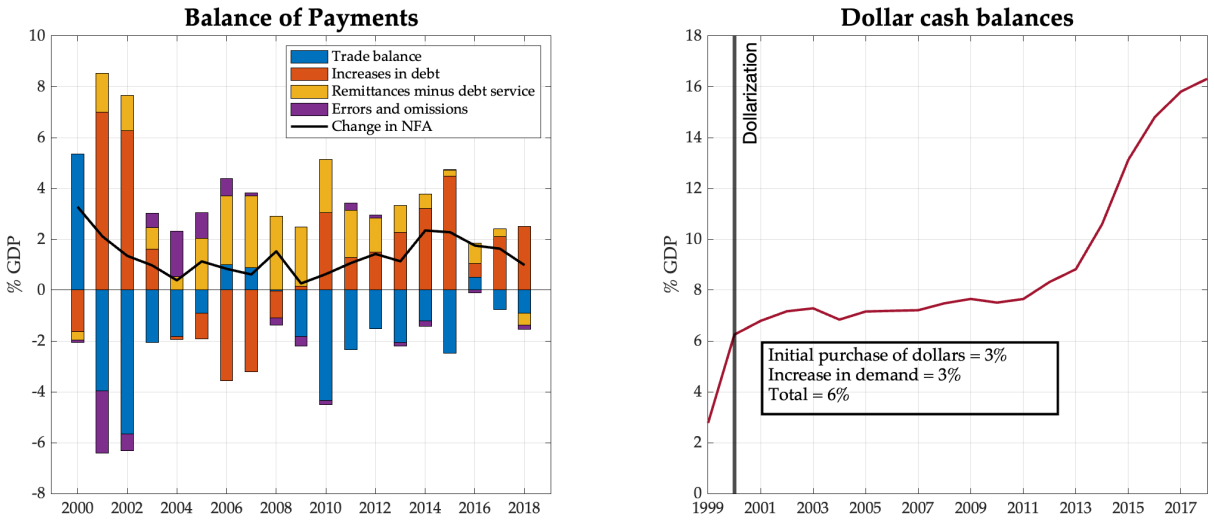


Figure 1: Balance of Payments and dollar cash balances for Ecuador in the 2000-2018 period. All variables are expressed in terms of GDP. Trade balance consists of net exports of goods and services. Increase in debt is taken from the capital account net of changes in the cash balances. Remittances minus debt service consists of rents and transfer income composing the current account balance. Cash balances are circulating banknotes among the public and liquid funds at depository institutions. Source: Central Bank of Ecuador.

The data show that cash balances in terms of output have increased in every year since the dollarization. In particular, the stock of US dollars in Ecuador increased approximately 13.5 percentage points of GDP in the 1999-2018 period. During these years, the trade balance was almost always in deficit except for four years (with the trade surpluses after 2000 being below one percentage point of output). Rents and transfers were significant only between 2005 and 2010 and hence only played a minor role in financing the increase in cash balances outside that time frame. Thus, the data supports the premise that the Ecuadorian dollarization was associated to the growth of foreign debt and in turn on default risk.

Literature review. The literature on dollarization has addressed both its costs and benefits in terms of loss of seignorage, price stability, stabilization policy, transaction costs and financial integration. Guidotti and Rodriguez (1992) analyze the transactional costs of dollarization while Borensztein and Berg (2000) identify advantages of dollarizing in that it lowers borrowing costs and deepens financial markets and disadvantages in that seignorage is transfered

to the United States. Alesina and Barro (2002) argue that dollarization implies losing a stabilization device but gains credibility and reduces inflation but Fischer (1982) warns against the loss of seignorage that dollarization implies. Calvo (2002) states that dollarization could be preferable in emerging economies where despite fixed exchange rate regimes, domestic interest rates remain high in fear of devaluation. Arellano and Heathcote (2010) argue that dollarization increases incentives to repay debts and increases access to financial markets in a context of low interest rates. More recently, Caravello et al. (2023) show that transitional dynamics after dollarization are tantamount to that of a sudden when the economy has a low stock of dollar holdings. However, the interaction of sovereign debt default and dollarization remains unexplored.

The paper is organized as follows: Section 2 presents the models and characterizes the equilibria, Section 3 presents the calibrations and evaluates the quantitative implications of the model, Section 4 presents the welfare analysis and Section 5 concludes.

2 The Model

Preferences. The economy is populated by identical infinitely-lived households with expected utility preferences defined over consumption c_t and beginning-of-period-$t+1$ real balances m_{t+1}

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u(c_t, m_{t+1}) \tag{1}$$

where $\beta \in (0,1)$ is the discount factor. The period utility function $u : \mathbb{R}^2_+ \to \mathbb{R}$ is homogeneous, satisfies the Inada conditions, is strictly increasing, and strictly concave in both arguments.

Endowment process. Every period t, the household receives a stochastic stream of a tradable good $y_t \in Y$ where Y is compact. This endowment follows a first-order Markov process with conditional distribution $F(y_{t+1}|y_t)$. Let $\mathbb{P}_{y_{t+1}|y_t}$ denote the probability measure associated to it and $\mathbb{E}_{y_{t+1}|y_t}$ the respective conditional expectation.

Government. There exists a benevolent government that seeks to maximize the expected discounted utility of households while having access to international financial markets. In these markets a discount bond b_{t+1} with geometrically decaying coupon δ is traded at price q_t which is endogenous. At any period t, bond issuance is $b_{t+1} - (1-\delta)b_t$ with coupon payment at $t+j$ equal to $\delta(1-\delta)^{j-1}$. In order to avoid Ponzi schemes on government debt, there is a lower bound on government debt such that $b_{t+1} \geq Z$ for a large negative Z. The government can also save on risk-free international reserves f_{t+1} at a discount price q_f which we assume to be constant. The proceeds from these international credit operations are rebated through a lump-sum subsidy τ_t to the household.

Budget constraint. The economy's budget constraint is given by

$$c_t + m_{t+1} + q_f f_{t+1} = y_t + (1-d_t)\left[\delta b_t - q_t(b_{t+1} - (1-\delta)b_t)\right] + f_t + \frac{i^M}{\pi} m_t + \tau_t \tag{2}$$

where i^M is the gross nominal return on money, π is the gross inflation rate between t and $t+1$, d_t is the default decision indicator and the lump-sum transfer τ_t is defined as follows

$$\tau_t = \begin{cases} m_{t+1} - \dfrac{i^M}{\pi} m_t & \text{for the national currency economy} \\ 0 & \text{for the dollarized economy} \end{cases} \tag{3}$$

Formulation in terms of risk-free assets . Let $a_t \equiv f_t + \dfrac{i^M}{\pi} m_t$ be defined as the holdings of risk-free assets by the economy. Then, the dollarized economy budget constraint becomes

$$c_t = y_t + a_t + (1 - d_t)\left[\delta b_t - q_t(b_{t+1} - (1-\delta)b_t)\right] - q_f a_{t+1} - \frac{R - R^M}{R} m_{t+1}$$

where $R \equiv q_f^{-1}$ and $R^M \equiv i^M/\pi$

For the local currency economy, once we consider the rebate τ_t, the risk-free asset simply becomes $a_t = f_t$.

Monetary regime. The economy can choose to dollarize in which case the domestic price level is equalized to that of the US since we assume the that the domestic goods market is open to both foreign and domestic consumers. We further assume that inflation is constant. On the other hand, the economy can choose to maintain its monetary independence in which case it runs a crawling-peg scheme with devaluation rate equal to i^M/π. For boundedness on money demand we assume $i \equiv \pi/q_f > i^M$.

Default decision. Debt contracts are not enforceable in the sense that the economy can choose to fully default on its debt. In that case, the economy is excluded from financial markets and is forced to revert to autarky.

We assume that defaulting entails two costs: temporary exclusion from financial markets and a utility cost. When the government defaults, there is an exogenous probability θ that the economy will be allowed to reenter financial markets next period with zero initial debt, i.e. the recovery value of debt is zero. However, with probability $1-\theta$ it remains in autarky. In addition to financial autarky, default entails a utility loss $u_D(y)$ which is weakly increasing in output.

Bond pricing. The international credit market consists of risk neutral foreign lenders who can borrow or lend as much as needed at a constant international risk-free gross interest rate $R > 1$. These creditors have perfect information about the state of the economy every period and price defaultable bonds so as to break even in expected value in every contract.

Timing and recursive notation. Given (b, a) and after observing y, the economy chooses to default ($d = 1$) or repay ($d = 0$)

i) If it defaults, the economy chooses consumption c and risk-free assets a' subject to its budget constraint in default.

ii) If it repays, the economy chooses consumption c, risk-free assets a' and bond holdings b' subject to the budget constraint and $q(b', a', y)$ adjusts so that foreign lenders break even.

The economy's recursive problem. Every period, the economy has the option to default or repay with value

$$v(b,a,y) = \max_{d\in\{0,1\}} (1-d)v^r(b,a,y) + dv^d(a,y) \tag{4}$$

where $v^r(b,a,y)$ is the value of repayment and $v^d(a,y)$ is the value of default.

The value of default is given by

$$\begin{aligned} v^d(a,y) = \max_{c,m',a'} & \; u\left(c,m'\right) - u_D(y) + \beta \mathbb{E}_{y'|y}\left[\theta v(0,a',y') + (1-\theta)v^d(a',y')\right] \\ \text{subject to } & \; c = y + a + \tau - q_f a' - \frac{R-R^M}{R}m' \\ & \; a' \geq R^M m' \\ & \; m' \geq 0 \end{aligned} \tag{5}$$

The value of repayment is given by

$$\begin{aligned} v^r(b,a,y) = \max_{c,b',m',a'} & \; u\left(c,m'\right) + \beta \mathbb{E}_{y'|y} v(b',a',y') \\ \text{subject to } & \; c = y + a + \tau + \delta b - q[b' - (1-\delta)b] - q_f a' - \frac{R-R^M}{R}m' \\ & \; a' \geq R^M m' \\ & \; m' \geq 0 \end{aligned} \tag{6}$$

where transfers are set to

$$\tau_t = \begin{cases} m' - R^M m & \text{for the national currency economy} \\ 0 & \text{for the dollarized economy} \end{cases}$$

The solution to the economy's recursive problem yields decision rules for default $\widehat{d}(b,a,y)$, bond holdings $\widehat{b}'(b,a,y)$, consumption under repayment and default $\{\widehat{c}^r(b,a,y), \widehat{c}^d(a,y)\}$ and real balances under repayment and default $\{\widehat{m}'^r(b,a,y), \widehat{m}'^d(a,y)\}$. International reserves under repayment and default can be recovered using the risk-free national asset decision rules $\{\widehat{a}'^r(b,a,y), \widehat{a}'^d(a,y)\}$.

Bond pricing function. To be consistent with the lenders' problem, the equilibrium bond price must satisfy

$$q(b',a',y) = R^{-1}\mathbb{E}_{y'|y}\left[\left(1-\widehat{d}(b',a',y')\right)\left(\delta + (1-\delta)q(b'',a'',y')\right)\right] \tag{7}$$

Definition 1 (Equilibrium). *A Markov perfect competitive equilibrium for an economy of this type is a set of*

1. *value functions $\widehat{v}, \widehat{v}^r$ and $\widehat{v}^d$*
2. *policy functions $\widehat{d}, \widehat{b}', \widehat{c}^r, \widehat{c}^d, \widehat{m}^r, \widehat{m}^d, \widehat{f}^r, \widehat{f}^d, \widehat{a}^r, \widehat{a}^d$ and*

3. *a bond pricing function* $\widehat{q}$

such that

1. *the value functions solve the economy's recursive problem*
2. *the policy functions are the economy's optimal choices*
3. *the bond pricing function satisfies no-arbitrage under risk neutrality and zero recovery value.*

3 Quantitative Analysis

3.1 Computation

The model is solved numerically with discrete-state dynamic programming with interpolation following Hatchondo et al. (2010). We force the vector of states in each economy to lie on finite and discrete grids of points. We use the solution to the finite horizon problem as the initial guess of the infinite horizon one. Then the policy and value functions are obtained via value function iteration. The curse of dimensionality is particularly present in this model which requires keeping the number of grid points relatively small. Thus, we use linear interpolation to approximate value, policy and bond pricing functions on a finer grid.

3.2 Calibration and Functional Forms

The utility function is of the constant elasticity of substitution type

$$u(c, m') = \frac{\left[\kappa c^{1-\psi} + (1-\kappa) m'^{1-\psi}\right]^{\frac{1-\sigma}{1-\psi}}}{1-\sigma}$$

where $\sigma, \psi > 0$ and $\kappa \in (0, 1)$. The output cost of default is a utility cost given by $u_D(y) = \alpha_0 + \alpha_1 \log y$.

The stochastic process of the endowment is assumed to follow a stationary first-order autoregressive process in logs

$$\log y' = \rho \log y + \varepsilon'$$

with $|\rho| < 1$ and $\varepsilon' \overset{iid}{\sim} N(0, \eta_\varepsilon^2)$. We discretize following Tauchen (1986).

Table 1 presents the values of the parameters and calibration used to obtain the quantitative results. Preference parameters ψ and κ are calibrated by fitting the money demand function generated by these CES preferences as shown in Appendix B to Ecuadorian data.

$$\log m' = \frac{1}{\psi} \log\left(\frac{1-\kappa}{\kappa}\right) - \frac{1}{\psi} \log\left(\frac{i-1}{i}\right) + \log c$$

This is the typical form of money demand used in empirical money demand equations. Using data from Ecuador we pinpoint the parameters κ and ψ by means of a constrained linear regression model on Ecuadorian M1, nominal interest rate on demand deposits and GDP

between 2000Q2-2019Q4. The results are very similar if M2 is used instead of M1 as well as if household consumption expenditure is used instead of GDP. In particular, they are consistent with the finding of Benati et al. (2021).

Parameter	Description	Value	Source/target
R	Risk free interest rate	1.01	Bianchi et al. (2018)
ψ	Elasticity of money demand	2.41	Money demand estimation
κ	Consumption relative weight	0.9995	Money demand estimation
π	US inflation	1.0051	Average US quarterly inflation
ρ	Persistence of output	0.98	Ecuador's linearly detrended GDP
η_ε	Standard deviation of output	0.01	Ecuador's linearly detrended GDP
θ	Probability of re-entry	0.28	Arellano (2008)
δ	Coupon rate	0.28	Bianchi et al. (2018)
σ	Elasticity of substitution	3.1	Bianchi et al. (2018)
β	Discount factor	0.988	Level of debt/reserves
(α_0, α_1)	Default cost	$(0.5, 2.5)$	Average default rates
i^M	Interest on money	1	

Table 1: Parameters and Calibration

Table 2 presents long-run business cycle statistics from simulations of the dollarized economy. In particular, the model matches the correlation between output and consumption as well as output and the spread on sovereign debt.

Moment	Model	Data
$\sigma(c)/\sigma(y)$	0.97	1.07
Mean debt-to-GDP	10%	43%
Mean reserves-to-GDP	12%	6%
Mean dollar-to-GDP	22%	16%
$\text{corr}(spread, y)$	-0.25	-0.3
$\text{corr}(c, y)$	0.99	0.96

Table 2: Long-run business cycle statistics

3.3 Measuring default incentives across regimes

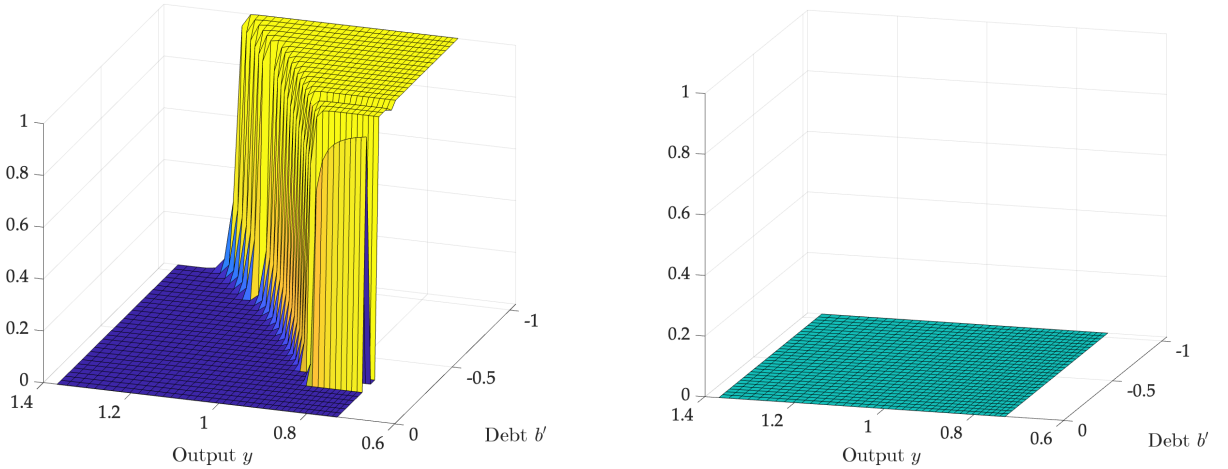
To provide a measure of the effect of dollarization on default incentives we will define two conditional probabilities of default across regimes.

$$p_+(b', a'^D, a'^{LC}, y) \equiv \mathbb{E}_{y'|y}[\widehat{d}^D(b', a'^D, y') | \widehat{d}^{LC}(b', a'^{LC}, y') = 0]$$
$$p_-(b', a'^D, a'^{LC}, y) \equiv \mathbb{E}_{y'|y}[1 - \widehat{d}^D(b', a'^D, y') | \widehat{d}^{LC}(b', a'^{LC}, y') = 1]$$

The probability measure defined by $p_+(b', a'^D, a'^{LC}, y)$ is the probability of default in the dollarized economy given that the non-dollarized economy would repay. This probability measures the effect of dollarization in increasing incentives to default. On the other hand, $p_-(b', a'^D, a'^{LC}, y)$ is the probability of repayment in the dollarized economy given that the

non-dollarized economy would default. This probability measures the effect of dollarization in decreasing incentives to default.

We summarize these conditional expectations in Figure 2 which presents them over debt and output positions for given values of assets.



(a) $\mathbb{P}$(dollarized defaults|local currency repays) (b) $\mathbb{P}$(dollarized repays|local currency defaults)

Figure 2: Default incentives in the dollarized economy relative to the local currency economy. Probabilities computed using default policy functions for given values of assets a'^{D} and a'^{LC} in the dollarized and local currency economies.

Consider the probability of increased incentives to default in panel (a). This probability increases with debt and decreases with output. This highlights that there exist combinations of the state space in which dollarization would induce default relative to non-dollarization. However, panel (b) shows that, for the same levels of assets, dollarization does not increase default incentives.

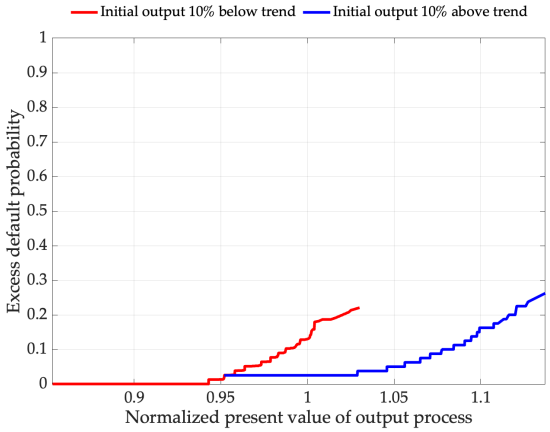
3.4 Simulations

In this subsection, we simulate the model. We perform two different simulation exercises: a short-run one and a long-run one. The short-run exercise consists of showing how in the first years after dollarization, the initial asset position can affect default incentives. In particular, we find that highly indebted economies would be more prone to default than economies with higher initial assets. The long-run exercise, on the other hand, focuses on analyzing the effects of dollarization on default incentives once the economy has been dollarized for a long period of time. This exercise shows that dollarization's effect of increasing default incentives is largely absent in the long run.

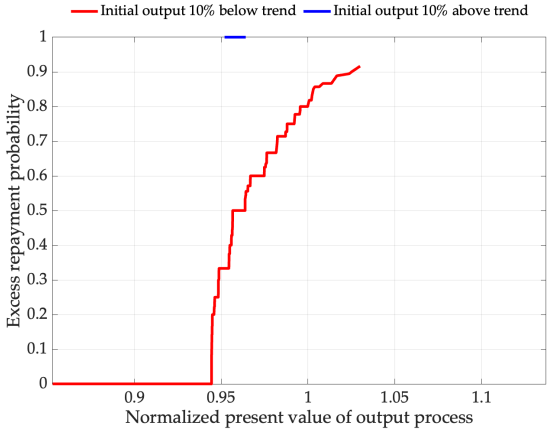
Short-run simulation: role of output and initial open market operation in the first 20 years after dollarization. Consider a dollarized economy with initial debt and real dollar holdings (b_0, m_0) and a local currency economy with initial reserves given by f_0. Dollarization implies an initial buyback of domestic currency to be exchanged for US dollars. Governments usually

devalue to exchange as much possible domestic currency for international reserves. If the exchange rate is not high enough for the whole stock of domestic currency to be bought, then foreign debt is issued to finance the remaining demand of US dollars. Thus, we can think of the additional increase of the stock of debt in the dollarized economy as $m_0 - f_0$.

Considering this relation between initial conditions, we simulate the model several times for different realizations of the output process and compute the share of default events in the dollarized economy relative to the local currency economy. Figure 3 shows that dollarization can induce both default and repayment in the short run. Repayment is only induced for low realizations of the output process whereas both low and high realizations of it can induce excess defaults.



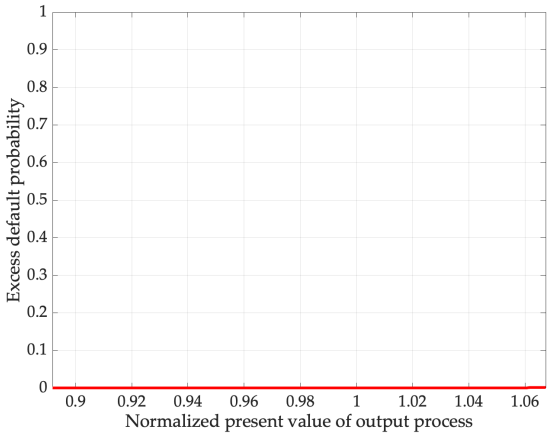
(a) $\mathbb{P}$(dollarized defaults|local currency repays)



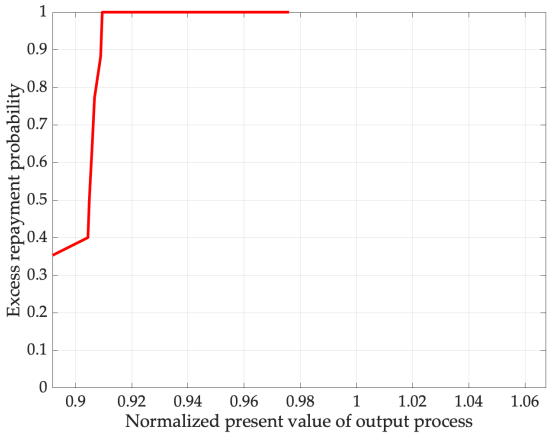
(b) $\mathbb{P}$(dollarized repays|local currency defaults)

Figure 3: Default incentives in the dollarized economy relative to the local currency economy for different levels of initial output. Probabilities computed across 1,000 simulations of 80 quarters each.

Long-run simulation: 200 years after dollarization. How big of a role is played by the initial large open market operation at the moment of dollarization? To see this, we repeat the previous exercise but using series of 1000 years and dropping the first 200 years. Figure 4 presents the conditional expectations of default and repayment showing that the effect of dollarization on increasing default incentives is close to zero. However, there is a strong effect of dollarization in increasing repayment relative to the non-dollarized economy for low values of the output process.



(a) $\mathbb{P}$(dollarized defaults|local currency repays)



(b) $\mathbb{P}$(dollarized repays|local currency defaults)

Figure 4: Default incentives in the dollarized economy relative to the local currency economy for different levels of initial output. Probabilities computed across 1,000 simulations of 80 quarters each.

4 Welfare evaluation

In this section, we perform a welfare evaluation of dollarization by comparing welfare in the dollarized economy with welfare in the local currency economy. Precisely, we compute the percentage of permanent consumption that makes the agent indifferent between the two economies. From this measure, we are able to compute break-even levels of local currency inflation above which dollarization would be welfare enhancing.

Given initial conditions $s_0 = (b_0, m_0, f_0, y_0)$ and an inflation level π of the local currency economy, we compute the equivalent constant consumption loss $\gamma(s_0, \pi)$ such that

$$W^{LC}(s_0) = \frac{1}{1-\beta} U(c(1-\gamma(s_0,\pi)) = W^D(s_0)$$

where W^{LC} (W^D) is the level of welfare in the local currency (dollarized) economy. From this measure, the break-even level of local currency permanent inflation $\pi^\star(s_0)$ as the value such that $\gamma(s_0, \pi^\star(s_0)) = 0$.

Figure 5 shows that the welfare cost of dollarization can be as high as 1.75% of permanent consumption for an economy with output 10% below trend and high levels of debt. In particular, the welfare cost is decreasing in local currency inflation and increasing in initial level of debt.

Figure 6 shows the break-even level of inflation for different levels of output when the economy has access to credit and when it does not. When economies have access to credit, the possibility of default when initial debt is high increases the break-even level of inflation to values close to 300% of permanent local currency inflation. This highlights the fact that economies with high debt (but not high enough to be in default) can be more prone to default when dollarizing.Note that, on the other hand, when economies do not have access to credit break-even inflation is largely flat.

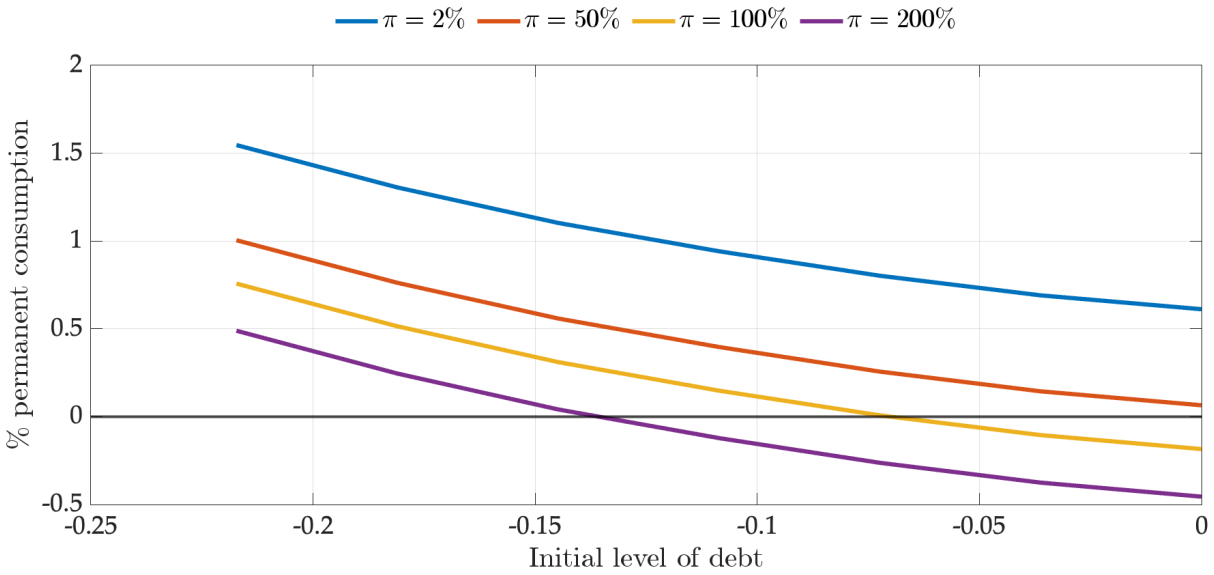
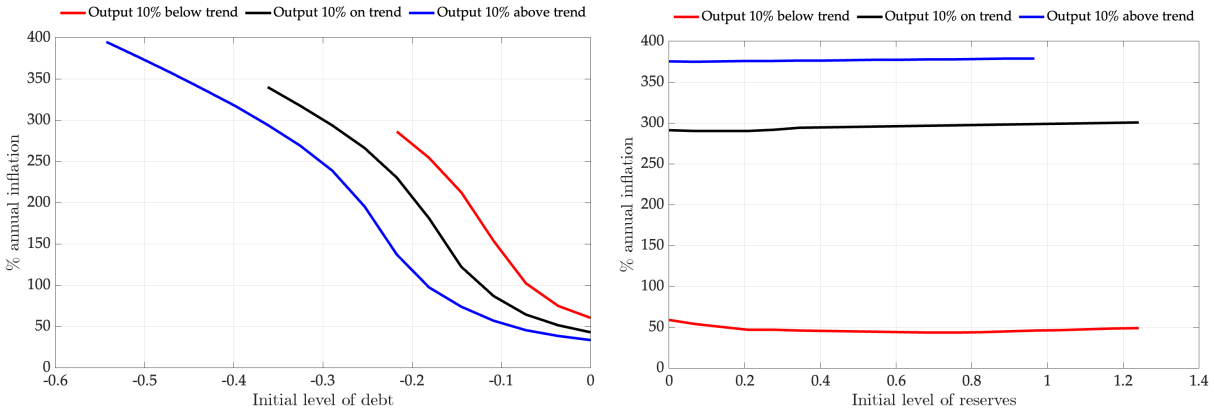


Figure 5: Welfare cost of dollarization with output 10% below trend and access to credit markets



(a) With access to credit

(b) Without access to credit

Figure 6: Break-even level of inflation. Computed as the value of local currency inflation that makes the equivalent permanent consumption loss of dollarization equal to zero.

5 Conclusion

In this paper, we have addressed the missing link between dollarization and sovereign default in emerging economies. We developed a small open dollarized economy model which was contrasted with the predictions of a benchmark sovereign default model with a national currency and international reserves.

The quantitative exercise consisted of calibrating the model for Ecuador and performing simulation exercises that capture the importance of the effects of dollarization on default incentives in the short and long run. The effect of dollarization on increasing default incentives is active in the short run, especially in the first 20 years after dollarization. Meanwhile, in the long run, the surviving effect of dollarization is that of decreasing default incentives as dollarization serves as a hedge against default risk.

Finally, welfare analysis shows that the possibility of default increases the break-even inflation rate for dollarizing in heavily indebted economies with access to credit. In terms of the equivalent of permanent consumption, welfare costs can be as high as 1. 75% when the initial debt-to-GDP ratio is 20%. The reason behind this result is that dollarizing would induce the economy to default and pay the output and financial costs it entails. Then, the inflation rate in the national currency needs to be high enough for the small open economy to want to bear this cost.

References

Alesina, Alberto and Robert J. Barro, "Currency Unions," *The Quarterly Journal of Economics*, 2002, *117* (2), 409–436. Publisher: MIT Press.

Arellano, Cristina, "Default Risk and Income Fluctuations in Emerging Economies," *American Economic Review*, 2008, *98* (3), 690–712.

_ **and Jonathan Heathcote**, "Dollarization and Financial Integration," *Journal of Economic Theory*, 2010, *145* (3), 944–973. Publisher: Elsevier.

Benati, Luca, Robert E. Lucas, Juan Pablo Nicolini, and Warren Weber, "International Evidence on Long-Run Money Demand," *Journal of Monetary Economics*, January 2021, *117*, 43–63. Publisher: North-Holland.

Bianchi, Javier, Juan Carlos Hatchondo, and Leonardo Martinez, "International Reserves and Rollover Risk," *American Economic Review*, September 2018, *108* (9), 2629–2670. Publisher: American Economic Association.

Borensztein, Eduardo and Andrew Berg, "The Pros and Cons of Full Dollarization," *IMF Working Paper*, 2000, *2000* (50).

Calvo, Guillermo A., "On Dollarization," *Economics of Transition*, 2002, *10* (2), 393–403. Publisher: Wiley Online Library.

Caravello, Tomás, Pedro Martinez-Bruera, and Iván Werning, "Dollarization Dynamics," Technical Report w31296, National Bureau of Economic Research, Cambridge, MA June 2023.

Eaton, Jonathan and Mark Gersovitz, "Debt with Potential Repudiation: Theoretical and Empirical Analysis," *Review of Economic Studies*, 1981, *48* (2), 289–309.

Fischer, Stanley, "Seigniorage and the Case for a National Money," *Journal of Political Economy*, April 1982, *90* (2), 295–313. Publisher: University of Chicago Press.

Guidotti, Pablo E. and Carlos A. Rodriguez, "Dollarization in Latin America: Gresham's law in reverse?," *Staff Papers*, 1992, *39* (3), 518–544. Publisher: Springer.

Hatchondo, Juan Carlos, Leonardo Martinez, and Horacio Sapriza, "Quantitative properties of sovereign default models: Solution methods matter," *Review of Economic Dynamics*, October 2010, *13* (4), 919–933.

Tauchen, George, "Finite State Markov-Chain Approximations to Univariate and Vector Autoregressions," *Economics letters*, 1986, *20* (2), 177–181. Publisher: Elsevier.

Appendices

A Computation algorithm

1. Obtain an initial guess for value and bond price functions from the finite-horizon problem $t = 0, 1, ..., T$ for T large enough.

   Dollarized economy

   At time T, the agent will set $a_{T+1} = i^M m_{T+1}/\pi$ and $b_{T+1} = 0$ since no lender would be willing to lend. Then, the budget constraint reads $c_T = y_T + a_T + (1-d)\delta b_T - m_{T+1}$. Since this is the optimal choice at T, the intratemporal condition between m_{T+1} and c_T plus the budget constraint pin down these two variables.

   From these, we recover $v_T^d(a_T, y_T), v_T^r(b_T, a_T, y_T)$ and $v_T(b_T, a_T, y_T)$ and can then solve for $q_T(b_{T+1}, a_{T+1}, y_T)$.

   Now we iterate backwards until $t = 0$ to obtain $v_0^d(a, y), v_0^r(b, a, y), v_0(b, a, y), q_0(b, a, y)$ which we use as initial guesses in the infinite horizon problem.

   Local currency economy

   At time T, the agent will set $f_{T+1} = 0$ and $b_{T+1} = 0$ since no lender would be willing to lend. Then, the budget constraint reads $c_T = y_T + f_T + (1-d)\delta b_T$ and the intratemporal condition of the household pins down m_{T+1}.

   From these, we recover $v_T^d(f_T, y_T), v_T^r(b_T, f_T, y_T)$ and $v_T(b_T, f_T, y_T)$ and can then solve for $q_T(b_{T+1}, f_{T+1}, y_T)$.

   Now we iterate backwards until $t = 0$ to obtain $v_0^d(f, y), v_0^r(b, f, y), v_0(b, f, y), q_0(b, f, y)$ which we use as initial guesses in the infinite horizon problem.

2. Solve the infinite horizon problem

   (a) Construct grids $\mathcal{A}, \mathcal{B}, \mathcal{Y}$ for assets, debt and output

   (b) Do regular VFI

   (c) Check for binding non-negativity constraints and adjust value and policy functions accordingly.

   (d) Update bond price $q(b', a', y)$(and $\mathbb{E}_{y'|y} v^d(a', y'), \mathbb{E}_{y'|y} v^r(b', a', y'), \mathbb{E}_{y'|y} v(b', a', y')$ using the transition matrix of output and policy functions for debt and assets obtained in the previous step.

   (e) Iterate until convergence.

B The money demand function

Preferences. There is a representative household that maximizes expected discounted utility over consumption c_t and real (end-of-period) money holdings m_t

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u(c_t, m_t)$$

where $\beta \in (0,1)$ is the discount factor. The period utility function $u : \mathbb{R}^2_+ \to \mathbb{R}$ satisfies the Inada conditions, is strictly increasing and strictly concave in both arguments and $u_{12} \in \mathbb{R}$.

The household's budget constraint reads

$$c_t + m_t + q_t^G a_{t+1} = y_t + \frac{m_{t-1}}{\pi} + a_t + T_t$$

where T_t are lump-sum government transfers and a_t are holdings of a domestic discount bond with price q_t^G. Also, π is the gross inflation rate between period $t-1$ and t.

Money demand function. The utility maximization problem of the household implies the following intratemporal margin relating consumption and demand for real balances

$$\frac{u_m(c_t, m_t)}{u_c(c_t, m_t)} = \frac{i_t - 1}{i_t}$$

where $i_t \equiv \pi_{t+1}/q_t^G$ is the gross nominal interest rate of the domestic bond.

Under homogeneity of the utility function $u(c, m)$, the marginal rate of substitution between consumption and real balances can be written in terms of the ratio m_t/c_t. Letting $g(m_t/c_t) \equiv \frac{u_m(c_t,m_t)}{u_c(c_t,m_t)}$, at an optimum the demand for real balances is a linear function $\mathcal{M}$ of current-period consumption

$$m_t = g^{-1}\left(\frac{i_t - 1}{i_t}\right) c_t \equiv \mathcal{M}(i_t) c_t$$

We assume $i_t = R\pi$ where R is the international gross risk-free rate.

In equilibrium, this domestic asset is in zero-net supply and the non-arbitrage condition calls for $q_t^G = R^{-1}$ where R is the international gross risk-free rate. As a result, the gross nominal interest rate is $i_t = R\pi$.

C Data

Except for the interest rate spread, all series span from the first quarter of 2000 until the second quarter of 2021 and were obtained from the Central Bank of Ecuador. The interest rate spread spans from the first quarter of 2001 up to the second quarter of 2021 although data from the first three quarters of 2003 is missing. The series of consumption and output are quarterly data in logs and real terms as well as linearly detrended. The series for trade balance is in % of

GDP. The series for the interest rate spread is constructed following the methodology in **?** but using the 5-year US Treasury bond as in Arellano (2008). The domestic interest rate in dollars is calculated as the yield of the 5-year US Treasury bond plus the EMBI spread. Then, these rates are deflacted using the expected inflation which is constructed as a simple average of the current period GDP deflator and its last three values. It is worth mentioning that the results do not drastically change when using the spread with respect to the 3-month US Treasury bill (its correlation with the 5-year spread is 0.9926). The series for the US Treasury bond yields were obtained from Yahoo! Finance and the J.P. Morgan EMBI spread were obtained from Ámbito Financiero. The GDP deflator for the United States was obtained from the FRED St. Louis and for Ecuador from the Central Bank of Ecuador.