Appendix, "The International Monetary Transmission Mechanism," by Santiago Camara, Lawrence Christiano, and Hüsnü Dalgic. In NBER Macroeconomics Annual 2024, volume 39, edited by Martin S. Eichenbaum, John V. Leahy, and Valerie A. Ramey. Chicago, IL: University of Chicago Press, 2025.

A Robustness Treatment of US Data in Panel VARs

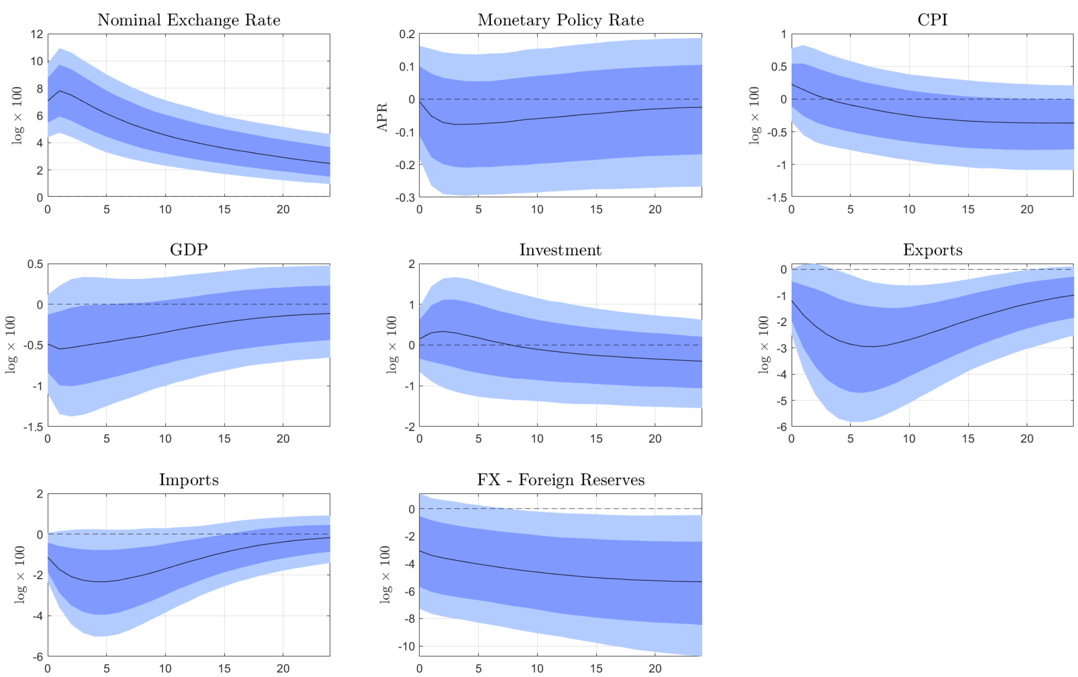
Here, we report the results of two robustness checks on the results reported in Figures 3 and 4.

A.1 Dropping US VAR From Country-level Data in Panel Regressions

We reestimate impulse response functions using a version of country-level equation (5) in which the three equations containing the US variables in $\tilde{Y}_t$ are deleted. Two lags of those variables are left as exogenous right hand variables in the country-level equations. The resulting panel VAR (i.e., equation (7)) zeros out any possible feedback from foreign economies to the US after a US monetary policy shock. Unlike the panel data VARs in section 2.2 the panel data VARs here cannot generate IRFs for US data, so none are presented.

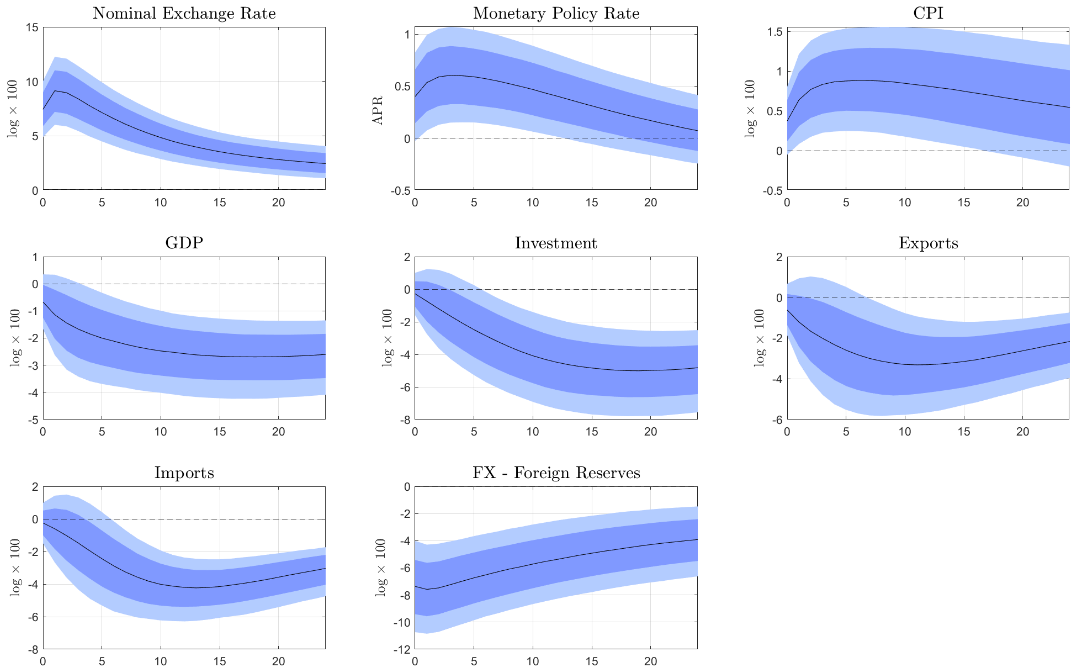
We redo the estimation of the perturbed version of equation (7) for AEs and EMEs. The resulting IRFs are reported in Figures 19 and 20, respectively.

Figure 19: Response to Contractionary US Monetary Policy Shock, Advanced Economies



Note: IRFs from a perturbed version of the panel VAR estimation for the AE countries reported in Figure 3. The perturbation deletes country-level equations where the US data are left-hand variables. Lagged US data remain in the remaining country-level equations. Because the US data are treated as an exogenous process, the system does not generate IRFs in US variables, unlike in Figure 3.

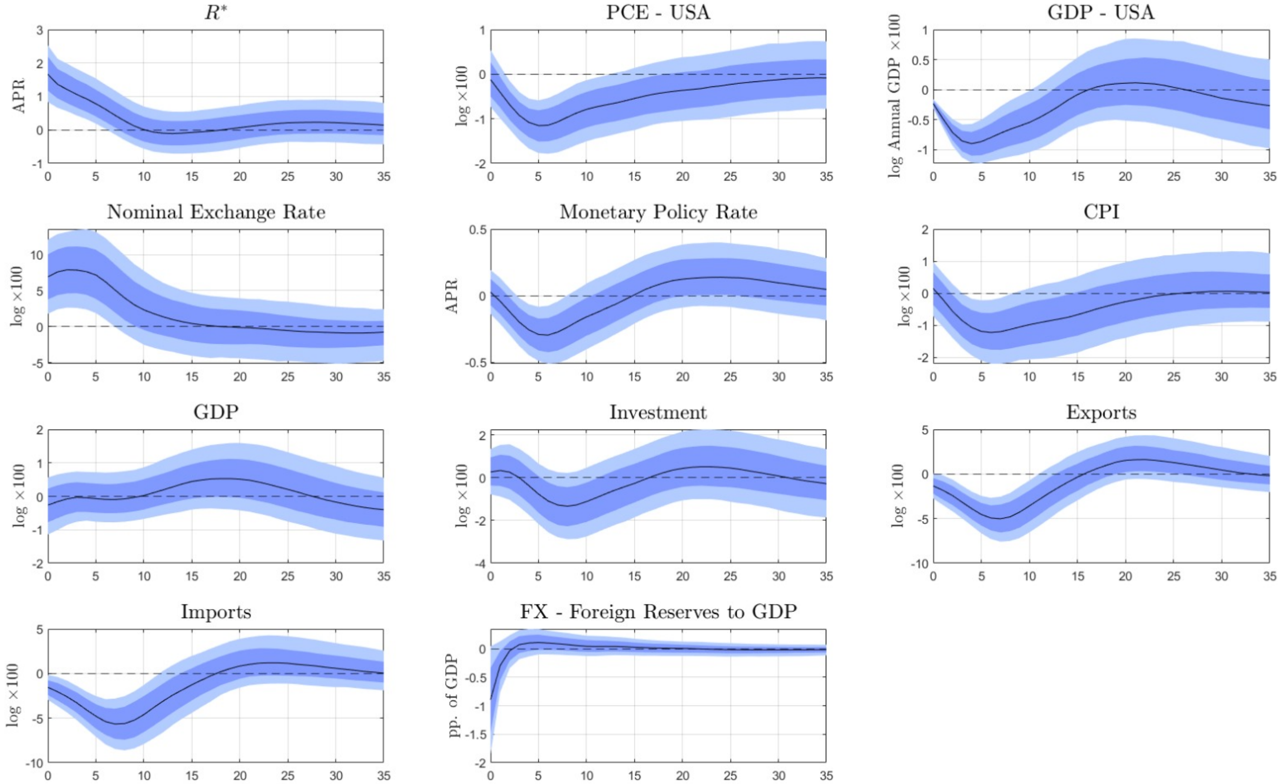
Figure 20: Response to Contractionary US Monetary Policy Shock, Emerging Market Economies



Note: IRFs are for EMEs. See notes to Figure 19 and text.

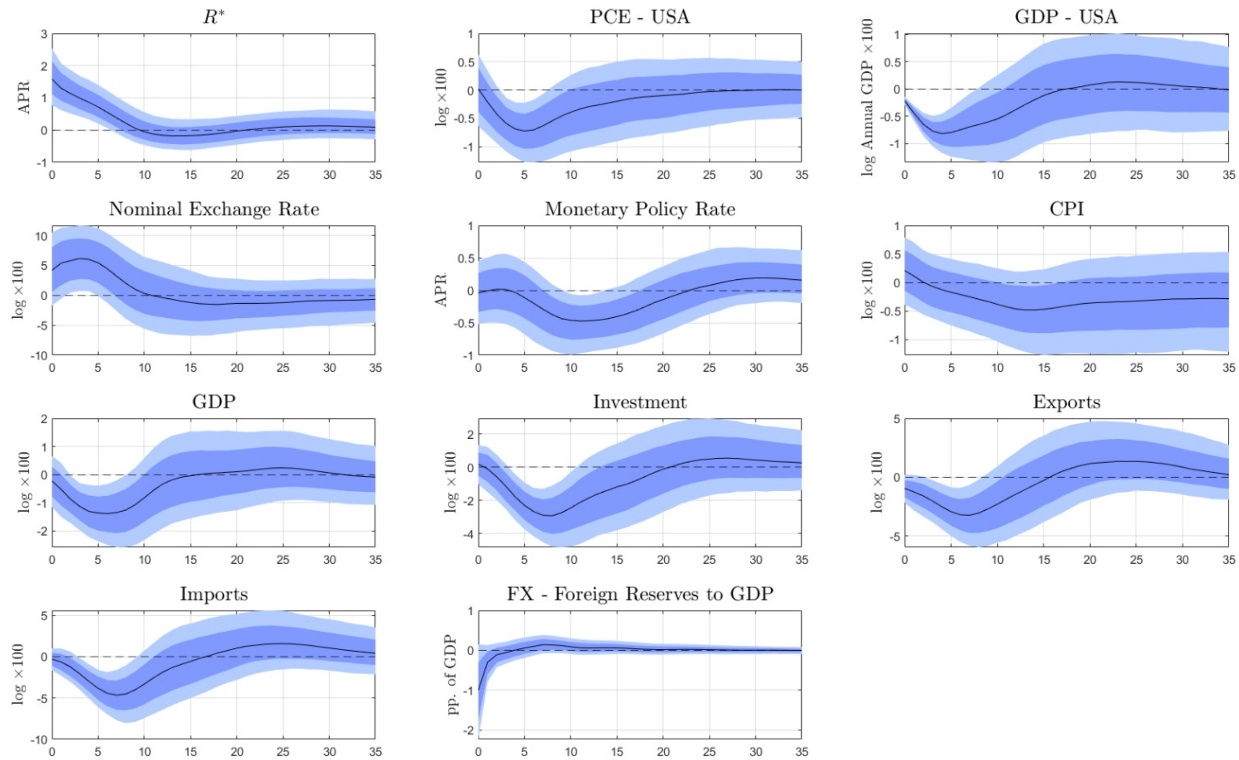
A.2 Panel Regressions Using Cross Country Averages

Figure 21: Response to Contractionary US Monetary Policy Shock, Advanced Economies



Note: IRFs are for AEs.

Figure 22: Response to Contractionary US Monetary Policy Shock, EMEs



Note: IRFs are for EMEs.

B Robustness of Results to Local Projections

We perform regressions similar to what is proposed in Jordà (2005). Consider the following equation:

$$y_{t+h} = \beta_y^h \varepsilon_t^m + \beta_{y,1}^h \varepsilon_{t-1}^m + \beta_{y,2}^h \varepsilon_{t-2}^m + \sum_y \sum_{j=1}^{2} J_{y,j}^h Y_{t-j} + u_t^{y,h}, \tag{45}$$

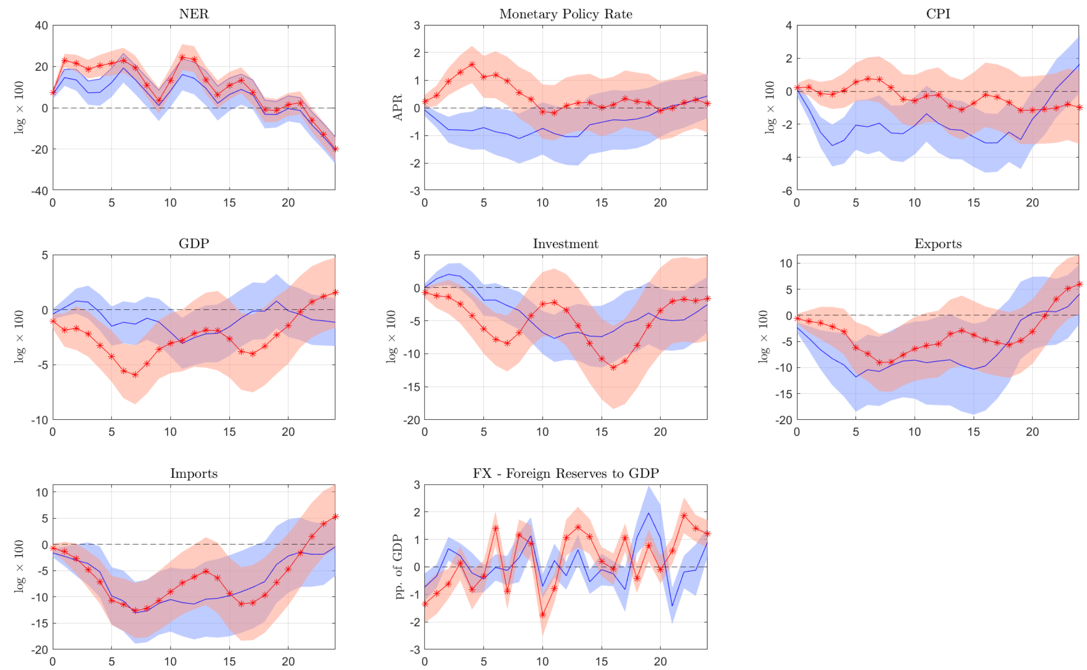
for $h = 0, ..., 24$. We perform these regressions separately for the AEs and the EMEs.[64] In the case of the AEs y_{t+h} is variable y at lead $t+h$, where y refers one of the 8 non-US variables in Y_t. The variables, y, are indicated in Figure 23. Also, Y_t in equation (45) corresponds to the average of $Y_{i,t}$ in equation (6) over the i's in the AEs. Similarly, for the case of the EMEs. Equation (45) corresponds to 25×8 least squares regressions, 25 regressions for each of the 8 non-US elements of Y.

The values of β_y^h are displayed in Figure 23. Not surprisingly the results are somewhat more noisy than what we find in our panel VARs (see Figures 3 and 4). However, the results are qualitatively the same. Output falls more in the EMEs than in the AEs. Indeed, the results are consistent with the baseline results in the text, in which EME output falls substantially more than

[64] To avoid clutter, our notation in equation (6) does not distinguish whether we are working with the AEs or the EMEs.

US output after a US monetary tightening. Monetary policy is accommodative in the AEs and restrictive in the EMEs. Importantly, exports fall significantly in both the AEs and the EMEs.

Figure 23: Response to Contractionary US Monetary Policy Shock, AEs and EMEs



Note: Starred red lines (shaded areas) represent the point estimates of β_y^h (two-standard deviation intervals) corresponding to EMEs. Solid blue lines and shaded areas corresponds to AEs. Standard deviations correspond to Newey-West robust standard errors. See text for further discussion.

C Robustness to Jarociński and Karadi Shocks

We also considered the monetary policy shocks computed in Jarociński and Karadi (2020). The analog of Figure 3, done using the monetary shock measure of Jarociński and Karadi (2020), appears in Figure 24. Similarly, the analog of Figure 4 for the EMEs appears in Figure 25. Finally, the analog of Figure 5 for Peru appears in 26.

Broadly, the effects of a US monetary tightening on AEs and EMEs are similar. Consider the AEs first. According to the Jarociński and Karadi (2020) monetary shock measure, (1) AE GDP falls, though by a bigger percent than the fall in US GDP implied by the Bauer and Swanson (2023b) shock (compare Figures 24 and 3); (2) as in the analysis in the text, the fall in EME GDP is substantially larger than the drop in AE GDP; (3) exports fall by a larger amount (in percent terms) than GDP in AEs and EMEs.

Turning to the results for Peru, we see that the results in the text based on Bauer and Swanson (2023a) are similar when we use the Jarociński and Karadi (2020).

Figure 24: Response to Contractionary US Monetary Policy Shock, Advanced Economies, JK

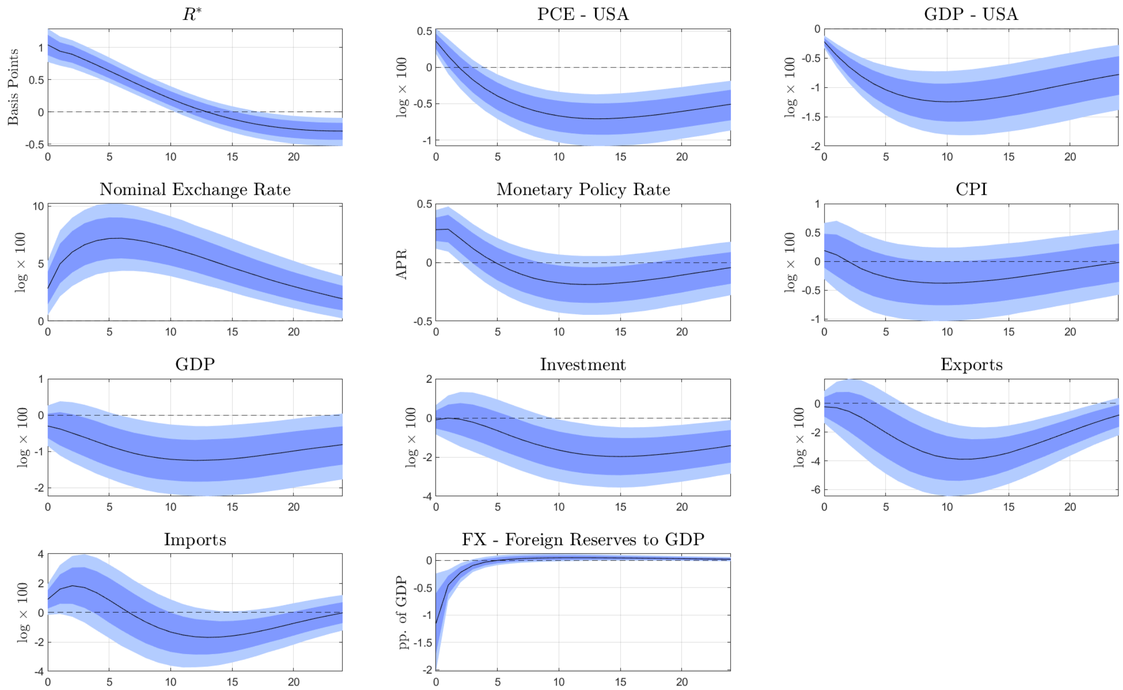


Figure 25: Response to Contractionary US Monetary Policy Shock, Emerging Markets, JK

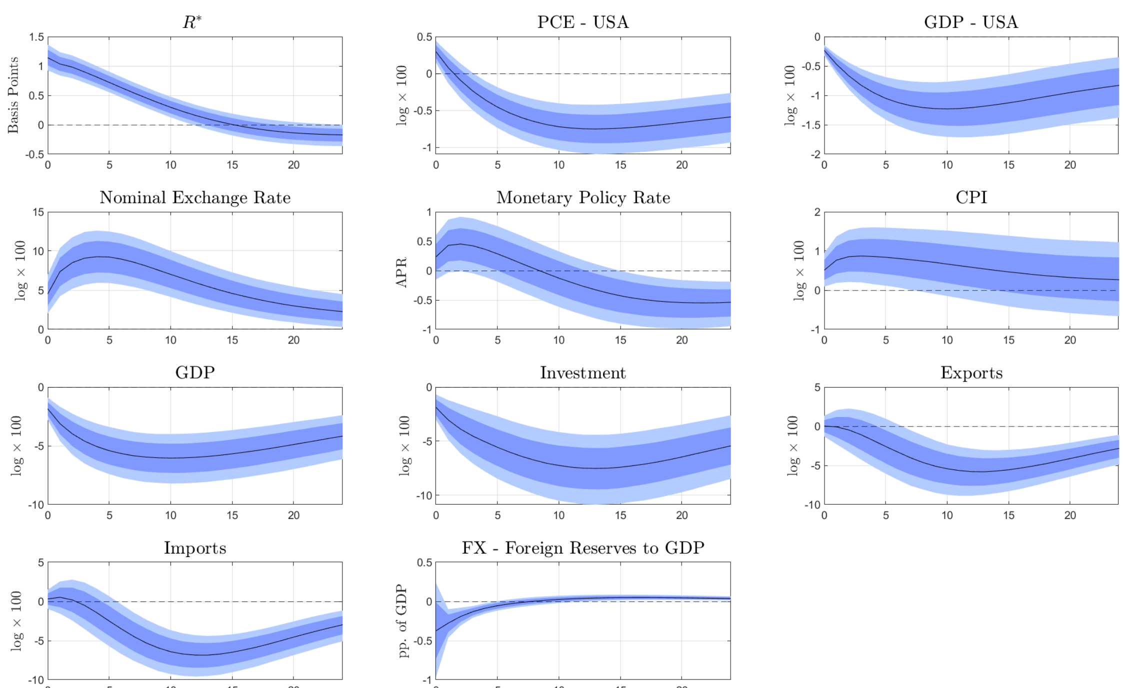
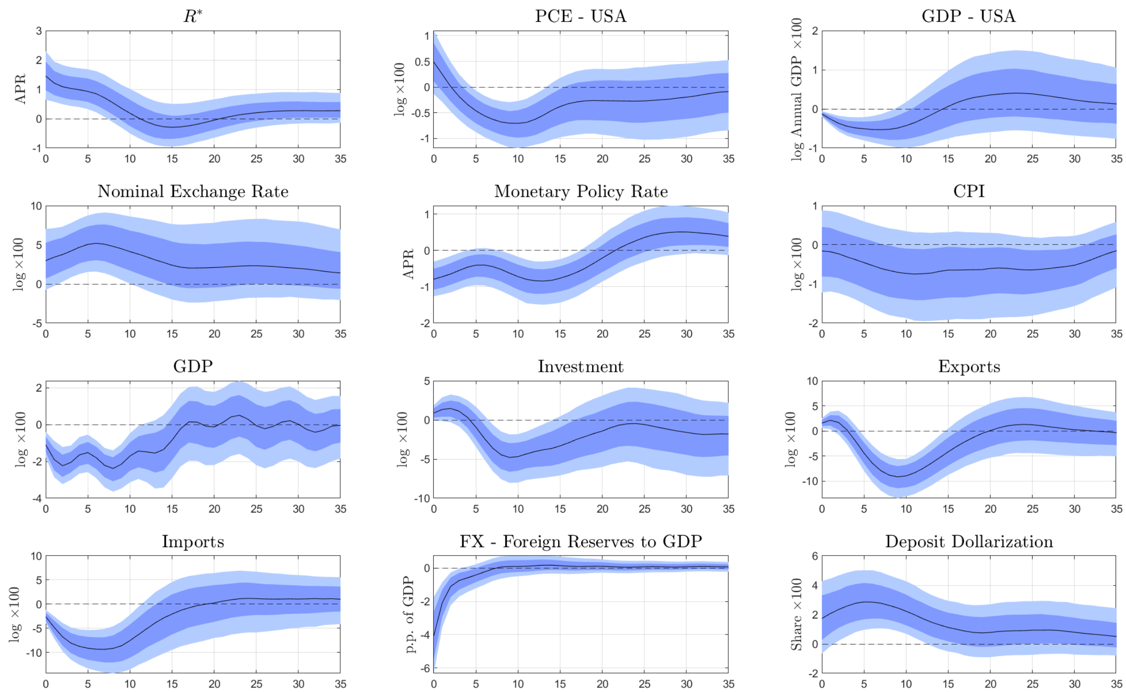


Figure 26: Response to Contractionary US Monetary Policy Shock, Peru, JK



D Prior and Posteriors for Model Parameters

This appendix reports priors and posteriors associated with our approximate Bayesian estimation approach. Because the estimation involved adjusting priors to target various steady state and other features, the results are not as straightforward to interpret as they are normally.

Table 4: AE Estimation

Parameter	Description	Prior Distribution	Prior Mean	Prior Std Dev	Posterior Mean	Posterior Std Dev
γ	Target Portfolio Cost	Normal	4.00	1.00	3.20	1.00
γ_R	Risk Appetite	Normal	200.00	75.00	44.78	13.57
γ_θ	Portfolio Inertia	Normal	-50.00	10.00	-47.77	10.67
κ	Investment Adjustment	Normal	3.00	1.00	1.78	0.91
ρ_R	MP Persistence	Normal	0.80	0.15	0.91	0.03
η_c	Consumption Elasticity of Substitution	Normal	2.50	0.30	1.53	0.37
η_x	Export elasticity of Substitution	Normal	2.50	0.50	1.18	0.55
ν_i	Investment Elasticity of Substitution	Normal	1.80	0.10	1.73	0.10
η^f	Price Elasticity of Exports	Normal	2.00	0.20	2.67	0.19
γ_f	Export Demand Shifter	Normal	6.00	0.50	3.86	0.75
θ^x	Export Calvo Stickiness	Beta	0.80	0.05	0.80	0.02
$1-\omega_c$	Home Bias, Consumption	Normal	0.85	0.02	0.90	0.02
γ_I	Home Bias, Investment	Normal	0.70	0.05	0.78	0.08
γ_x	Home Bias, Exports	Normal	0.70	0.05	0.77	0.05
ρ_R	MP Persistence	Normal	0.80	0.15	0.91	0.03

Table 5: EME Estimation

Parameter	Description	Prior Distribution	Prior Mean	Prior Std Dev	Posterior Mean	Posterior Std Dev
γ	Target Portfolio Cost	Normal	2.00	0.20	1.78	0.23
γ_R	Risk Appetite	Normal	70.00	10.00	29.46	8.46
γ_θ	Portfolio Inertia	Normal	-60.00	15.00	-19.47	7.97
κ	Investment Adjustment	Normal	5.00	1.50	5.85	1.17
θ_{R*}	FX Intervention Coefficient	Normal	0.50	0.15	0.16	0.02
ρ^{FX}	FX Intervention Persistence	Beta	0.85	0.10	0.21	0.06
η_c	Consumption Elasticity of Substitution	Normal	0.50	0.10	0.41	0.11
η_x	Export elasticity of Substitution	Normal	1.00	0.12	0.70	0.14
ν_i	Investment Elasticity of Substitution	Normal	1.20	0.30	0.91	0.15
η^f	Price Elasticity of Exports	Normal	1.50	0.10	1.53	0.10
γ_f	Export Demand Shifter	Normal	6.00	2.00	5.67	0.38
θ^x	Export Calvo Stickiness	Beta	0.80	0.10	0.80	0.07
$1-\omega_c$	Home Bias, Consumption	Normal	0.75	0.10	0.98	0.01
γ_I	Home Bias, Investment	Normal	0.60	0.10	0.71	0.11
γ_x	Home Bias, Exports	Normal	0.60	0.10	0.44	0.08
ρ_R	MP Persistence	Normal	0.85	0.15	0.82	0.05
$1-\phi$	Credit Dollarization	Normal	0.60	0.05	0.45	0.05
$\bar{\Upsilon}$	Steady State Deposit Dollarization	Normal	0.40	0.10	0.47	0.05
$\frac{F^*}{4\times GDP}$	Steady State Reserves/GDP	Normal	0.15	0.01	0.15	0.01

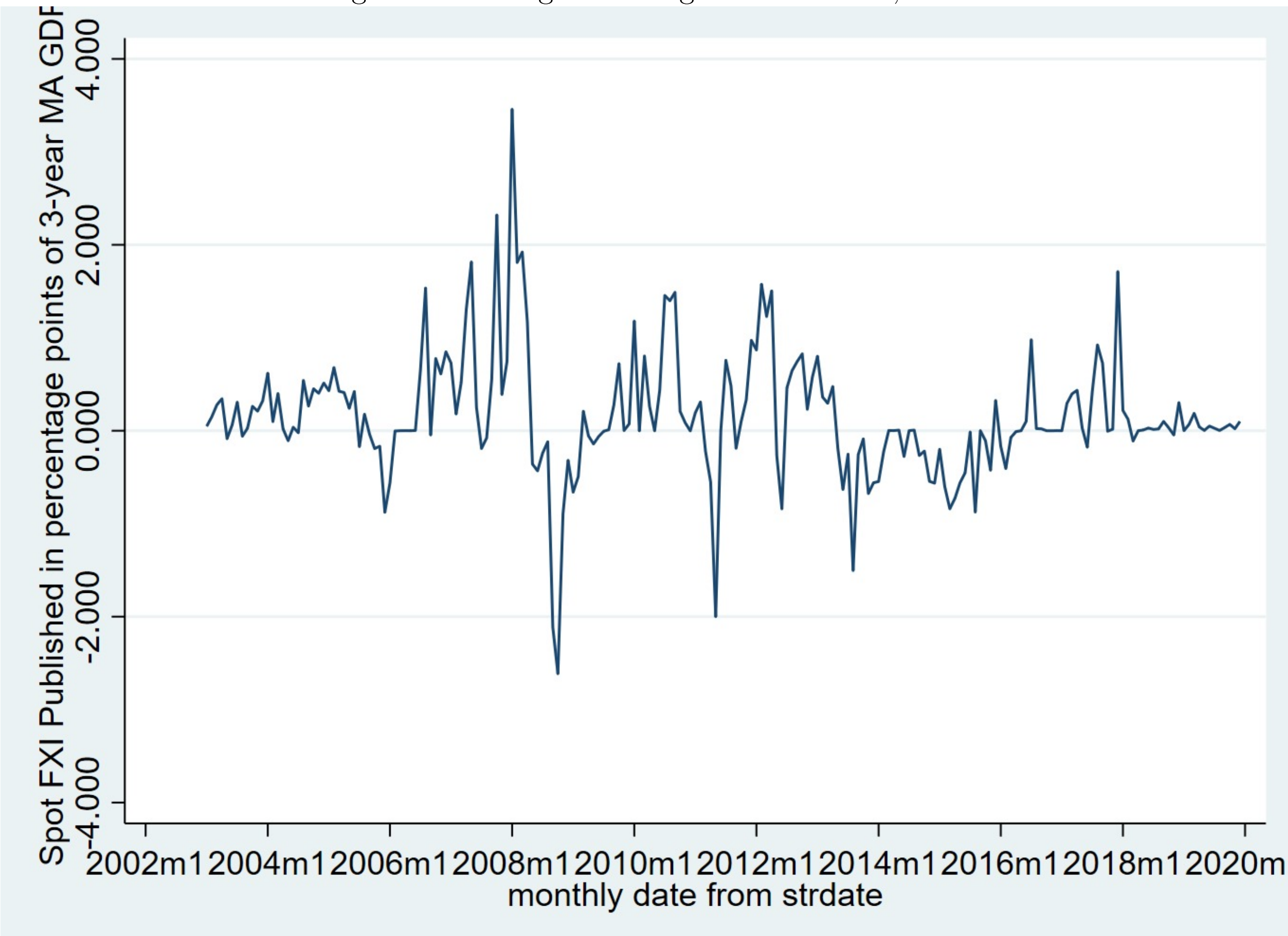
Table 6: Peru Estimation

Parameter	Description	Prior Distribution	Prior Mean	Prior Std Dev	Posterior Mean	Posterior Std Dev
γ	Target Portfolio Cost	Normal	2.50	0.50	2.56	0.50
γ_R	Risk Appetite	Normal	30.00	10.00	22.46	7.59
κ	Investment Adjustment	Normal	3.00	1.00	3.16	0.81
θ_{R*}	FX Intervention Coefficient	Normal	0.50	0.05	0.42	0.04
ρ^{FX}	FX Intervention Persistence	Beta	0.80	0.10	0.78	0.05
η_c	Consumption Elasticity of Substitution	Normal	1.20	0.60	0.94	0.60
η_x	Export elasticity of Substitution	Normal	1.50	0.30	1.58	0.30
ν_i	Investment Elasticity of Substitution	Normal	1.20	0.20	1.17	0.20
η^f	Price Elasticity of Exports	Normal	2.00	0.20	2.11	0.20
γ_f	Export Demand Shifter	Normal	5.50	0.50	4.02	0.36
θ^x	Export Calvo Stickiness	Beta	0.80	0.05	0.77	0.04
$1-\omega_c$	Home Bias, Consumption	Normal	0.70	0.05	0.83	0.07
γ_I	Home Bias, Investment	Normal	0.30	0.10	0.21	0.11
γ_x	Home Bias, Exports	Normal	0.50	0.10	0.51	0.10
ρ_R	MP Persistence	Normal	0.80	0.15	0.88	0.04

E Foreign Exchange Interventions in Peru

Data in the following figure are taken from Adler et al. (2024). Note that FX interventions in Peru are substantial.

Figure 27: Foreign Exchange Interventions, Peru



Note: Data obtained from replication files associated with Adler et al. (2024). Data represent FX purchases and sales (when negative), in US dollars as a percent of a 3-year moving average of Peruvian GDP measured in dollars.

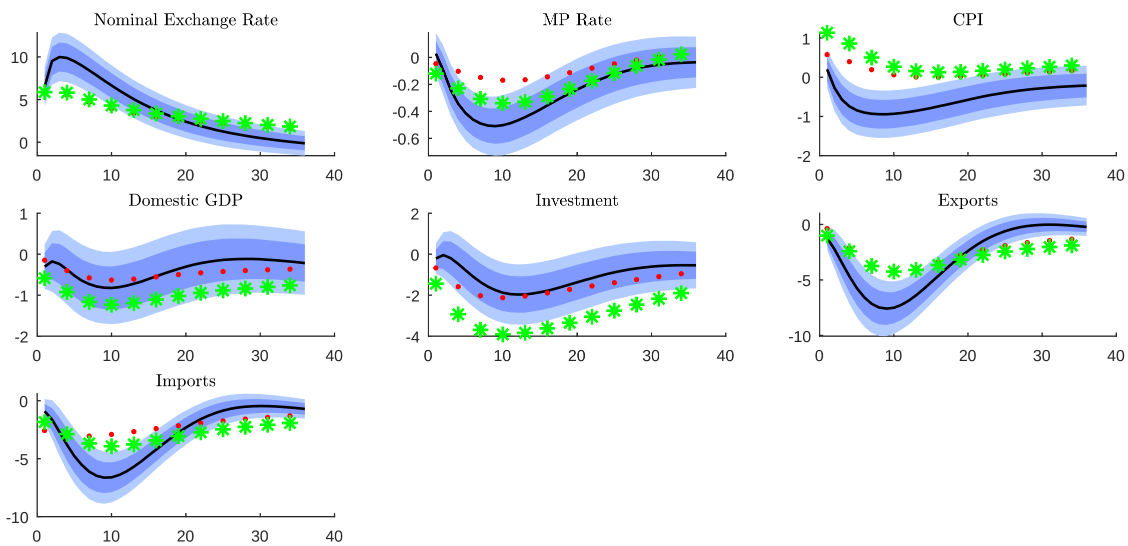
F Home Bias in Advanced Economies

In section 5.1 we showed that the AE model can account for the evidence that GDP falls by a smaller amount in AEs than in EMEs, after a US monetary tightening. At the same time, the AE model has the shortcoming that it implies a counterfactually small share of trade in GDP (see Table 3). In fact, our sample suggests that AEs are about as open as EMEs. We were concerned about the hypothesis that the success of the AE model in matching the relatively small decline in AE GDP reflects its counterfactual implication for the share of trade in GDP. After all, if the AEs were in financial and goods market autarky, then *nothing* would happen to AE GDP if the US tightened monetary policy. To check this hypothesis we perturbed the home bias AE parameters, $1-\omega_c, \gamma_i, \gamma_x$ by setting their values to 0.75 times their estimate for the EMEs, so that $1-\omega_c = 0.735(.90), \gamma_i = 0.53\,(.78)\,, \gamma_x = .33(.77)$. The numbers in parentheses correspond to the baseline estimated home bias parameters for the AE model reported in Table 2. We recomputed the numbers in the AE column of Table 3 and found that they are essentially unchanged, except,

$X/GDP = M/GDP = 0.58$. So, the fraction of trade in GDP in the model with the perturbed home bias parameters is higher than what that fraction is in the baseline estimated model.

Figure 28 displays the impulse responses of the AE model at the original (red dots) and perturbed (yellow stars) parameter values. The red dots and empirical responses are taken from Figure 7. Notably, the fall in output under the perturbed values of the parameters is only a little bigger than it is in the estimated model. So, low value of the home bias parameters in the estimated AE model are not the reason the model is successful at explaining the relatively small drop in GDP after a US monetary tightening. Specifically, home bias parameters themselves do not explain the difference between AE and EME response. We can see why the estimation procedure does not like the perturbed parameter values. The smaller home bias increases passthrough from the exchange rate into inflation and magnifies the drop in investment.

Figure 28: Impact of Low Home Bias in Advanced Economies

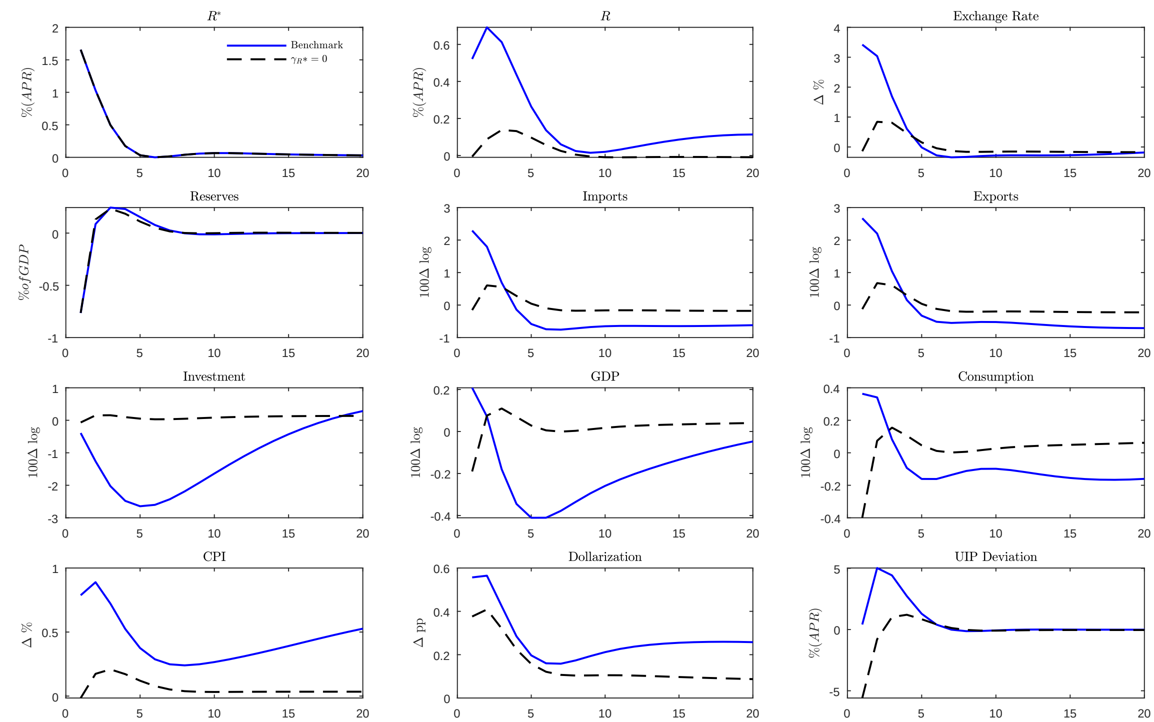


Notes: see notes (1)-(3) in Figure 7. The starred lines in the figure correspond to IRFs of estimated model in which the home bias parameters in consumption, investment and imports are set to the values indicated in the text associated with this figure.

G The Pure R_d^* Shock and γ_{R^*}

In the paper we explain that the quantitative value of the γ_{R^*} parameter, which controls the impact of $R_{d,t}^*$ on the household's dollar share target, Υ_t, is substantial. At the same time, we report that the pure interest rate effect is 'small'. Yet γ_{R^*} obviously operates only via the pure interest rate effect and not via the other two effects. Figure 29 shows that most of the pure interest rate effect is due to $\gamma_{R^*} > 0$. So, while the pure interest rate effect on aggregate activity is small, the role of γ_{R^*} in that effect is large.

Figure 29: Impact on Transmission of PureR_d^* Shock of γ_{R^*}

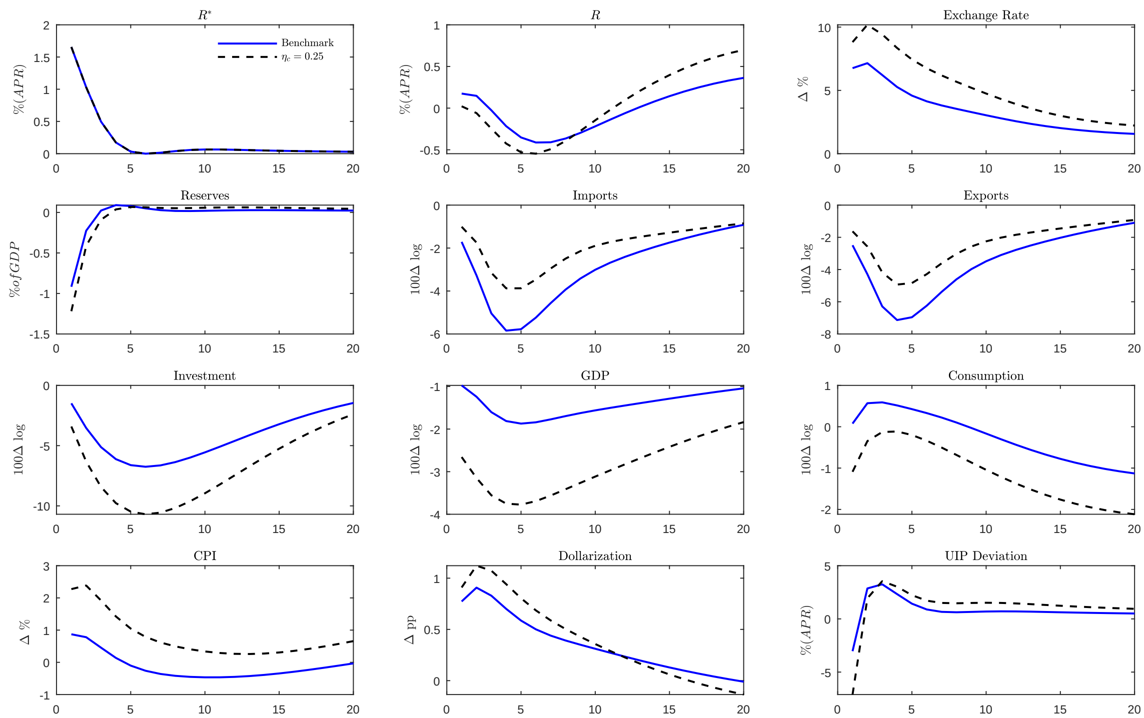


Notes: see notes (1)-(3) in Figure 7. The starred lines in the figure correspond to IRFs of estimated model in which the home bias parameters in consumption, investment and imports are set to the values indicated in the text associated with this figure.

H Consumption and the Elasticity of Substitution

In Figure 30 we display the IRFs of the EME model under our baseline parameterization of the elasticity of substitution, $\eta_c = .41$, and under a lower elasticity of substitution, $\eta_c = 0.25$. As expected, consumption now drops. In effect the lack of substitutability means that the price of consumption goods is higher when the exchange rate depreciates. In fact the exchange depreciates by even more with the reduction in the elasticity of substitution. We can see why the estimation did not 'like' a lower value of η_c. While that moves the exchange rate response in the direction of the data at the same time it moves investment too far down and the CPI too far up.

Figure 30: Impact of Reducing Elasticity of Substitution In Production of Consumption Goods



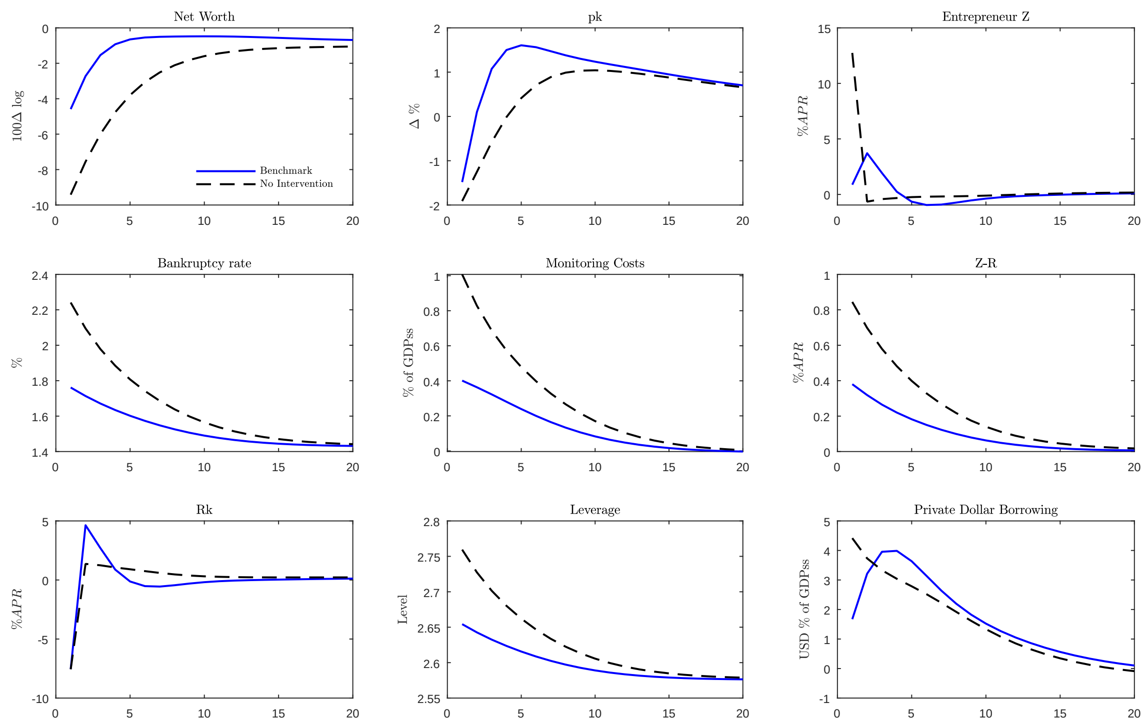
Notes: see notes (1)-(3) in Figure 7. The starred lines in the figure correspond to IRFs of estimated model in which the home bias parameters in consumption, investment and imports are set to the values indicated in the text associated with this figure.

I Impact of FX Intervention on Financial Variables in Peru Model

Here we consider the impact on financial markets of the FX intervention considered in the Peru model in section 5.3.1 in the text. The text examines the impact of FX intervention on the transmission of a US monetary tightening to the main macroeconomic variables in Peru (see Figure 11). Figure 31 displays the impact on financial variables associated with investment. Consider the response net worth of entrepreneurs, in panel 1,1. The relatively big exchange rate depreciation that occurs in the absence of an FX intervention (see Figure 11) produces a nearly 10 percent drop in net worth. As discussed in the text, FX intervention moderates the sharp initial depreciation that occurs in the absence of intervention. Panel 1,1 shows that by reducing the initial depreciation, FX intervention cuts the initial decline in entrepreneurial net worth by more than one-half. The reason for the big fall in net worth in the absence of FX intervention is partly the very large jump in interest paid by entrepreneurs. The latter is due to the jump in the exchange rate (see dashed line in panel 1,3), the fact that part of entrepreneurial debt is financed in dollars and that entrepreneurs choose contracts that minimize the need for banks to enter the

Arrow-Securities market (recall the discussion in Subsection 3.4.3). In addition, the fall in the price of capital causes the realized rate of return on capital to plunge in the period of the shock (panel 3,1). Note that the impact of the drop in net worth on borrowing and, hence, investment is initially mitigated by a rise in leverage (see panel 3,2 and the initial increase in private borrowing in panel 3,3). The reason for the increase in leverage is that the drop in the price of capital creates the expectation that that price will rise over time (panel 1,2), increasing the capital gains component of the expected rate of return on capital, R_t^k (see equation (20)). Other things the same, a higher expected rate of return on capital leads to higher leverage in the in equilibrium loan contracts.

Figure 31: FX Interventions in Peru: Financial Variables



Notes: financial variables corresponding to the IRFs in Figure 11. 'Net Worth' corresponds to N_t in equation (19); 'pk' corresponds to the price of capital, P_t^k, in section 3.6, scaled by the price of homogeneous goods; 'Entrepreneur Z' refers to the period t realized interest rate, Z_t, paid by the entrepreneur on debt undertaken in period $t-1$; 'Bankruptcy rate' is the time t realized value of $F(\overline{\omega}_t)$, the fraction of non-performing entrepreneurs (see section 3.4.2); 'Monitoring costs' is the realized time t resources, $\mu G(\overline{\omega}_t)$, devoted by banks to recovering funds from non-performing entrepreneur borrowers (see equation (25)); '$Z-R$' denotes the interest rate spread, $E_t[Z_{t+1} - R_{t+1}]$, between what entrepreneurs expect to pay on a loan taken in period t and what the bank expects to pay to fund that loan; 'Rk' corresponds to the period t rate of return on capital, R_t^k, defined in equation (20); 'Leverage' denotes the leverage of entrepreneurs, defined as total assets divided by net worth, $P_t^k K_t / N_t$.

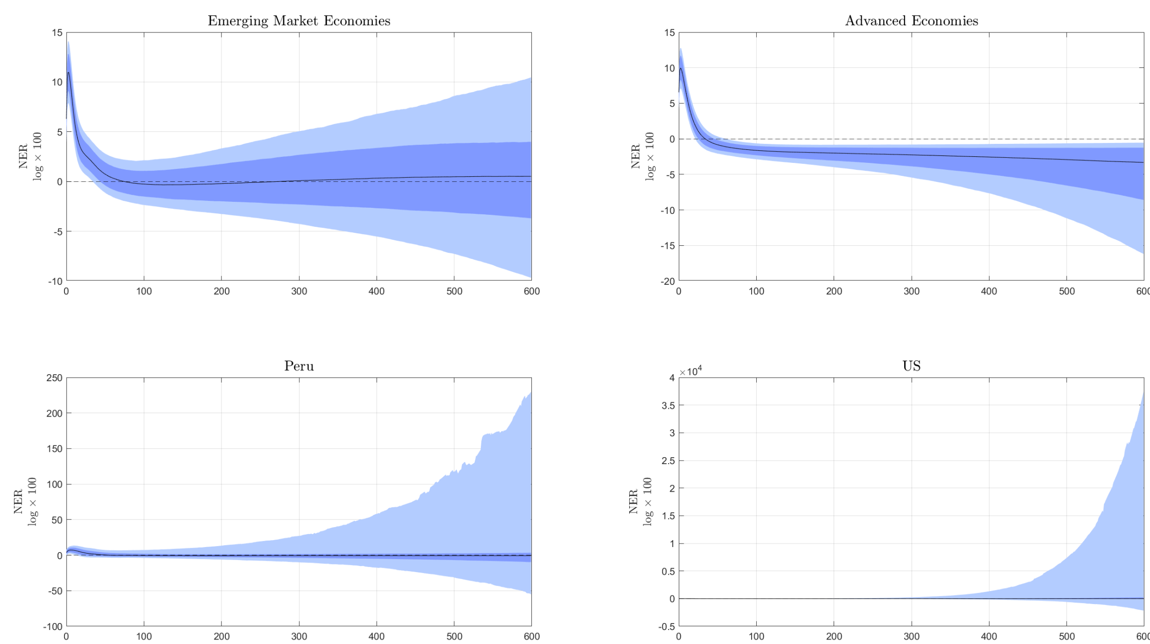
J The Long-run Impact of a US Policy Shock on Exchange Rate and Dollar Premium

The two sets of figures in this section document the appropriateness of the assumptions underlying the representation of the log-level of the exchange rate in section 5.5.1 of the text. We actually only use assumptions in the case of the EMEs. However, the long-horizon IRFs and shows that the assumptions also apply to the US and Peruvian VARss. We report a small amount of evidence against the assumption in the case of the AEs.

J.1 Long-Horizon IRFs for log Exchange Rate

Figure 32 displays the 600 month (50 year) impulse responses in the log-level of the exchange rate. The dark and light shaded areas correspond to 68 and 90 percent probability intervals. Note that in the case of EMEs, the US and Peru, a long run zero response lies within the probability intervals. In the case of the AEs, the upper bound of the probabilities intervals lies below zero. This suggests that there is a permanent depreciation in the AE exchange rates after a US monetary tightening.

Figure 32: Long Run Impact on Level of Nominal Exchange Rate After a US Monetary Tightening

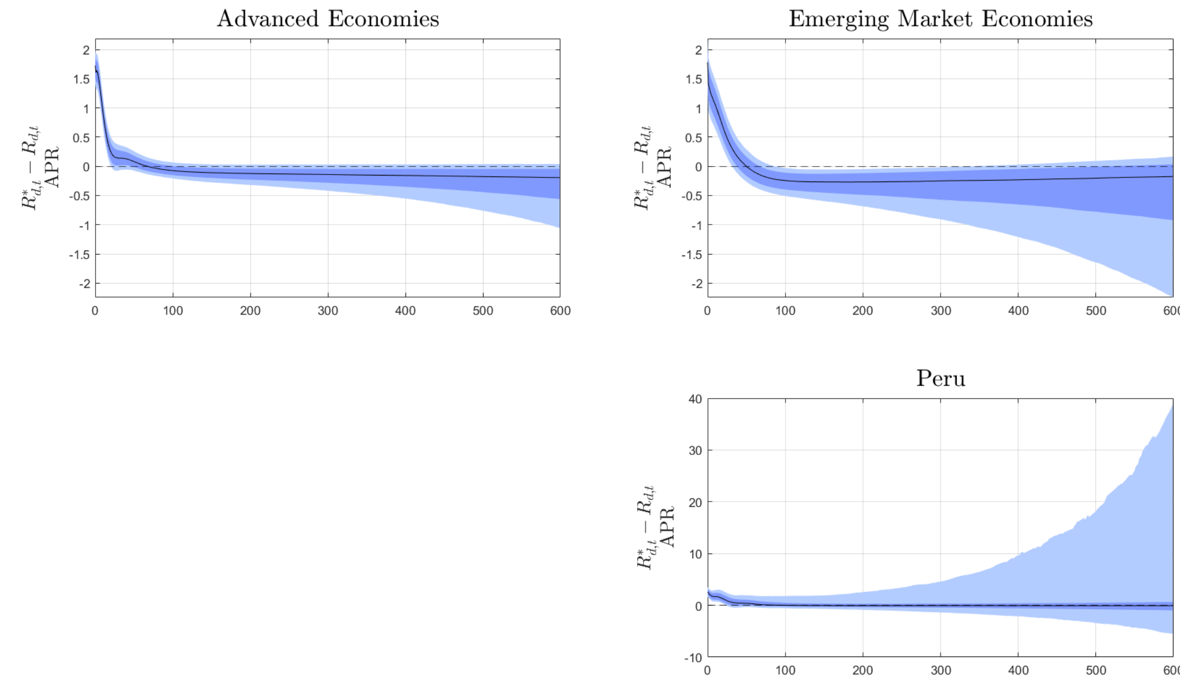


Notes: 600 period IRFs of the log level of nominal exchange rate to a Bauer and Swanson (2023b) monetary tightening for different VAR's in Section 2 of the manuscript. Panel 1,1: IRF from EME VAR underlying Figure 4; Panel 1,2 IRF from AE VAR underlying Figure 3; Panel 2,1: IRF from Peru VAR underlying Figure 5; Panel 2,2: IRF from US VAR underlying Figure 1.

J.2 Long-Horizon IRFs for Dollar Premium

Figure 33 shows that the long-run response of the dollar premium to a US monetary policy shock includes zero in probability intervals. The modal response is eventually a small negative number in the case of AEs and EMEs.

Figure 33: Long Run Impact of US Monetary Tightening on Dollar Premium

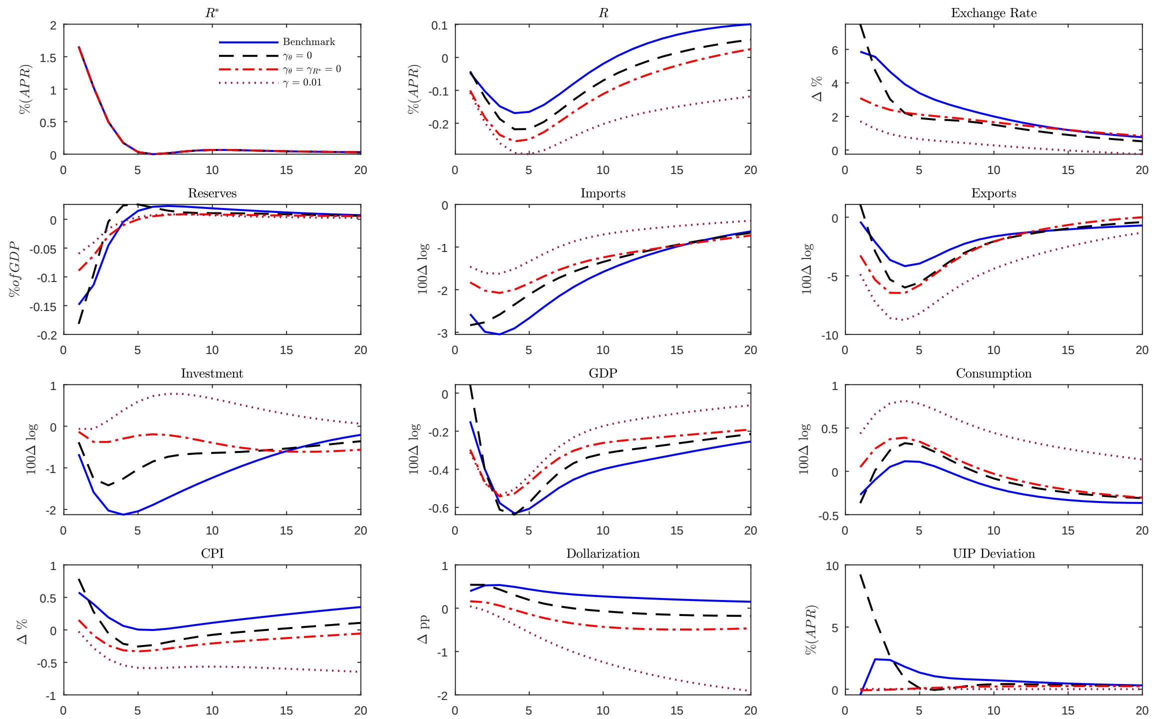


Notes: 600 period IRFs of the dollar premium, $R^*_{d,t} - R_{d,t}$, to a Bauer and Swanson (2023b) monetary tightening for different VAR's in Section 2 of the manuscript. Panel 1,1: IRF from AE VAR underlying Figure 3; Panel 1,2 IRF from EME VAR underlying Figure 4; Panel 2,2: IRF from Peruvian VAR underlying Figure 1.

K Excessive Overshooting in the AE Model

Figure 34 displays the impact of the UIP frictions on the transmission of a US monetary tightening to AE economies. The figure is the analog of Figure 17 in the text, which displays the impact in the EME model. The dotted line in the figure shows the response when UIP frictions are turned off. The solid line shows what happens in the estimated version of the model, with the parameter values reported in section 4 of the text. In the latter, the UIP frictions double the percentage point drop in GDP after a monetary tightening. In the AE model the UIP frictions increase the percentage point drop by only about 15 percent. The discussion in the text suggests that the primary reason that UIP frictions play a smaller role in the transmission of US monetary shocks to AEs is their balance sheets are less vulnerable to exchange rate shocks, modeled here as reflecting a high value ofϕ, the fraction of loans to risky entrepreneurs that are financed in LCU.

Figure 34: The Impact of Portfolio Friction Parameters



Notes: response to a US monetary tightening under different parameterizations of the model. The baseline parameterization corresponds to the version of the model with parameters set as in section 34. The horizontal axis is measured in quarters, consistent with the observations in section 2.1.2. The monetary tightening shock occurs in period 1.

L Impact of Export Demand Parameters on the Results

Here, we explore the impact on IRFs of the two parameters of export demand: γ_f, controls the elasticity of the demand shifter with respect to the transitory component of US GDP and η_f, is the elasticity of demand with respect to the terms of trade, p^x. In section 4.2 we provide intuition for why η_f plays a small role in our results and why γ_f plays a large role.[65] The results in Figure 35 support this intuition. The figure displays (solid blue line) the IRFs for the EME model at its estimated parameter values (see Table 2). Where the variables overlap, the solid blue line coincides with the red dots in Figure 9. The dashed line shows the IRFs when the value of γ_f is cut roughly in half, by setting it to unity. The dot-dashed line shows the IRFs η_f is also changed by raising it from roughly 4 to $\eta_f = 8$.

Consider first the dashed line. Note that the maximal drop in GDP in the baseline model is nearly 2 percent and that the smaller value of γ_f reduces the drop in GDP to a maximum of only 0.5 percent. Reducing the value of γ_f has a substantial effect on GDP by reducing the magnitude of the drop in the export demand shifter. In effect, the move from the blue line to the

[65] For the demand shifter, see equation (17)).

dashed line can be interpreted as the effect of a positive shift in the demand for exports. This increases employment and GDP, as well as the price level. This in turn leads to an increase in the interest rate, which results in an appreciation of the currency. Via the balance sheet effect, this improves the net worth position of entrepreneurs (not shown) and thereby allows them to expanding borrowing. This in turn leads to an increase in investment, which, together with the response of exports, pushes up GDP. The impact on consumption is mixed: the rise in the interest rate, pushes consumption and the rise in GDP pushes consumption up because of the wealth effect. In sum, changing the magnitude of γ_f has a significant impact on model properties.

Turning to γ_f, note from Figure 9 that the dot-dashed and dashed lines are similar. This means that doubling the value of η_f has relatively little impact on the economy. This is not surprising because the US price level moves relatively little, while EME export prices are sticky, so that the terms of trade do not change much.

Figure 35: EME's, Perturbing Parameters of Export Demand