The Macro Impact of Paying in Dollars in Emerging Economies

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Abstract

I study household consumption, saving, and investment in economies where durable goods are priced in U.S. dollars while income is earned in local currency (pesos). I develop a quantitative household model with lumpy durable adjustment, exchange-rate risk, and portfolio choice between peso and dollar assets subject to transaction frictions. Dollar saving provides a hedge against fluctuations in the local-currency price of durables, but is imperfectly liquid for everyday consumption.

Using Uruguayan household balance-sheet data to discipline the model, I show that restricting access to dollar saving or increasing its cost substantially diminish welfare measures. Exchange-rate risk and rare devaluation events rationalize persistent household dollarization even after stabilization. The results highlight a trade-off between policies that reduce aggregate dollarization and the micro-level insurance role of foreign-currency saving.

Keywords: Dollar prices, Durable goods, Lumpy Investment.

JEL Classification: C63, E21, E22, F31, G51

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1 Introduction

In many emerging economies, households earn income in local currency but face durable goods and savings options denominated in U.S. dollars. This dual-currency environment creates a fundamental mismatch between the units of income, consumption, and wealth, with potentially large welfare implications. I quantify how dollar-priced durables and dollar saving jointly transmit exchange-rate risk to household spending, portfolios, and welfare.

While inflation stabilization typically restores confidence in domestic currency, several Latin American economies remain persistently dollarized, especially in household savings and durable goods pricing (Calvo and Vegh, 1992; Levy Yeyati and Ize, 2005; Drenik and Perez, 2021). This persistence suggests that the dollar provides not only a store of value but also a hedge against local-currency risk. Yet, the microeconomic implications of such environments remain unexplored. Dollarization should be read as an endogenous response to informational and contractual frictions—not merely as a symptom of macro instability (Castellares and Toma, 2020).

Durables occupy a central role in this context. They are both consumption goods and stores of value, connecting the real and financial sides of the household problem. When durable goods are priced in dollars but income is received in pesos, exchange rate fluctuations alter the relative cost of maintaining or upgrading durable stocks.

At the same time, dollar-denominated savings offer a natural hedge. These features raise a core question: how does dollar pricing transmit exchange-rate shocks to household behavior? and what is the welfare cost of restricting dollar saving? Throughout, dollarization is treated as an endogenous household response to exchange-rate risk rather than a purely macroeconomic pathology.

Overview. I develop a quantitative household model of durable adjustment under exchange-rate risk. The framework combines three key ingredients: (i) lumpy adjustment of durable goods, (ii) sticky dollar pricing of durables, and (iii) portfolio choices between peso and dollar assets subject to transaction costs. Households face idiosyncratic income shocks and stochastic exchange rates, deciding jointly when to update their durable stock and how to allocate liquid wealth across currencies.

I solve the model numerically and estimate key frictions by SMM using moments of Uruguayan economy. I calibrate it to Uruguayan microdata from the *Encuesta Financiera de los Hogares Uruguayos* (EFHU), which uniquely reports household holdings of liquid assets by currency. Key parameters—such as durable adjustment costs, dollar trading frictions, and the consumption share of durables—are disciplined by matching observed adjustment frequencies, dollar-deposit shares, and the dispersion of durable holdings.

Main findings. Dollar pricing of durables shapes household behavior through three mechanisms. First, it amplifies adjustment frictions: because durable replacement costs are denominated in dollars, exchange-rate shocks alter their real burden, extending inaction regions and generating infrequent but large adjustments. Second, it creates a portfolio–durable trade-off: households balance the liquidity of peso assets against the hedging value of dollar assets, smoothing consumption across currencies. Third, it strengthens precautionary saving: greater exchange-rate volatility induces households to accumulate dollar buffers, which stabilize purchasing power but delay durable replacement.

Quantitatively, raising the cost of dollar saving through regulation or policy—raises both consumption and durable-expenditure volatility. Households attempt to self-insure via peso savings, but these assets fail to hedge against dollar-priced goods. Welfare falls substantially, underscoring that dollar saving is a first-order margin of insurance in partially dollarized economies.

Related literature. This paper contributes to four strands of research.

First, it extends models of lumpy consumption and household portfolio choice (Caballero, 1993, 1994; Caballero and Engel, 1999; Leahy and Zeira, 2005; Caplin and Leahy, 2006; Barsky et al., 2007; House, 2014; Stacchetti and Stolyarov, 2015; Berger and Vavra, 2015; Kaplan and Violante, 2014; Kaplan et al., 2020; McKay and Wieland, 2021; Baley and Blanco, 2021; Beraja and Wolf, 2021; Beraja and Zorzi, 2024; McKay and Wieland, 2022). These frameworks highlight how nonconvex adjustment costs and inaction regions generate heterogeneous and state-dependent household behavior. My model builds on this tradition by introducing currency denomination as an additional friction, linking durable adjustment to portfolio composition and exchange-rate risk. Hence, I endogenize foreign-asset choice under dollar pricing to match key empirical regularities in partially dollarized economies.

Second, the paper relates to the empirical literature on dollarization and foreign-currency pricing in small open economies (Calvo and Vegh, 1992; Schmitt-Grohé and Uribe, 2001, 2016; Levy Yeyati and Ize, 2005; Rappoport, 2009; Álvarez Parra et al., 2013; Castillo and Winkelried, 2010; Licandro and Mello, 2018, 2019; Landaberry and Mello, 2019; Castellares and Toma, 2020; Christiano et al., 2021; Salomao and Varela, 2022; Gutierrez et al., 2023; Drenik and Perez, 2021, 2024). These studies document the persistence of foreign-currency pricing and the widespread use of dollar deposits as a hedge against peso depreciation. I use these empirical regularities as calibration targets for the quantitative model.

Third, this work is closely related to the recent quantitative work on heterogeneous-agent small-open-economy models. Zhou (2022) develops a redistribution framework calibrated to Uruguayan microdata to study how exchange-rate movements reallocate wealth across households. De Rosa (2019) provides the benchmark estimates of Uruguay's wealth-to-income and dollarization ratios used in that calibration. My approach complements theirs by emphasizing the micro-level portfolio and adjustment margins that determine exposure to exchange-rate risk.

Fourth, the paper connects to the dominant-currency literature (Gopinath et al., 2010, 2020; Gopinath and Itskhoki, 2021; Gopinath and Stein, 2021; Amiti et al., 2022; Bocola and Lorenzoni, 2020; Egorov and Mukhin, 2023), which highlights how the U.S. dollar anchors global trade and financial pricing. In my framework, both financial assets and durables are priced in dollars, creating an endogenous transmission channel from exchange-rate shocks to household welfare. Finally, the analysis relates to macro-financial research on rare disasters and crisis dynamics (Barro, 2006; Barro and Ursua, 2008; Gourio, 2012; Farhi and Gabaix, 2015; Drenik et al., 2018; Cravino and Levchenko, 2017), which motivates my exchange-rate-disaster counterfactual. Low-probability devaluations in this setting amplify precautionary saving and reproduce the persistent dollarization observed in Uruguay's post-stabilization period.

Policy implications. The results highlight a fundamental trade-off. Policies that restrict foreign-currency deposits may stabilize the banking system but at the cost of greater household-level volatility and welfare losses. Conversely, dollar saving provides valuable risk-sharing in economies where durable goods remain priced in dollars. Understanding this tension is essential for designing de-dollarization policies that improve systemic stability without eroding household welfare. In particular, dollar access acts as an endogenous stabilizer for households; restricting it magnifies real volatility. This offers a cautionary lesson for de-dollarization efforts that pursue systemic stability at the cost of household risk exposure.

Layout. Section 2 introduces the household model and its key mechanisms. Section 3 describes the data, key empirical facts, and calibration targets. Section 4 details estimation and model fit. Section 5 presents counterfactual experiments on the main parameters. Section 6 concludes.

2 Model

I develop a partial equilibrium household model with incomplete markets, lumpy durable adjustment, idiosyncratic earnings risk, and exchange rate shocks. The environment builds on Kaplan and Violante (2014); Berger and Vavra (2015); Kaplan et al. (2020) and McKay and Wieland (2021), and introduces two features motivated by South American data.

First, durable goods are priced in U.S. dollars and exhibit near-complete exchange-rate pass-through. This reflects the imported nature of many durables and the prevalence of dollar pricing in retail markets (Gopinath and Itskhoki, 2021; Drenik and Perez, 2021, 2024). Drenik and Perez (2024) document that 80–90% of durable listings are dollar-priced, and that dollar-priced items tend to be more expensive and remain longer on the market.

Second, households can hedge exchange-rate risk by holding liquid wealth in dollars, but dollar liquidity is costly or inconvenient for routine non-durable purchases (Kehoe and Nicolini, 2021). The model makes dollarization endogenous through a portfolio choice over currency composition.

A key modeling choice is tractability with endogenous dollarization. Rather than treating peso and dollar deposits as separate dynamic states, I summarize the liquid portfolio by total liquid wealth in local-currency units and model currency composition as a within-period choice. This keeps the hedging motive but avoids adding two asset states.

2.1 Household maximization problem

Preferences. Households have CRRA utility over non-durable consumption $c_t \geq 0$ and the stock of durables $d_t \geq 0$:

$$u(c_t, d_t) = \frac{\left(c_t^{\nu} d_t^{1-\nu}\right)^{1-\gamma}}{1-\gamma}, \tag{2.1}$$

where $\nu \in (0,1)$ controls the expenditure share on non-durables and $\gamma > 0$ is the coefficient of relative risk aversion.

Idiosyncratic earnings. Log earnings follow an AR(1):

$$\log y_t = \rho_y \log y_{t-1} + \varepsilon_t^y, \qquad \varepsilon_t^y \sim \mathcal{N}(0, \sigma_y^2). \tag{2.2}$$

Exchange rate and durable prices. The nominal exchange rate e_t (local currency per USD) follows

$$\log e_t = \rho_e \log e_{t-1} + \varepsilon_t^e, \qquad \varepsilon_t^e \sim \mathcal{N}(0, \sigma_e^2). \tag{2.3}$$

The durable has a sticky USD price p_d, so its local-currency price is $P_t^d \equiv e_t p_d$. The non-durable good is the numeraire.

2.1.1 Reduced-state liquid wealth and portfolio choice

Let w_t denote *total liquid wealth in local-currency units* at the beginning of period t,

$$w_t \equiv a_t + e_t a_t^{\$},$$

where a_t are peso deposits and $a_t^{\$}$ are USD deposits. I impose a borrowing constraint to isolate the portfolio hedging channel.

Within the period, households choose a dollar share $s_t \in [0,1]$ for their *end-of-period* savings decision. Let $w_t' \geq 0$ denote savings carried from t to t+1 (before returns are realized). The household allocates w_t' across currencies:

$$a_t' = (1 - s_t) w_t', \qquad a_t^{\$\prime} = \frac{s_t w_t'}{e_t}.$$

Holding USD positions entails a proportional wedge $\kappa \in (0, 1)$ that captures limited transactional usefulness or regulatory costs of dollar saving.

The wedge κ captures ongoing costs of maintaining dollar liquidity—such as account fees, limited merchant acceptance, or the inconvenience of currency conversion for routine purchases—rather than one-time transaction costs. Hence, the model generates bunching near 0 and 1.

The portfolio choice determines next period's liquid wealth:

$$w_{t+1} = (1 + r)\,(1 - s_t)\,w_t' + (1 + r^{\$})\,s_t\,w_t'\,\frac{e_{t+1}}{e_t} - \kappa\,s_t\,w_t'. \tag{2.4}$$

This formulation makes dollarization endogenous while keeping (w_t, d_{t-1}, e_t, y_t) as the dynamic state.

2.1.2 Durables: depreciation, and adjustment

Durables deliver utility services and depreciate over time. If the household does not adjust, the durable stock evolves according to

$$d_t = \big(1 - \delta\big)\,d_{t-1}, \tag{2.5}$$

where $\delta \in (0, 1)$ is the baseline depreciation rate.

If the household adjusts, it chooses a new durable stock $d_t \geq 0$ and liquidates the depreciated stock at a resale value subject to partial irreversibility. Specifically, selling the depreciated stock yields a fraction $(1 - f)$ of its replacement value, with $f \in (0, 1)$ interpreted as a resale haircut.

2.1.3 Recursive formulation

The state is

$$S_t = (w_t, d_{t-1}, e_t, y_t).$$

Each period the household chooses: non-durable consumption c_t, end-of-period savings w'_t, a portfolio share s_t, and (if adjusting) a new durable stock d_t.

The value function is

$$V(S_t) = \max\left\{V^{\text{adjust}}(S_t),\, V^{\text{noadjust}}(S_t)\right\}. \tag{2.6}$$

Adjust branch. If the household adjusts, it chooses (c_t, w'_t, d_t, s_t):

$$V^{\text{adjust}}(S_t) = \max_{c,\, w',\, d,\, s\in[0,1]} \{u(c,d) + \beta\, \mathbb{E}[V(S_{t+1}) \mid S_t]\}, \tag{2.7}$$

$$\text{s.t.} \qquad c + w' + P^d_t\, d = y + (1+r)\, w \ + \ (1-f)\, P^d_t\, \big(1-\delta\big)\, d_{-1}, \tag{2.8}$$

$$w_{t+1} = (1+r)\,(1-s)\, w' + (1+r^{\$})\, s\, w'\, \frac{e_{t+1}}{e_t} - \kappa\, s\, w', \tag{2.9}$$

$$c \geq 0, \quad w' \geq 0, \quad d \geq 0.$$

Here $w \equiv w_t$ and $d_{-1} \equiv d_{t-1}$.

No-adjust branch. If the household does not adjust, durables follow (2.5) and the household chooses (c_t, w'_t, s_t):

$$V^{\text{noadjust}}(S_t) = \max_{c,\, w',\, s\in[0,1]} \left\{u\big(c, \big(1-\delta\big)d_{-1}\big) + \beta\, \mathbb{E}[V(S_{t+1}) \mid S_t]\right\}, \tag{2.10}$$

$$\text{s.t.} \qquad c + w' = y + (1+r)\, w, \tag{2.11}$$

$$w_{t+1} = (1+r)\,(1-s)\, w' + (1+r^{\$})\, s\, w'\, \frac{e_{t+1}}{e_t} - \kappa\, s\, w', \tag{2.12}$$

$$c \geq 0, \quad w' \geq 0.$$

Exogenous processes. Earnings and the exchange rate evolve according to (2.2)–(2.3). Expectations are taken over (e_{t+1}, y_{t+1}) conditional on (e_t, y_t).

2.2 Main mechanisms

The model features four interconnected mechanisms that link dollar pricing, portfolio choice, and durable adjustment. I describe each in turn and then discuss how they interact.

Dollar pricing and exchange-rate pass-through.

Durable goods are priced in U.S. dollars with near-complete pass-through to local-currency prices: $P_t = e_t p_d$. This assumption reflects the imported nature of many durables and the prevalence of dollar pricing in retail markets documented by Drenik and Perez (2021, 2024). The key implication is that exchange-rate movements directly shift the local-currency cost of durable adjustment. A depreciation (rise in e_t) raises the peso cost of replacing or upgrading durables, effectively tightening the household's budget constraint when it chooses to adjust. This creates an asymmetry: depreciations make adjustment more costly, while appreciations make it cheaper.

Endogenous dollarization as hedging.

Households can partially insure against exchange-rate risk by holding liquid wealth in dollars. When the peso depreciates, dollar-denominated savings appreciate in local-currency terms, providing resources precisely when durable replacement becomes expensive. The portfolio share s_t balances this hedging benefit against the proportional wedge κ, which captures the reduced transactional usefulness of dollar assets for everyday peso-denominated consumption. In equilibrium, households tilt toward dollars when exchange-rate volatility is high, but the wedge prevents full dollarization. This mechanism rationalizes the widespread but incomplete dollarization observed in Uruguayan household portfolios.

Lumpy adjustment through irreversibility.

Durable adjustment is infrequent and lumpy due to frictions. Partial irreversibility—modeled as a resale haircut f—means that households selling durables recover only a fraction of replacement value. This generates asymmetric adjustment: households are reluctant to downsize even when their durable stock exceeds the target. Hence, there are inaction regions in which households tolerate deviations from their optimal durable stock rather than paying adjustment costs. Households delay replacement until the deviation becomes sufficiently large, then make discrete, lumpy changes (Caballero, 1993).

Portfolio-durable interaction.

The preceding mechanisms are not independent—they interact through the household's wealth accumulation. Liquid assets provide self-insurance against both income shocks and exchange-rate risk, while durables provide utility services but are costly to adjust and partially illiquid. The wealth transition equation (2.4) ties portfolio composition to the timing of durable adjustment: households who anticipate adjusting soon have stronger incentives to hold dollars (to hedge replacement costs), while households deep in the inaction region may prefer peso liquidity for consumption smoothing. This interaction generates state-dependent portfolio behavior that varies with the household's position in the durable gap distribution.

3 Data

I construct the empirical moments using the Uruguayan Household Financial Survey (EFHU, for its Spanish acronym). EFHU was conducted in three waves between 2012 and 2017 by the Universidad de la República (Montevideo). It is nationally representative, covering roughly 20,000 households, and complements Uruguay's recurrent household survey (ECH) by collecting detailed balance-sheet information.

Household portfolio data. A distinctive feature of EFHU is that it records liquid asset holdings separately in pesos and U.S. dollars, together with detailed information on debts, durable ownership, values, and the timing of durable purchases. This allows measurement of both the level and the currency composition of household balance sheets, which is central for analyzing household dollarization.

Main variables. From the survey I construct measures of: (i) liquid savings in pesos and dollars and the implied dollar share of liquid assets; (ii) total household income; (iii) durable ownership, values, and tenure (years since last upgrade); and (iv) household debt positions. Variables are harmonized across survey waves to ensure consistent definitions.

Currency conversion and comparability. For reporting and cross-wave comparability, all monetary values are expressed in U.S. dollars using official exchange rates at the time of each survey wave. Most moments used in the quantitative analysis are ratios (e.g. dollar shares, durable shares, adjustment frequencies) and are therefore invariant to the unit of account.

Sample features. EFHU consists of repeated cross-sections rather than a true household panel. Accordingly, empirical moments are computed at the cross-sectional level within each wave and pooled using survey weights. All statistics reported in this section are survey-weighted using household expansion factors.

Aggregate data and pricing evidence. To benchmark the survey against macroeconomic aggregates, I complement EFHU with official statistics from the Central Bank of Uruguay on deposit dollarization, inflation, interest rates, and real and nominal exchange rates. I also combine EFHU information with external evidence on pricing. Non-durable goods and services are overwhelmingly quoted in pesos, while durable categories—such as vehicles, appliances, and housing improvements—are predominantly quoted in dollars. This pattern is consistent with the evidence documented in Drenik and Perez (2021, 2024) and motivates the modeling of dollar-priced durables.

Figure 1 illustrates a strong negative relationship between durable and liquid wealth shares. Households allocate a roughly fixed total wealth between durables and liquid assets, consistent with lumpy adjustment models and with internal balance-sheet consistency in the EFHU data.

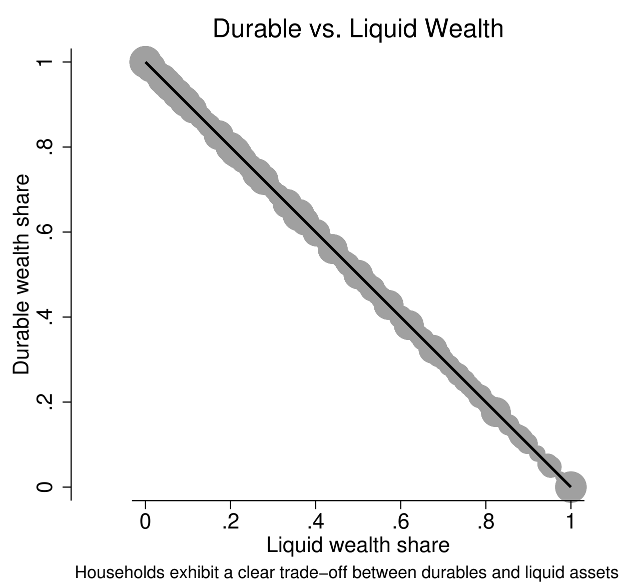

Figure 1: Durable–Liquid Wealth Relationship. Households exhibit a clear trade-off between durables and liquid assets, consistent with lumpy adjustment models.

3.1 Empirical facts

I document four empirical facts that motivate the structure of the model and discipline the quantitative analysis.

Fact 1: Widespread dollar saving and bimodality. Dollar assets are pervasive in household portfolios. Between 60 and 70 percent of households report holding at least some liquid savings in dollars, and between one-half and two-thirds of total deposits are denominated in foreign currency. The distribution of portfolio dollarization exhibits strong mass points at 0 and 1 (Figure 2), consistent with transaction-cost models in which small frictions generate corner solutions.

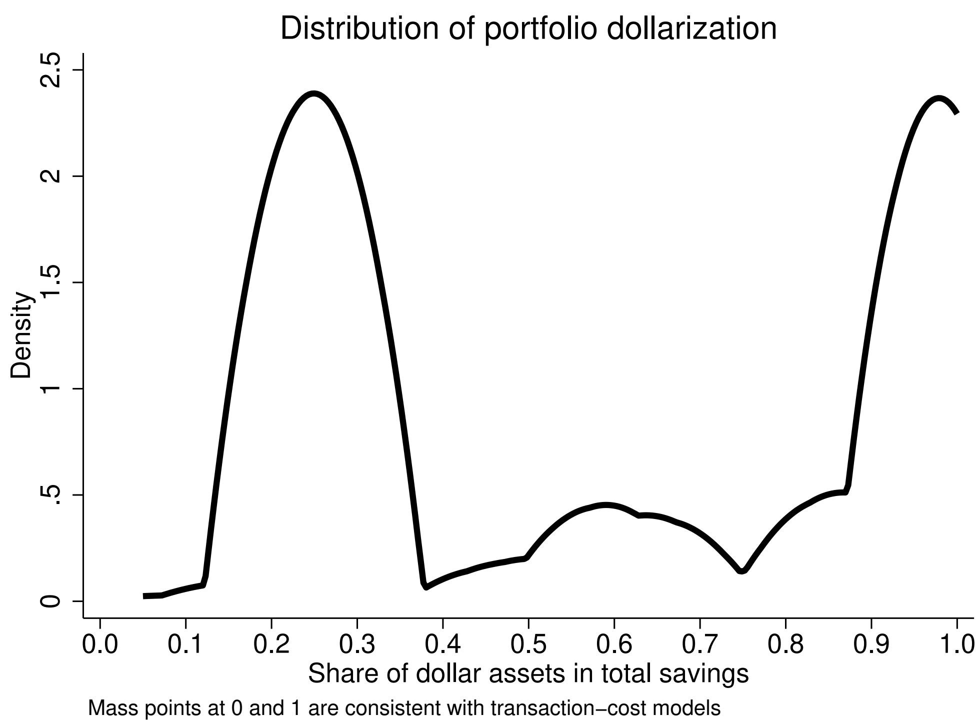

Figure 2: Distribution of portfolio dollarization

Fact 2: Dollar pricing of durables. Durable goods are predominantly quoted in dollars, while non-durables remain peso-denominated. Survey responses on durable values and complementary price data show that vehicles, appliances, and housing-related expenditures are largely priced in dollars. Table 1 places Uruguay in a cross-country perspective: despite low inflation, it combines high deposit dollarization with pervasive dollar pricing of durables, indicating that dollar pricing is a persistent structural feature rather than a purely inflationary phenomenon.

Table 1: Cross-country pricing and deposit dollarization

	Non-dur.	**Durables**		**Infl. (%)**	**$ Deposits (%)**
Country	Goods	Vehicles	Real estate	(2018)	(2020)
Argentina	0	9	76	47.6	32
Bolivia	42	67	83	1.5	—
Paraguay	60	57	33	3.2	45
Peru	4	68	54	2.2	40
Uruguay	35	85	88	7.6	75

Notes: Pricing shares from online listings; inflation from World Bank; dollar deposits from financial statistics. See text for sources and construction.

Fact 3: Heterogeneity in dollarization across households. Dollar participation and portfolio shares vary systematically across the income distribution. Dollar saving is not confined to high-income households: middle- and lower-income households also hold dollar assets, though typically in smaller amounts. Figure 3 shows an increasing pattern. This heterogeneity motivates modeling income risk and endogenous portfolio choice.

Fact 4: Infrequent durable adjustment. Durable adjustment is infrequent. Most households report last upgrading their main durable more than a decade ago. Figure 4 shows the distribution of durable tenure (years since last update). Because durables are priced in dollars, exchange-rate movements raise the local-currency cost of replacement and widen inaction regions.

Descriptive statistics and estimation targets. Table **??** reports key descriptive statistics from EFHU. Durables constitute the bulk of household wealth, while dollar deposits account for a substantial share of liquid savings. While the figures and tables document a broad set of empirical regularities, the quantitative estimation targets a subset of moments that map directly into the model's key margins:

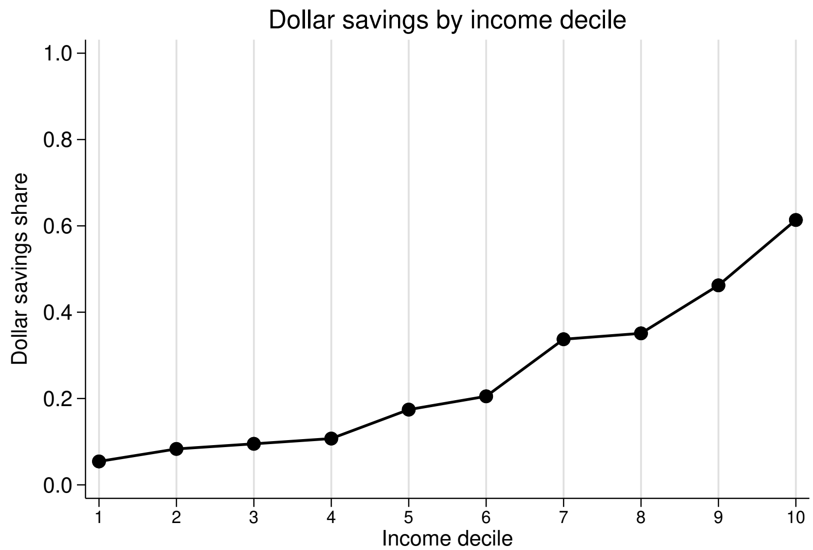

Figure 3: Distribution of portfolio dollarization

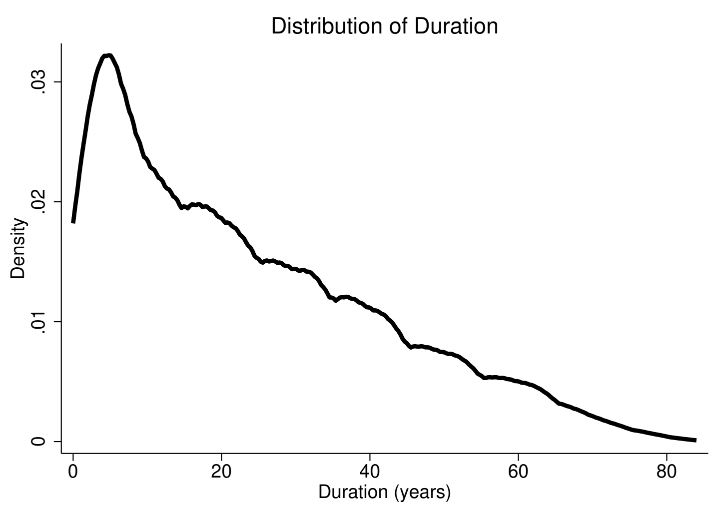

Figure 4: Durable updating is infrequent. Most households have long spells without upgrades, supporting the lumpy-adjustment mechanism and the role of dollar pricing in widening inaction regions. Notes: survey-weighted densities; sample restricted to positive income and non-negative durables.

(i) durable goods duration, (ii) the mean and dispersion of the durable share of wealth, and (iii) the mean and dispersion of the dollar share of liquid assets. Additional balance-sheet statistics, are reported for context but are not directly targeted in the baseline estimation.

Table 2: Summary statistics from EFHU (2012–2017), survey-weighted

Moment (survey–weighted)	**Value**
Dollar deposit share (mean)	**0.24**
Durable value / wealth (mean)	**0.83**
Durable value / quarterly income (median)	**1.85**
Durable tenure (average years)	**23.2**
Housing value (median)	**$150,000**
Vehicle value (median)	**$8,000**
Quarterly income (median)	**$4,922**

Wealth = durables + liquid savings. Quarterly income = 3× monthly income. All figures survey–weighted; winsorized 1–99 by wave.

Taken together, these facts show that dollarization in Uruguay is simultaneously a portfolio phenomenon, a pricing phenomenon, and a heterogeneous one. The combination of detailed microdata, stable inflation, and salient exchange-rate risk provides a sharp empirical environment to identify the interaction between dollar pricing, portfolio choice, and lumpy durable adjustment. These empirical regularities motivate the following quantitative exercise and counterfactuals.

4 Quantitative Framework

This section maps the model to Uruguayan data and states how each parameter enters the targeted moments.

4.1 Calibration

Parameters that are standard in the quantitative household literature or directly observable from aggregate data are calibrated outside the model. The remaining parameters, which govern portfolio choice and durable adjustment frictions, are estimated by simulation.

Preferences. The discount factor β and the coefficient of relative risk aversion γ are set to standard values commonly used in quantitative household models. These parameters are not disciplined by Uruguayan microdata but facilitate comparability with the existing literature.

Idiosyncratic earnings process. Household labor income follows an AR(1) process. The persistence ρ_y and innovation variance σ_y are estimated from EFHU income data to match the observed persistence and cross-sectional dispersion of earnings.

Exchange-rate process. The nominal peso–dollar exchange rate follows an AR(1) process with persistence ρ_e and volatility σ_e, calibrated using quarterly data from the Central Bank of Uruguay. These parameters discipline the magnitude and persistence of exchange-rate risk faced by households.

Prices and returns. Durable goods are priced in U.S. dollars with full pass-through to local-currency prices, consistent with the evidence documented in Section 3. The non-durable good is the numeraire. The risk-free return on local liquid assets is set to ensure consistency with the discount factor.

External benchmarks. EFHU microdata are complemented with aggregate balance-sheet statistics from the Central Bank of Uruguay and related studies (e.g. IMF; De Rosa 2019). These benchmarks discipline the overall scale of liquid wealth and durable holdings but are not directly targeted in the estimation.

Table 3 summarizes the calibrated parameters and the parameters estimated by SMM.

4.2 Estimation

Simulated Method of Moments. The remaining parameters are estimated using the Simulated Method of Moments (SMM). For a given parameter vector, the household problem is solved, a large cross-section of households is simulated from the stationary distribution, and simulated moments are computed. Parameters are

Table 3: Model parameters: calibration and estimation

Parameter	Description	Value	Discipline
Calibrated			
β	Discount factor	0.986	Standard
γ	Risk aversion	2.00	Standard
δ	Durable depreciation	0.05	Standard
r	Local interest rate	0.0142	BCU data
r	Dollar interest rate	0.011	BCU data
ρ_y	Income persistence	0.90	EFHU, De Rosa (2019)
σ_y	Income volatility	0.20	EFHU, De Rosa (2019)
ρ_e	Exchange-rate persistence	0.66	BCU data
σ_e	Exchange-rate volatility	0.15	BCU data
p_d	Durable price (USD)	5.0	Drenik and Perez (2021)
Estimated by SMM			
ν	Non-durable utility share	0.54 (0.0537)	Durable share moments
f	Resale haircut (irrevers.)	0.013 (0.2289)	Durable tenure
κ	Dollar portfolio wedge	0.0059 (0.0009)	Dollar share moments

chosen to minimize

$$\hat{\theta} = \arg\min_{\theta} \left(m^{\text{data}} - m^{\text{model}}(\theta)\right)' W \left(m^{\text{data}} - m^{\text{model}}(\theta)\right),$$

where W is a diagonal weighting matrix.

Because EFHU consists of repeated cross-sections rather than household panels, all empirical moments are computed at the cross-sectional level. Accordingly, the model is evaluated in its stationary distribution, and simulated moments are constructed to mirror the survey moments.

Targeted moments. The estimation targets moments that discipline the model's three central margins: durable adjustment, portfolio dollarization, and the allocation between durables and liquid wealth. Specifically, the targeted moments include:

- the mean duration since last durable adjustment;
- the mean and variance of the dollar share of liquid assets;
- the mean and variance of the durable share of total household wealth.

These moments jointly identify the key frictions of the model. The resale haircut f governs durable inaction; the portfolio wedge κ disciplines dollarization; and the utility share parameter ν shapes the allocation between durables and liquid wealth.

4.3 Model-implied distributions and aggregate dynamics

I use the estimated model to characterize the stationary distribution of household portfolios and the aggregate dynamics implied by lumpy durable adjustment under exchange-rate risk in partial equilibrium. These objects are not directly targeted in estimation but provide internal validation of the model's mechanisms.

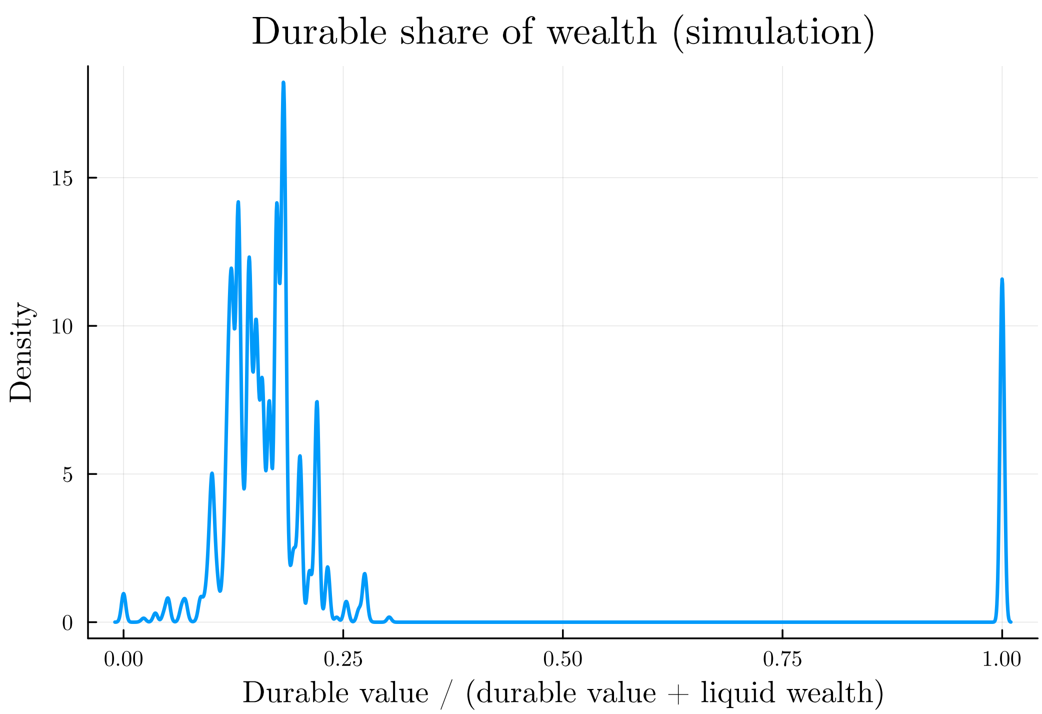

Figure 5: Distribution of the durable share of total household wealth

Figure 5 plots the model-implied distribution of the durable share of total household wealth. The distribution is sharply bimodal, with mass concentrated near zero and near one. This pattern reflects endogenous sorting between liquid-rich households with few durables and durable-rich households with limited liquid buffers. The result mirrors micro evidence from EFHU and highlights the role of nonconvex durable adjustment costs in generating illiquidity and concentration of

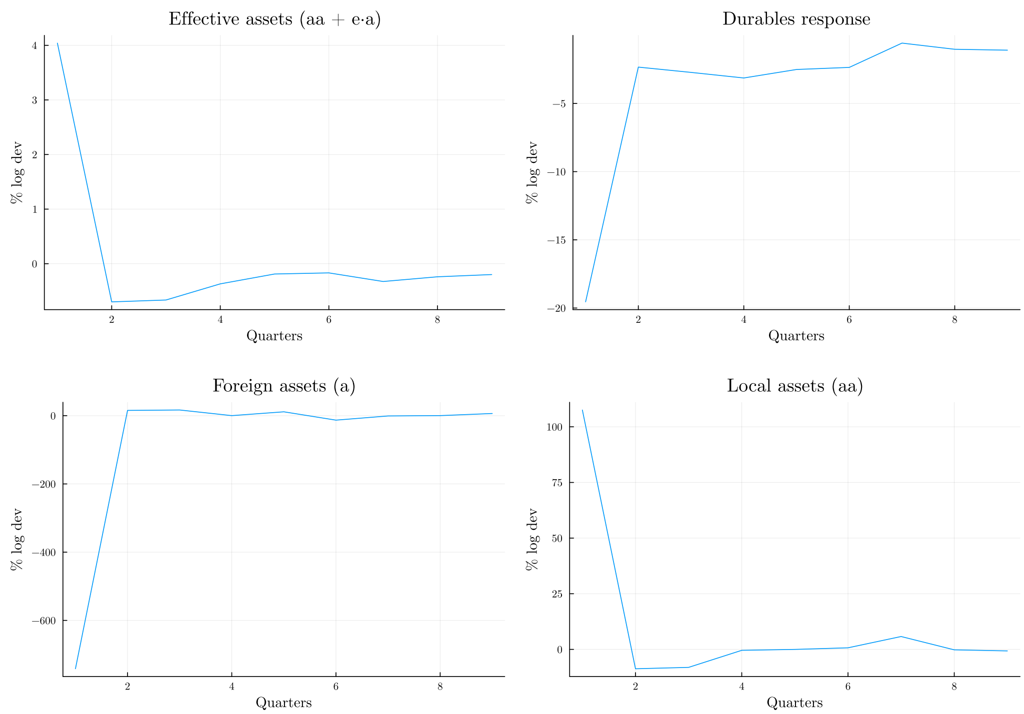

Figure 6: Impulse Response Functions

wealth in durables.

Figure 6 reports impulse responses to a three-standard-deviation exchange-rate depreciation. The shock generates an immediate reallocation of assets toward liquid portfolios as they reduce their durable holdings. In particular, they increase their local assets given the higher relative returns.

Consumption falls on impact due to higher effective prices of dollar-priced durables and precautionary motives, and then partially recovers as households rebalance portfolios. Overall, exchange-rate shocks transmit primarily through portfolio composition and consumption smoothing.

4.4 Model fit

Table 4 compares the targeted empirical moments to their simulated counterparts. The model matches the frequency and duration of durable adjustment and reproduces both the level and dispersion of portfolio dollarization. It also captures the

Table 4: Targeted moments: data and model

Moment	Data	Model
Mean years since last adjustment	23.2	24.4
Mean dollar share of liquid assets	0.24	0.23
Var. dollar share	0.24	0.07
Mean durable share of wealth	0.83	0.22
Var. durable share of wealth	0.09	0.04

concentration of household wealth in durables observed in the data.

Remaining discrepancies reflect margins that are deliberately abstracted from, such as borrowing constraints, housing heterogeneity, or life-cycle considerations. Nevertheless, the quantitative framework captures the key empirical regularities linking dollar pricing, portfolio choice, and lumpy durable adjustment.

5 Counterfactuals

I use counterfactuals to isolate how (i) nonconvex durable adjustment frictions, (ii) exchange-rate risk, and (iii) access to dollar saving shape household portfolios, spending dynamics, and welfare. In each experiment, I change one parameter or one component of the shock process and hold the remaining parameters fixed at their estimated values. I compute all outcomes in the stationary distribution implied by the counterfactual policy functions.

Welfare. Let $V^{\text{base}}(S)$ and $V^{\text{cf}}(S)$ denote the value functions in the baseline and counterfactual economies. Let μ^{base} denote the stationary distributions over the baseline. I summarize welfare by the stationary-average value,

$$\bar{V}^j \equiv \int V^j(S)\, d\mu^{base}(S).$$

I define the consumption-equivalent variation (CEV) as

$$\lambda = \left(\frac{\bar{V}^{\text{cf}}}{\bar{V}^{\text{base}}}\right)^{\frac{1}{1-\gamma}} - 1, \tag{5.1}$$

With $\gamma > 1$, $\lambda > 0$ is a welfare loss (Lucas, 1987).

Table 5: Welfare loss for baseline households (CEV,%)

Counterfactual	**CEV$_{A \to B}$ keep μ^A (%)**
Higher durable adjustment cost	+0.06
Fixed exchange rate	+3.42
High exchange rate volatility	+8.95
Restricted dollar saving	+3.52

Notes: CEV$_{A \to B}$ keep μ^A reports changes in welfare and isolates policy/value changes holding the baseline stationary distribution fixed.
Positive values indicate welfare losses relative to the baseline economy; negative values indicate welfare gains.

5.1 More costly durable adjustment

I first increase the cost of durable adjustment by raising the resale haircut f (partial irreversibility).

Higher adjustment costs reduce the frequency of durable updates and increase the average duration between adjustments. Conditional on adjustment, households make larger discrete changes in durables. The reduced flexibility in the durable margin increases the value of liquid buffers, shifting resources toward liquid wealth and increasing the demand for assets that insure the dollar-priced replacement cost of durables.

The welfare effect negative as higher frictions worsen misallocation of the durable stock. Quantitatively, the net effect is summarized in Table 5.

5.2 Fixed exchange rate

I also consider a fixed-exchange-rate regime by setting $\sigma_e = 0$, eliminating exchange-rate risk while holding the mean level of the exchange rate fixed. In this environment, dollar assets no longer provide state-contingent insurance against movements in the local-currency price of durables, because that price becomes constant.

As a result, households reduce their demand for dollar savings and reallocate liquid wealth toward peso assets. Durable adjustment becomes less state dependent and both consumption and durable expenditure volatility decline. The welfare effect reflects two offsetting forces: reduced price risk lowers precautionary motives, but dollar assets lose their hedging role, which explains the welfare losses.

5.3 Higher exchange-rate volatility

Next, I increase exchange-rate risk by raising the innovation volatility σ_e of the baseline AR(1) exchange-rate process. This experiment captures macroeconomic environments with more volatile depreciations and thus more volatile local-currency prices for dollar-priced durables.

Higher σ_e increases the dispersion of states in which durable replacement becomes optimal. The model therefore predicts welfare losses driven by increased risk in the effective price of durables.

5.4 Higher cost of dollar saving

I next increase the portfolio wedge κ, which captures the reduced transactional usefulness or regulatory/tax cost of holding dollars. The experiment is a reduced-form representation of policies that discourage foreign-currency deposits or raise their effective cost relative to peso assets.

A higher κ reduces equilibrium dollarization and increases household exposure to exchange-rate risk when purchasing dollar-priced durables. Households substitute toward peso liquid wealth, which is more useful for routine transactions but does not hedge the durable replacement cost. The model predicts higher consumption and durable-expenditure volatility and welfare losses, reflecting the diminished ability to insure the durable price risk.

5.5 Rare exchange-rate disasters

Finally, I introduce rare but severe exchange-rate shocks following the rare-disaster literature (Barro, 2006; Barro and Ursua, 2008; Gourio, 2012; Farhi and Gabaix, 2015). This counterfactual captures the possibility of sudden devaluations, such as those experienced by Uruguay in the early 2000s, which are infrequent but large and persistent.

Specifically, I augment the baseline exchange-rate process,

$$\log e_t = \rho_e \log e_{t-1} + \sigma_e \varepsilon_t,$$

with a jump component:

$$\log e_t = \rho_e \log e_{t-1} + \sigma_e \varepsilon_t + J_t \kappa_e, \qquad J_t \sim \text{Bernoulli}(\pi_e), \tag{5.2}$$

where $\kappa_e > 0$ denotes the log size of a devaluation and π_e is the per-period probability of a crisis. I calibrate π_e to match annual disaster probabilities between 20 percent and consider devaluation sizes $\kappa_e \in \{\ln 1.18, \ln 1.89\}$, spanning moderate to severe exchange-rate collapses, consistent with historical estimates for emerging economies—e.g. Uruguay in 2002 (Drenik et al., 2018).

The rare jump simultaneously raises the local-currency price of dollar-denominated durables and revalues dollar-denominated liquid assets. As a result, even when crises do not materialize within a finite simulation window, the latent probability of a large devaluation increases the insurance value of dollar savings. Households respond by tilting their portfolios toward foreign currency and delaying durable adjustment, reflecting heightened precautionary motives.

Table 6: Rare exchange-rate disasters

$\pi^{(y)}$	Deval. size (%)	CEV (%)	Mean USD share	Mean duration
0.20	18	0.30	0.074	24.45
0.20	89	0.27	0.074	24.45

Notes: Devaluation size is $100(\exp(\kappa_e) - 1)$. CEV denotes the consumption-equivalent welfare change relative to the baseline economy.

Table 6 shows that rare exchange-rate disasters generate nontrivial welfare effects despite leaving household behavior unchanged. Expected devaluations reduce welfare as higher durable prices dominate expected portfolio gains. Importantly, households adjust their portfolio composition, reducing their dollar savings and keeping the inaction durations unaffected. This reflects the dominance of non-convex adjustment costs in governing durable decisions, which makes extensive margins insensitive to tail risk. The result highlights a wedge between welfare and behavior: rare disasters matter for expected utility even when they do not induce observable changes in adjustment or portfolio choices.

6 Conclusion

This paper studies how dollar pricing of durable goods shapes household behavior in small open economies. I develop a quantitative household model that combines lumpy durable adjustment, exchange-rate risk, and portfolio choice between peso and dollar assets. The model highlights how the denomination of durable prices interacts with portfolio frictions to jointly determine consumption smoothing, saving composition, and the timing of durable purchases.

Three mechanisms emerge. First, dollar pricing amplifies durable adjustment frictions: because replacement costs are denominated in dollars, exchange-rate fluctuations alter the local-currency cost of adjustment, widening inaction regions and generating infrequent but large durable updates. Second, households face a portfolio trade-off between peso assets, which are liquid for everyday consumption, and dollar assets, which hedge against depreciation but are imperfectly liquid. Third, exchange-rate dynamics directly link saving and spending decisions by affecting both the real return on dollar assets and the cost of dollar-priced durables.

Quantitatively, the model replicates key features of Uruguayan household data, including infrequent durable adjustment, long durable tenures, and widespread dollar saving across the income distribution. Counterfactuals show that higher durable adjustment frictions or greater exchange-rate volatility reduce welfare. Policies that raise the cost of dollar saving or restrict access to foreign-currency assets reduce household dollarization but substantially increase household-level risk exposure and welfare losses. By contrast, exchange-rate stabilization compresses precautionary saving and improves welfare, but eliminates the insurance role of dollar assets.

The results suggest that household dollarization is an endogenous response to pricing frictions and exchange-rate risk in partially dollarized economies. Policies aimed at reducing dollarization face a fundamental trade-off: while they may enhance systemic financial stability, they shift exchange-rate risk onto households. An alternative approach is to reduce the underlying demand for dollar hedging by promoting credible monetary policy and developing deep local-currency financial markets, rather than restricting the supply of dollar assets.

More broadly, the analysis underscores the importance of studying currency denomination at the household level. Understanding how financial and real frictions jointly shape portfolio choice and consumption behavior is essential for assessing macroeconomic vulnerability in emerging economies.

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Appendix

A Durable adjustment with dollar pricing: gaps, inaction, and hedging

This appendix provides intuition for the household's durable adjustment decision in the presence of dollar pricing and exchange-rate risk. The discussion is illustrative and focuses on the reduced-form environment used in the quantitative model.

Environment. The household state is

$$s_t = (w_t, d_{t-1}, e_t, y_t),$$

where w_t is total liquid wealth in local-currency units, d_{t-1} is the beginning-of-period durable stock, e_t is the nominal exchange rate (local currency per USD), and y_t is an idiosyncratic income shifter. Preferences are

$$u(c_t, d_t) = \frac{(c_t^{\nu} d_t^{1-\nu})^{1-\gamma}}{1-\gamma}, \qquad \nu \in (0,1),\ \gamma > 0.$$

Durables are priced in dollars at price p_d, so the local replacement cost is $P_t^d = e_t p_d$.

Durable adjustment is lumpy due to partial irreversibility. If the household does not adjust, the durable stock evolves as

$$d_t = (1-\delta) d_{t-1}.$$

If the household adjusts, it chooses a new durable stock d_t and liquidates the depreciated stock at a resale value subject to a haircut $f \in (0,1)$.

Frictionless target and normalized gap

Absent adjustment frictions, the optimal durable choice satisfies the intratemporal condition

$$\frac{u_d(c_t, d_t)}{u_c(c_t, d_t)} = P_t^d,$$

which implies the frictionless target

$$d_t^* = \frac{1-\nu}{\nu} \cdot \frac{c_t}{e_t p_d}.$$

Define the normalized durable gap as

$$z_t \equiv \frac{(1-\delta)\, d_{t-1}}{d_t^*} = \underbrace{\frac{(1-\delta)\,\nu}{1-\nu}}_{\xi} \cdot \frac{e_t p_d\, d_{t-1}}{c_t}.$$

Values $z_t > 1$ correspond to an excessive durable stock relative to the target, while $z_t < 1$ indicates underaccumulation.

Exchange-rate movements directly affect the gap: a depreciation raises $e_t p_d$, increasing z_t and pushing households toward delaying replacement or downsizing.

Inaction and asymmetric adjustment

Because adjusting involves resale losses, households tolerate deviations from the frictionless target. The value gain from adjustment is decreasing in $|z_t - 1|$ near the target and increasing when the gap becomes large. This generates an inaction region in z_t.

Unlike fixed-cost S–s models, partial irreversibility implies asymmetric inaction:

- When $z_t > 1$ (excess durable stock), selling is costly due to the resale haircut, so households tolerate relatively large deviations.
- When $z_t < 1$ (insufficient durable stock), buying is less distorted, leading to a narrower inaction region.

As a result, the effective inaction set is wider on the "sell" side than on the "buy" side, consistent with infrequent durable replacement and long observed tenures.

Dollar saving and hedging

Households allocate end-of-period savings across peso and dollar assets. Let s_t denote the dollar share of savings. The next-period liquid wealth is

$$w_{t+1} = (1+r)(1-s_t)w'_t + (1+r^{\$})s_t w'_t \frac{e_{t+1}}{e_t} - \kappa s_t w'_t,$$

where κ captures the reduced liquidity of dollar saving.

Dollar assets hedge exchange-rate risk: when e_{t+1} rises, the local-currency value of dollar savings increases, partially offsetting the higher replacement cost of durables. By stabilizing future consumption relative to durable needs, dollar saving reduces the volatility of the marginal rate of substitution between c and d.

Remark A.1 (Hedging and inaction). Policies or environments that increase the effectiveness of dollar saving as a hedge against exchange-rate risk reduce the volatility of the normalized gap z_t and shrink the effective inaction region.

Comparative statics

Locally, the normalized gap satisfies

$$z_t \propto \frac{e_t p_d \, d_{t-1}}{c_t}.$$

Hence:

$$\frac{\partial z_t}{\partial e_t} > 0 \quad \text{and} \quad \frac{\partial z_t}{\partial y_t} < 0.$$

Depreciations push households toward inaction or downsizing, while positive income shocks encourage upgrading. Increases in irreversibility (f) widen the inaction region, whereas improved hedging opportunities through dollar saving narrow it.

Figure 7 shows the stationary distribution of the durable gap, defined as the log deviation between the depreciated durable stock and the frictionless target. The bimodal shape reflects clustering near the target for recent adjusters and large deviations for households inside the inaction region. This pattern is consistent with an endogenous (S,s)-type policy implied by nonconvex adjustment costs.

This mechanism clarifies how dollar pricing, exchange-rate risk, and portfolio

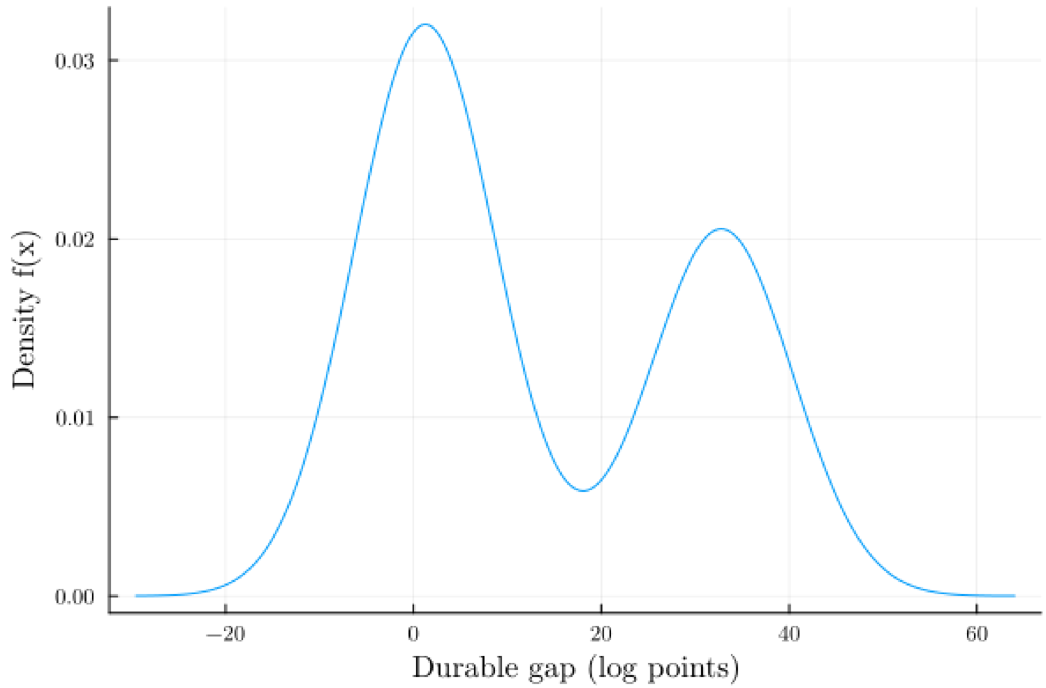

Figure 7: Distribution of the durable gap

choice jointly shape durable adjustment behavior in the quantitative model.

A.1 Comparative statics

I examine how key moments respond to changes in structural parameters. This exercise serves two purposes: it clarifies the economic mechanisms underlying the model and it supports the local identification of the SMM estimator.

Figure 8 reports comparative statics with respect to the resale haircut f and exchange-rate volatility σ_e, holding other parameters fixed at their estimated values. The left panel shows that increasing the resale haircut monotonically reduces the adjustment rate: higher irreversibility widens the inaction region, causing households to tolerate larger deviations from their target durable stock before adjusting. The relationship is steep at low values of f and flattens as adjustment becomes rare, consistent with (S, s) models where the marginal effect of frictions diminishes once inaction is already prevalent.

The right panel shows that increasing exchange-rate volatility raises the equilibrium dollar share of liquid assets. Greater volatility increases the insurance value of dollar holdings, which appreciate in local-currency terms precisely when depreciation raises the cost of durable replacement. The response is approximately linear over the empirically relevant range.

Importantly, these two margins are largely orthogonal. Adjustment costs primarily affect the timing of durable updates with minimal effect on portfolio composition, while exchange-rate volatility primarily affects currency allocation with limited impact on adjustment frequency. This separation arises because the adjustment decision depends on the level of the durable gap relative to thresholds, whereas portfolio choice depends on the variance of future exchange rates.

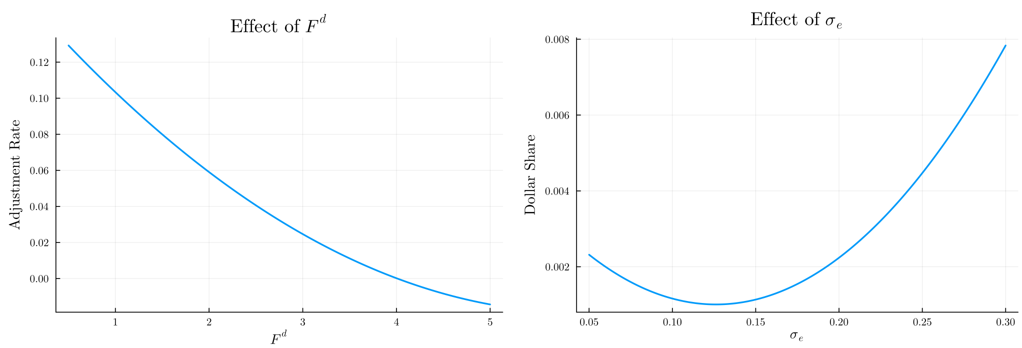

Figure 8: Comparative Statics

B Convex Durable Adjustment Model

This section presents a convex-adjustment benchmark that clarifies the interaction between exchange-rate risk, dollar assets, and durable investment. The environment abstracts from nonconvex adjustment costs and partial irreversibility, allowing for smooth durable adjustment. The purpose is interpretive: to isolate how dollar pricing mechanically links portfolio choice and durable investment through Euler equations.

Environment. Households choose consumption c_t, liquid wealth, dollar assets, and durable investment $x_t \equiv d_t - (1-\delta)d_{t-1}$. Durables are priced in dollars at price p_d, so the local-currency purchase price is $e_t p_d$. Adjustment costs are quadratic:

$$\frac{\phi}{2}x_t^2.$$

Let λ_t denote the multiplier on the budget constraint and μ_t the multiplier on durable accumulation.

(i) USD asset Euler. The optimality condition for dollar-denominated liquid assets is

$$1 = \mathbb{E}_t\left[\beta(1+r^{\$})\frac{\lambda_{t+1}}{\lambda_t}\frac{e_{t+1}}{e_t}\right].$$

Dollar assets pay off in local currency through exchange-rate revaluation. Hence, exchange-rate risk enters directly into the intertemporal trade-off.

(ii) Durable Euler (Tobin's q). Define Tobin's q_t as the shadow value of installed durables relative to their replacement cost:

$$q_t \;\equiv\; \frac{\mu_t}{\lambda_t\, e_t p_d}.$$

With quadratic adjustment costs, the investment rule is linear:

$$q_t = 1 + \phi x_t.$$

The forward-looking Euler equation for q_t is

$$q_t = \frac{u_d(c_t, d_t)}{\lambda_t\, e_t p_d} + \mathbb{E}_t\left[\beta(1-\delta)\frac{\lambda_{t+1}}{\lambda_t}\frac{e_{t+1}}{e_t}q_{t+1}\right].$$

(iii) Intratemporal MRS. Preferences imply

$$\frac{u_d}{u_c} = \frac{1-\nu}{\nu}\frac{c_t}{d_t}.$$

Interpretation. Tobin's q_t measures the marginal value of an additional unit of durable relative to its dollar replacement cost. Exchange-rate risk enters both Euler equations symmetrically through the term e_{t+1}/e_t:

- In the *portfolio Euler*, dollar assets hedge depreciations by delivering higher local-currency payoffs.

- In the *durable Euler*, depreciations raise the future replacement cost of durables, increasing the continuation value of installed capital.

As a result, exchange-rate movements jointly affect saving in dollar assets and the incentive to invest in durables. Dollar assets hedge precisely the states in which durable replacement becomes expensive. This convex benchmark makes clear that the interaction between currency choice and durable investment arises even absent nonconvexities.

In the full model, nonconvex adjustment costs and irreversibility transform these smooth responses into infrequent, state-dependent adjustment episodes, but the underlying hedging logic remains the same.

C Data construction and measurement alignment

Currencies and timing. All monetary variables are expressed in U.S. dollars. For each EFHU wave w conducted in calendar year t, peso-denominated variables X_{it}^{UY} are converted using the contemporaneous nominal exchange rate e_t (pesos per dollar):

$$X_{it}^{USD} = \frac{X_{it}^{UY}}{e_t}.$$

This convention aligns the data with the model's pricing structure, in which durable goods are priced in dollars and have local-currency prices $P_t^d = e_t p_d$. All empirical moments used for estimation are ratios or shares and are therefore invariant to the choice of numeraire.

Income concept. To match the model's normalization of durable holdings by income, we use labor income only. Quarterly labor income is constructed as

$$y_{it}^{\text{lab}} \equiv 3 \times \text{monthly labor income},$$

winsorized by wave to limit the influence of extreme values. All moments involving durable-to-income ratios in the data use y_{it}^{lab} as the denominator, and the simulated moments are constructed using the same definition.

Durable definitions. In the baseline specification, the household durable stock is defined as the sum of housing and vehicle values. We additionally report robustness exercises using (i) housing only and (ii) vehicles only. This distinction is relevant because depreciation rates and resale frictions differ across components, while the model abstracts from this heterogeneity by using a single composite durable good.

Survey design and inference. All descriptive statistics and empirical moments are computed using household survey weights. Standard errors and the SMM weighting matrix are constructed using a household-level block bootstrap, resampling households with replacement to preserve cross-variable dependence within households.

D Estimation

Objective. Parameters are estimated by Simulated Method of Moments (SMM). Let m^{data} denote the vector of empirical moments and $m(\theta)$ the corresponding simulated moments generated by the model under parameter vector θ. The estimator solves

$$\hat{\theta} \;=\; \arg\min_{\theta}\; Q(\theta), \qquad Q(\theta) = \left[m(\theta) - m^{\text{data}}\right]^{\top} W \left[m(\theta) - m^{\text{data}}\right].$$

We initialize the procedure with a diagonal weighting matrix $W_0 = \text{diag}(1/\widehat{\text{Var}}(m_k^{\text{data}}))$. After an initial convergence, we estimate the covariance matrix of the empirical moments using influence functions and a block bootstrap clustered by survey wave. The efficient weighting matrix is then $W^{\star} = \widehat{\Sigma}^{-1}$, where $\widehat{\Sigma}$ denotes the estimated covariance of m^{data}. Parameters are re-estimated using $W^{\star}$, and we report the over-identifying J-statistic and its associated p-value.

Simulation and optimization. Simulated expectations are computed by forward simulation under the estimated Markov processes for income and exchange rates. Common random numbers are used across parameter evaluations to reduce simulation noise and ensure smoothness of the objective function.

Optimization proceeds in two stages. First, we perform a coarse global search using simulated annealing to explore the parameter space and mitigate local minima. Second, we refine convergence using a local gradient-based algorithm (BFGS), initialized at the best candidate from the global stage. The procedure is repeated from multiple starting values, and we retain the parameter vector that minimizes $Q(\theta)$.

Inference and robustness. Parameter uncertainty is quantified using the delta method. Let $J = \partial m(\theta)/\partial\theta^\top|_{\hat{\theta}}$ denote the Jacobian of simulated moments evaluated at the estimate. The asymptotic covariance matrix is

$$\widehat{\mathrm{Var}}(\hat{\theta}) = \left(J^\top W^\star J\right)^{-1} J^\top W^\star \widehat{\Sigma} W^\star J \left(J^\top W^\star J\right)^{-1}.$$

Standard errors are reported as square roots of the diagonal elements.

We assess numerical robustness by varying simulation horizons, random seeds, and initial conditions, and by reporting sensitivity profiles for key structural parameters (δ, f, κ).

E Computational Procedure

Discretization. The model is solved on a finite grid for the state variables (w, d, e, y). Idiosyncratic income and exchange-rate processes are approximated by n_y- and n_e-state Markov chains using the Tauchen–Hussey method. Asset and durable grids are nonlinearly spaced to concentrate points near borrowing constraints and low durable holdings; the baseline grid sizes are $n_w = 15$ and $n_d = 11$. Durables depreciate deterministically at rate δ.

Solution method. For each state-grid point, we solve the Bellman equations associated with the adjustment and no-adjustment branches, $V^{\text{adjust}}(s)$ and $V^{\text{noadjust}}(s)$. Off-grid choices are handled by interpolation, and expectations are taken over the discrete transition matrices for (e', y'). Value function iteration proceeds until convergence, $\|V^{(k+1)} - V^{(k)}\|_\infty < 10^{-4}$. Optimal policy functions for consumption, portfolio choice, and durable adjustment are stored for simulation.

Simulation. Given parameter vector θ, the model is simulated forward for $T = 1{,}500$ periods, discarding the first 250 as burn-in. Moments are computed from the ergodic distribution of simulated households and aligned with their empirical counterparts (means, dispersions, ratios, and adjustment frequencies). Common random numbers are used across parameter evaluations to reduce Monte Carlo noise in the SMM objective.

Estimation routine. Estimation combines a global and a local optimization stage. First, a simulated-annealing algorithm explores the parameter space to mitigate nonconvexity arising from durable adjustment costs. Second, the best candidate is refined using a quasi-Newton (BFGS) method, initialized at the global optimum. Convergence is declared when changes in parameters and the objective function fall below 10^{-4}.

Weighting matrix and inference. The optimal SMM weighting matrix $W^{\star}$ is constructed from the empirical covariance of moments estimated via influence functions and a block bootstrap clustered by survey wave. After re-estimation under $W^{\star}$, parameter uncertainty is quantified using the delta method:

$$\widehat{\mathrm{Var}}(\hat{\theta}) = \left(J^{\top} W^{\star} J\right)^{-1} J^{\top} W^{\star} \widehat{\Sigma} W^{\star} J \left(J^{\top} W^{\star} J\right)^{-1},$$

where $J = \partial m(\theta) / \partial \theta^{\top}|_{\hat{\theta}}$.

Diagnostics and robustness. We verify that simulated ergodic distributions replicate the targeted data moments and report the over-identifying J-statistic. All results are robust to alternative random seeds, grid densities, and simulation horizons. Sensitivity checks for key parameters confirm that policy functions and moment matches are locally stable.