Online Appendix

For
"The Macroeconomic Stabilization of Tariff Shocks:
What is the Optimal Monetary Response?"

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1. Demand equations not listed in text

The composition of expenditure on adjustment costs, both for prices and bond holding, follows the same preferences as for consumption, and the associated demands mirror Eqs. (4)-(9). Adjustment costs for bond holding are as follows:

$$AC_{B,D,t} = \theta P_t AC_{B,t} / P_{D,t}$$

$$AC_{B,N,t} = (1-\theta) P_t AC_{B,t} / P_{N,t}$$

$$d_{AC,B,t}(h) = \left(p_t(h) / P_{D,t}\right)^{-\phi} AC_{B,D,t}$$

$$d_{AC,B,t}(f) = \left(p_t(f) T_{D,t} / P_{D,t}\right)^{-\phi} AC_{B,D,t}$$

$$AC_{B,H,t} = \nu \left(P_{H,t} / P_{N,t}\right)^{-\eta} AC_{B,N,t}$$

$$AC_{B,F,t} = (1-\nu)\left(P_{F,t} T_{N,t} / P_{N,t}\right)^{-\eta} AC_{B,N,t} .$$

The economy-wide demand for goods arising from price adjustment costs sums across the demand arising among *n* home firms: $AC_{P,t} = n_t AC_{P,t}(h)$. This is allocated as follows:

$$AC_{P,D,t} = \theta P_t AC_{P,t} / P_{D,t}$$

$$AC_{P,N,t} = (1-\theta) P_t AC_{P,t} / P_{N,t}$$

$$d_{AC,P,t}(h) = \left(p_t(h) / P_{D,t}\right)^{-\phi} AC_{P,D,t}$$

$$d_{AC,P,t}(f) = \left(p_t(f) T_{D,t} / P_{D,t}\right)^{-\phi} AC_{P,D,t}$$

$$AC_{P,H,t} = \nu \left(P_{H,t} / P_{N,t}\right)^{-\eta} AC_{P,N,t}$$

$$AC_{P,F,t} = (1-\nu)\left(P_{F,t} T_{N,t} / P_{N,t}\right)^{-\eta} AC_{P,N,t} .$$

The demand for differentiated goods for use as intermediates in production mirrors Eqs. (6)-(7), as follows:

$$d_{G,t}(h)=\left(p_t\left(h\right)/P_{D,t}\right)^{-\phi}G_t$$

$$d_{G,t}(f)=\left(p_t\left(f\right)T_{D,t}/P_{D,t}\right)^{-\phi}G_t.$$

The demand for differentiated goods for use in the sunk entry investment of new firms mirrors Eqs. (6)-(7), as follows:

$$d_{K,t}(h)=\left(p_t\left(h\right)/P_{D,t}\right)^{-\phi}ne_tK_t$$

$$d_{K,t}(f)=\left(p_t\left(f\right)T_{D,t}/P_{D,t}\right)^{-\phi}ne_tK_t.$$

2. Market clearing conditions and shock processes not listed in the text

Market clearing for the non-differentiated goods market requires:

$$y_{H,t}=C_{H,t}+AC_{P,H,t}+AC_{B,H,t}+\left(1+\tau_N\right)\left(C^*_{H,t}+AC^*_{P,H,t}+AC^*_{B,H,t}\right)$$

$$y_{F,t}=\left(1+\tau^*_N\right)\left(C_{F,t}+AC_{P,F,t}+AC_{B,F,t}\right)+C^*_{F,t}+AC^*_{P,F,t}+AC^*_{B,F,t}.$$

The market clearing condition for the manufacturing goods market is given in Eq. (19) in the main text.

Labor market clearing requires:

$$\int_0^{n_t}l_t\left(h\right)dh+l_{H,t}=l_t.$$

Bond market clearing requires:

$$B_{Ht}+B^*_{Ht}=0$$

$$B_{Ft}+B^*_{Ft}=0.$$

Balance of payments requires:

$$\int_0^{n_t}p^*_t\left(h\right)\left(d^*_t\left(h\right)\right)dh-\int_0^{n^*_t}p_t\left(f\right)\left(d_t\left(f\right)\right)df+P^*_{Ht}\left(C^*_{H,t}+AC^*_{P,H,t}+AC^*_{B,H,t}\right)$$
$$-P_{F,t}\left(C_{F,t}+AC_{P,F,t}+AC_{B,F,t}\right)-i_{t-1}B^*_{H,t-1}+e_ti^*_{t-1}B_{F,t-1}=\left(B^*_{H,t}-B^*_{H,t-1}\right)+e_t\left(B_{F,t}-B_{F,t-1}\right).$$

Shocks are assumed to follow joint log normal distributions. In the case of tariffs, we can write

$$\begin{bmatrix} \log T_{D,t} - \log \overline{T_D} \\ \log T^*_{D,t} - \log \overline{T^*_D} \\ \log T_{N,t} - \log \overline{T_N} \\ \log T^*_{N,t} - \log \overline{T^*_N} \end{bmatrix} = \rho_T \begin{bmatrix} \log T_{D,t-1} - \log \overline{T_D} \\ \log T^*_{D,t-1} - \log \overline{T^*_D} \\ \log T_{N,t-1} - \log \overline{T_N} \\ \log T^*_{N,t-1} - \log \overline{T^*_N} \end{bmatrix} + \varepsilon_{Tt}$$

with autoregressive coefficient matrix ρ_T, and the covariance matrix $E\left[\varepsilon_{Tt}\varepsilon_{Tt}^{'}\right]$. In the case of productivity shocks:

$$\begin{bmatrix} \log \alpha_{D,t} - \log \overline{\alpha_D} \\ \log \alpha_{N,t} - \log \overline{\alpha_N} \end{bmatrix} = \rho_A \begin{bmatrix} \log \alpha_{D,t-1} - \log \overline{\alpha_D} \\ \log \alpha_{N,t-1} - \log \overline{\alpha_N} \end{bmatrix} + \varepsilon_{At}$$

with autoregressive coefficient matrix ρ_A, and the covariance matrix $E\left[\varepsilon_{At}\varepsilon_{At}^{'}\right]$. Foreign productivity follows an analogous process.

In the case of markup shocks:

$$\begin{bmatrix} \log T_{MU,t} - \log \overline{T_{MU}} \\ \log T^*_{MU,t} - \log \overline{T^*_{MU}} \end{bmatrix} = \rho_{MU} \begin{bmatrix} \log T_{MU,t} - \log \overline{T_{MU}} \\ \log T^*_{MU,t} - \log \overline{T^*_{MU}} \end{bmatrix} - \varepsilon_{MUt}$$

3. Price-setting equations assuming stickiness in the local currency (LCP model)

Under the assumption that firms set separate prices in the two markets, in units of domestic currency for sale in the domestic market, and in units of foreign currency for sale in the foreign market, the price setting equations (Eqns. 23-24) are replaced by the following:

$$p_t(h) = \frac{\phi}{\phi-1} mc_t + \frac{\psi_P}{2}\left(\frac{p_t(h)}{p_{t-1}(h)} - 1\right)^2 p_t(h) - \psi_P \frac{1}{\phi-1}\left(\frac{p_t(h)}{p_{t-1}(h)} - 1\right)\frac{p_t(h)^2}{p_{t-1}(h)}$$
$$+ \frac{\beta\psi_P}{\phi-1} E_t\left[\frac{\mu_t}{\mu_{t+1}} \frac{\Omega_{H,t+1}}{\Omega_{H,t}}\left(\frac{p_{t+1}(h)}{p_t(h)} - 1\right)\frac{p_{t+1}(h)^{2-\phi}}{p_t(h)^{1-\phi}}\right]$$

and

$$p^*_t(h) = \frac{\phi}{\phi-1}\frac{mc_t(1+\tau_{Dt})}{e_t} + \frac{\psi_P}{2}\left(\frac{p^*_t(h)}{p^*_{t-1}(h)} - 1\right)^2 p^*_t(h) - \frac{1}{\phi-1}\psi_P\left(\frac{p^*_t(h)}{p^*_{t-1}(h)} - 1\right)\frac{p^*_t(h)^2}{p^*_{t-1}(h)}$$
$$+\beta\frac{\psi_P}{\phi-1} E_t\left[\frac{\mu_t}{\mu_{t+1}}\frac{\Omega^*_{H,t+1}}{\Omega^*_{H,t}}\left(\left(\frac{p^*_{t+1}(h)}{p^*_t(h)} - 1\right)\frac{e_{t+1}}{e_t}\frac{p^*_{t+1}(h)^{2-\phi}}{p^*_t(h)^{1-\phi}}\right)\right]$$

where $\Omega_{H,s} = \left(\frac{p_s(h)}{P_{D,s}}\right)^{-\phi}\left(C_{D,s} + G_s + ne_s(1-\theta_K)K_s + AC_{P,D,s} + AC_{B,D,s}\right)\frac{1}{\mu_s}$, and

$$\Omega^*_{H,s} = \left(\frac{(1+\tau_D)\, p_s(h)}{e_s P^*_{D,s}} \right)^{-\phi} \left(C^*_{D,s} + G^*_s + ne^*_s (1-\theta_K) K^*_s + AC^*_{P,D,s} + AC^*_{B,D,s} \right) \frac{1}{\mu_s}.$$

4. Selection of parameter values for numerical experiments

Where possible, parameter values are taken from standard values in the literature. See table Risk aversion is set at $\sigma = 2$; labor supply elasticity is set at $1/\psi = 1.9$ following Hall (2009). Consistent with a quarterly frequency, $\beta = 0.99$.

The price stickiness parameter is set at ψ_p =49, a value which implies in simulations of a productivity shock that approximately three quarters the firms resetting price after the first year. [1] The firm death rate is set at δ =0.025. The mean sunk cost of entry is normalized to the value $\overline{K}$=1, and the adjustment cost parameter for new firm entry, λ, is taken from Bergin and Corsetti (2020). The share of intermediates in differentiated goods production follows Bergin and Corsetti (2020) to a modest value of ζ =1/3.

To choose parameters for the differentiated and non-differentiated sectors we draw on Rauch (1999). In the two-sector version of the model, we choose θ so that differentiated goods represent 55 percent of U.S. trade in value; in the one-sector version θ =1. We assume the two countries are of equal size with no exogenous home bias, $\nu = 0.5$, but allow trade costs to determine home bias ratios. To set the elasticities of substitution within the differentiated and non-differentiated sectors we draw on the estimates by Broda and Weinstein (2006), classified by sectors based on Rauch (1999). The Broda and Weinstein (2006) estimate of the elasticity of substitution between differentiated goods varieties is ϕ=5.2 (the sample period is 1972-1988). The corresponding elasticity of substitution for non-differentiated commodities is η = 15.3. We initially adopt a Cobb-Douglas specification for the aggregator function combining the two sectors ($\xi \to 1$), but sensitivity analysis will report results for alternative calibrations of this parameter.

[1] As is well understood, a log-linearized Calvo price-setting model implies a stochastic difference equation for inflation of the form $\pi_t = \beta E_t \pi_{t+1} + \lambda mc_t$, where *mc* is the firm's real marginal cost of production, and where $\lambda = (1-q)(1-\beta q)/q$, where *q* is the constant probability that a firm must keep its price unchanged in any given period. The Rotemberg adjustment cost model used here gives a similar log-linearized difference equation for inflation, but with $\lambda = \phi/\psi_P$. Under our parameterization, an adjustment cost parameter of ψ_P = 49 implies a Calvo probability of not changing price *q* = 0.725. This implies that 27.5% of firms have reset price after one quarter, and that 72% ($1-0.725^4$) of firms have reset after one year.

To set trade costs, we calibrate τ_D so that exports represent 26% of GDP, as is the average in World Bank national accounts data for OECD countries from 2000-2017.[2] This requires a value of τ_D =0.44.[3] This is somewhat larger than the value of 0.25 used for trade costs in Obstfeld and Rogoff, (2001), but it is small compared to some trade estimates, such as 1.7 suggested by Anderson and van Wincoop 2004, and adopted by Epifani and Gancia (2017). We follow the standard assumption of trade models that the homogeneous good is traded frictionlessly (τ_N =0).

Calibration of policy parameters for the historical monetary policy Taylor rule are taken from Coenen, et al. (2010): γ_i=0.7, γ_p =1.7, γ_Y=0.1.

The process for tariff shocks is calibrated with a mean value of 1.02 (2 percentage point mean tariff rate) to match U.S. tariff data in Barattieri et al. (2021). The autoregressive parameter is set to 0.56, estimated from Barattieri et al. (2021).[4] The standard deviation of 6 percentage points is taken from Caldara et al. (2020), chosen to capture tariff increases that have been threatened on imports from China and on imports of autos and motor-vehicle parts in 2018-2019.

When productivity shocks are simulated, we calibrate based on standard values from Backus et al. (1992). Innovations follow a standard deviation of 1% with an international correlation of 0.25. Autoregressive coefficients are chosen as 0.90 on own lags and 0.09 on lags of foreign productivity. Parameterization of markups shocks will be identical to that for tariff shocks, to facilitate comparison.

5. Modifications of model for alternative versions of markup shock

To specify that markup shocks only affect export prices, the firm budget constraint (20) is modified as follows:

$$\pi_t(h) = p_t(h)d_t(h) + e_t p_t^*(h)d_t^*(h)T_{MU,t} - mc_t y_t(h) - P_t AC_{p,t}(h).$$

which implies that the price setting equation for domestic sales (23) does not include a markup shock, but the equation for exports (24) does, as follows:

[2] See https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?locations=OE.

[3] To coincide with standard accounting definitions, differentiated goods used as intermediates are included in the measure of exports, and excluded in the measure of GDP, as is appropriate.

[4] We do not adopt the standard deviation of shocks estimated in Barattieri et al (2021), as these estimates are based on a sample from normal times with low volatility in tariffs compared to the more recent period of Brexit and Trump tariffs.

$$p_t^*(h)=\frac{\phi}{(\phi-1)T_{MU,t}}\frac{(1+\tau_D)mc_t}{e_t}+\frac{\psi_P}{2}\left(\frac{p_t^*(h)}{p_{t-1}^*(h)}-1\right)^2 p_t^*(h)-\psi_P\frac{1}{\phi-1}\left(\frac{p_t^*(h)}{p_{t-1}^*(h)}-1\right)\frac{p_t^*(h)^2}{p_{t-1}^*(h)}$$
$$+\frac{\psi_P}{\phi-1}E_t\left[\beta\frac{\Omega_{t+1}^*}{\Omega_t^*}\left(\frac{p_{t+1}^*(h)}{p_t^*(h)}-1\right)\frac{p_{t+1}^*(h)^2}{p_t^*(h)}\right]$$

In addition, the government budget constraint (31) becomes:

$$T_t=(M_t-M_{t-1})+(T_{D,t}-1)n_{t-1}^*d_t(f)+(1-T_{MU,t})n_{t-1}^*d_t(f)$$
$$+(T_{N,t}-1)(C_{F,t}+AC_{P,F,t}+AC_{B,F,t})$$

Next, specifying an international swap of revenue from the markup shocks in each country requires the home government budget constraint be modified further:

$$T_t=(M_t-M_{t-1})+(T_{D,t}-1)n_{t-1}^*d_t(f)+(1-T_{MU,t}^*)n_{t-1}d_t^*(h)$$
$$+(T_{N,t}-1)(C_{F,t}+AC_{P,F,t}+AC_{B,F,t})$$

Finally, specifying that markup shock for exports are placed outside of price stickiness implies the price setting rule (24) becomes the following (conditional on maintaining the specification above that markup shocks do not affect domestic prices):

$$p_t^*(h)=\frac{(1+\tau_D)}{e_tT_{MU,t}}p_t(h).$$

6. Model with low pass-through of tariffs to consumer prices

In this section, we investigate the sensitivity of our results to the degree of pass-through of tariffs to consumer prices. The motivation from this exercise comes from empirical studies that, utilizing data from the recent trade war, have documented a high degree of pass-through of tariffs to import prices measured at the dock, but have produced mixed evidence on the pass-through to prices at the consumer level. We will show that extending our model to account for distribution can bring our analysis closely in line with a realistic account of differences in tariff pass-through at the dock and at consumer level. Remarkably, our main conclusions and results remain broadly unaffected in this exercise.

6.1 Empirical motivation for low tariff pass-through

The empirical literature on tariff pass-through has flourished after 2016, due to the combined effects of Brexit and the aggressive trade initiatives by the Trump administration. Based on regressions of U.S. import price indexes controlling for inflation, Cavallo et al.

(2019) find that, for a typical good imported from China, only 7.5% of a tariff increase is offset by a drop in price set by the exporter: the pass-through to prices at the dock is 92.5%. When additional controls are included in the regression, the change in exporter price is insignificantly different from zero, implying a pass-through indistinguishable from 100%. Looking at retail prices, however, the same authors find mixed results, differentiated by product. By way of example, pass-through appears high for washing machines, initially slow but eventually high pass-through for tires, and low pass-through for bicycles. Flaaen et al. (2020) find a pass-through as low as 21% for washing machines after the 2016 anti-dumping duties on China; and in a range between 58% and 125% after the 2018 tariffs on Chinese exports (depending on estimation method). Both Flaaen et al. (2020) and Cavallo et al. (2019) highlight that tariffs led to a similar degree of price rise across washing machine brands directly affected by the tariffs, and other brands, including domestic brands, not affected directly by the tariff.[5]

Our benchmark model with PCP fits the empirical evidence of nearly complete pass-through of tariffs to import prices at the dock. Price stickiness at the dock increases the degree of tariff pass-through, since it precludes producers from adjusting their export price to offset tariffs imposed on importers. To underscore this point, using as our reference the case of a unilateral foreign tariff in the two-sector sticky-price model with constant money growth, we find that pass-through of the tariff to the import price at the dock is 100%.[6] In the flexible price version of the model, exporters would lower the ex-tariff price by 5.7%, implying a pass-through of 94.3%.

The fit of our benchmark model in terms of pass-through to retail prices is more difficult to evaluate, given the range of estimates in the recent empirical literature. In the reference case of the model singled out above, we find that the pass-through of the tariff to the sectoral consumer price index of differentiated goods in the foreign country (which includes

[5] Cavallo et al. (2019) interpret this as evidence that the direct effect of the tariff on import prices was close to zero – estimating regressions based on a comparison of brands directly affected by the tariff and those not affected, they find that a 20 percent tariff is associated with only a 0.9 percent increase in the retail prices of affected household goods, and a 1.4 percent increase in the retail prices of affected electronics products after one year. In contrast, Flaaen et al. (2020) attribute the similarity among affected and unaffected brands to factors such as rising materials costs or to domestic producers using their market power to raise prices.

[6] To measure pass-through to an import price index, we can define a data-consistent import price index that holds constant the number of varieties: $\widehat{P}^*_{Mt} = \left(\overline{n}\left(p^*_t(h)T^*_{D,t}\right)^{1-\phi}\right)^{\frac{1}{1-\phi}} = \overline{n}^{\frac{1}{1-\phi}} p^*_t(h)T^*_{D,t}$. The percentage change from steady state for this index will be identical to that simply of the foreign import price of a representative home variety: $p^*_t(h)T^*_{D,t}$.

both domestic and imported varieties) is a modest 24.3%, owing largely to home bias in this sector.[7] This compares favorably with the pass-through to consumer prices Flaaen et al. (2020) estimate for 2016 China duties, but is smaller than the pass–through the same authors estimate for the 2018 tariffs. It is higher than the values (close to zero) estimated in Cavallo et al. (2019).

Price stickiness in local currency (LCP) does not reduce tariff pass-through in the model. In the scenario of a unilateral foreign tariff in the two-sector model with constant money growth policy, depicted in Figure 5, home exporters actually *raise* their ex-tariff export price. The pass-through of the tariff to the import price is 108.7%, larger than the 100% found for the PCP model; the pass-through to the consumer price index of differentiated goods is 26.7%, similar but slightly higher than for the PCP model. As noted above, tariffs are imposed directly on the importer: if the exporter leaves its supply price at its pre-tariff level, the importer will have to have to adjust its supply price to the full extent of tariff, or suffer a drop in its margin.

6.2 Modified model with distribution

Hereafter, to account for a moderate degree of tariff pass-through at consumer level, we model the incidence of local production inputs and/or distribution on the price of imports faced by consumers. We extend the model in the spirit of Corsetti and Dedola (2005), positing that, realistically, consumers do not purchase imported differentiated varieties directly from producers. Consumer goods combine imported goods with domestic labor and home differentiated domestic goods as inputs. Analytically, we now specify the consumption index without the direct inclusion of imported varieties: $C_{D,t} \equiv \left(\int_0^{n_t} c_t(h)^{\frac{\phi-1}{\phi}} dh \right)^{\frac{\phi}{\phi-1}}$, and correspondingly change in the consumer price indexes and demand equations in the main text (Eqs. 4-7) as follows:

$$C_{D,t} = \theta \left(P_{D,t}^C / P_t^C \right)^{-\xi} C_t$$

$$C_{N,t} = (1-\theta)\left(P_{N,t} / P_t^C \right)^{-\xi} C_t$$

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[7] We can define a data-consistent price index for foreign differentiated goods holding the number of varieties fixed: $\widehat{P}_{D,t}^* \equiv \left(\overline{n^*} p_t^*(f)^{1-\phi} + \overline{n} \left(p_t^*(h) T_{D,t}^* \right)^{1-\phi} \right)^{\frac{1}{1-\phi}}$.

$$c_t(h) = \left(p_t(h) / P^C_{D,t}\right)^{-\phi} C_{D,t}$$

$$c_t(f) = 0,$$

where we define additional price indexes specific to consumption:

$$P^C_{D,t} = \left(n_t p_t(h)^{1-\phi}\right)^{\frac{1}{1-\phi}}$$

$$P^C_t = \left(\theta P^{C\ 1-\xi}_{D,t} + (1-\theta)\left(P_{N,t}\right)^{1-\xi}\right)^{\frac{1}{1-\xi}}.$$

To be clear: given the roundabout production structure, domestic firms use imported differentiated goods as inputs, hence households do consume foreign differentiated goods indirectly. They purchase them from domestic firms that combine them with home differentiated goods and additional labor inputs, according to the extended production function shown in the appendix. One can interpret this labor and material inputs as part of a domestic distribution cost. Consistently, we recalibrate the trade cost for differentiated goods (τ_D = 0.23) to maintain the same ratio of imports as a share of GDP as in the benchmark version of the model.

6.3 Simulation results for modified model with low tariff pass-through

This version of the model is able to reconcile the empirical evidence of a near zero pass-through to consumers, with a near perfect pass-through at the dock, both for PCP and LCP versions of price stickiness. Simulating a foreign tariff shock on home exports in the two-sector model with a constant money growth rule, we find that, for the PCP case, pass-through at the dock is 99.0% for a given imported variety; pass-through to the consumer price index of differentiated goods is actually negative, and equal to -14.25%, in the initial period of the shock. Under a suboptimal constant money growth rule, the tariff has the counterintuitive effects of lowering the prices of differentiated goods faced by consumers, since, for lack of stabilization, the economic slows down causes wages and hence marginal costs of domestic producers to fall markedly. One year after the shock, the pass-through to consumer prices rises to 23.8%. Results are similar under LCP price stickiness: the tariff pass-through to consumer prices is -16.6% in the initial period of the shock, 26.7% one year later.

In light of the similarity of PCP and LCP specifications in terms of matching the empirical pass-through of the tariff, we focus our discussion on the PCP economy, allowing for either unilateral or symmetric shocks. Simulation results are reported in Appendix Figure 16 (unilateral shock) and Appendix Figure 17 (symmetric shock). In our distribution-augmented two-sector model, the optimal policy and macroeconomic dynamics in response are close to our baseline---i.e., it is only moderately affected by the degree of tariff pass-through to consumer prices. Relative to our baseline, a low pass-through to consumer prices only slightly dampens the transmission of the shock to GDP and the interest rate change mandated by optimal policy.

Key to this remarkable result is the use of imports as intermediates. Even if the tariff does not impact consumer prices on a one-to-one basis, it still has large effects on GDP and other macroeconomic aggregates through the demand for imported intermediate goods by domestic producers. On impact, Home GDP falls 1.45% in the low pass-through specification, compared to 2.06% in the benchmark model (shown in Figure 3). Consequently, the optimal policy calls for a similarly strong expansionary response to moderate the macroeconomic effects of the tariff, with a home interest rate cut (by 0.53 percentage points, compared to a cut of 0.54 percentage points in the benchmark model shown in Figure 3). In a symmetric tariff war shock, a low tariff pass through to consumer prices even amplifies the home contraction: in our no-policy specification, GDP falls by 2.71%, versus 1.86% for the benchmark case. We conclude that a low pass-through to consumer prices does not necessarily moderate the macroeconomic effects of tariff shocks, nor reduces the need for a thorough assessment of the correct monetary policy response.

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Appendix Table 1. Moments of variables, and welfare:
just foreign tariff shock (one sector model)
Comparing Taylor Rule policy to Ramsey

	One-sector model	
	home	foreign
standard deviations in percent (difference from Ramsey case)		
GDP	3.09	-0.60
employment	2.60	0.72
consumption	-0.27	-0.08
firm entry investment	-6.18	-4.17
number of firms	-1.05	-0.56
inflation	-0.27	0.28
real exch. rate	-0.67	-0.67
unconditional means of variables (percent change from Ramsey case)		
GDP	0.041	0.386
employment	0.027	0.054
consumption	-0.052	-0.025
firm entry investment	-0.453	-0.240
number of firms	-0.453	-0.240
Welfare (percent change from Ramsey case, conditional, in consumption units):		
	-0.124	-0.125

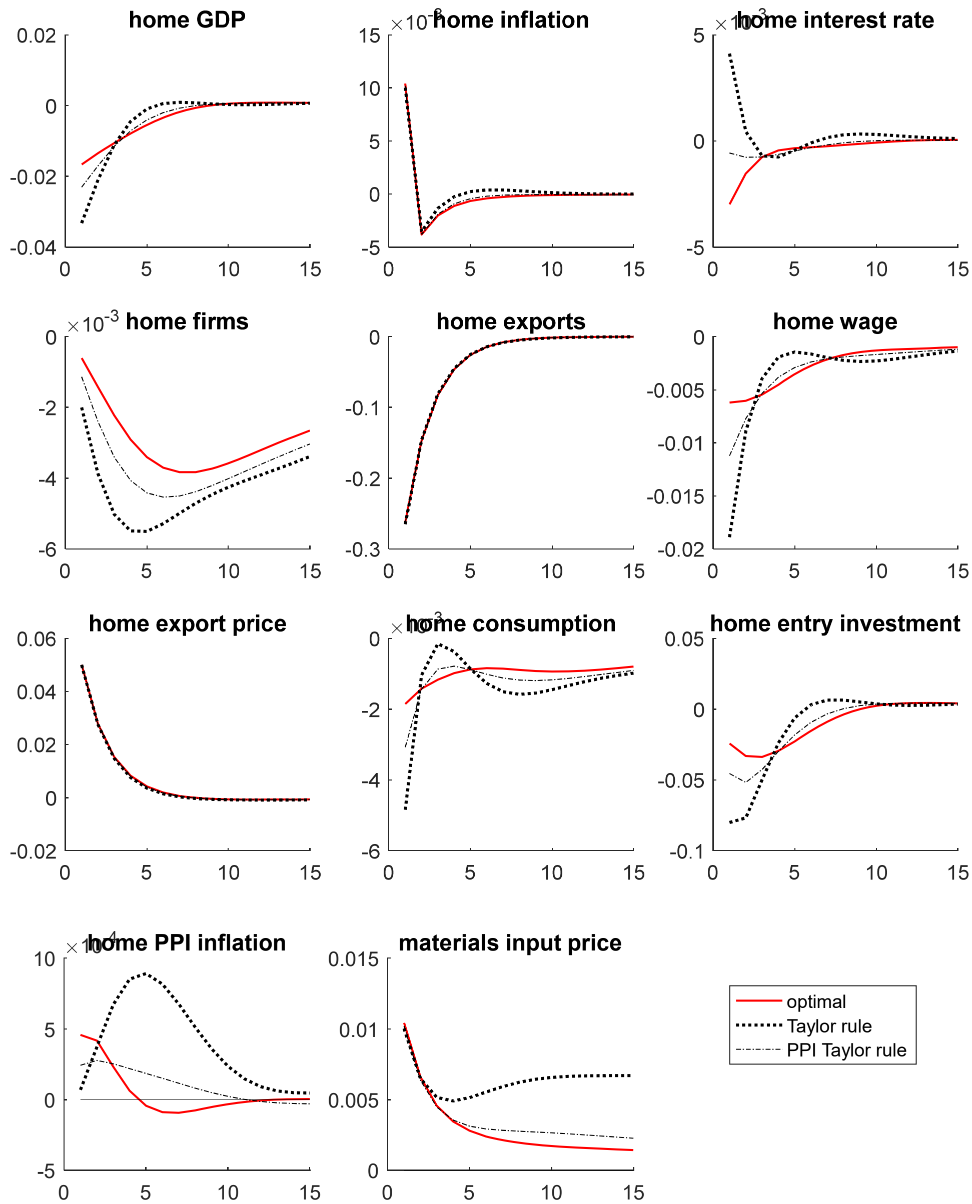
Appendix Table 2. Moments of variables, and welfare: LCP version
Comparing Taylor Rule policy to Ramsey

	One-sector model		Two-sector model	
	Common shock	Independent shock	Common shock	Independent shock
standard deviations in percent (difference from Ramsey case)				
GDP	1.64	0.98	0.76	0.15
employment	1.23	0.61	0.51	0.07
consumption	0.28	-0.11	0.05	0.04
firm entry investment	6.17	-3.10	5.39	2.15
number of firms	0.61	-0.56	0.59	0.36
inflation	-0.06	0.00	-0.29	-0.15
real exch. rate	0.00	-0.75	0.00	0.08
unconditional means of variables (percent change from Ramsey case)				
GDP	0.045	0.020	0.019	0.039
employment	0.021	0.019	0.015	0.048
consumption	-0.011	-0.040	-0.010	-0.047
firm entry investment	-0.054	-0.209	-0.084	-0.354
number of firms	-0.054	-0.209	-0.084	-0.354
Welfare (percent change from Ramsey case, conditional, in consumption units):				
	-0.084	-0.105	-0.056	-0.122

Appendix Table 3. Moments of variables, and welfare: DCP version
Comparing Taylor Rule policy to Ramsey

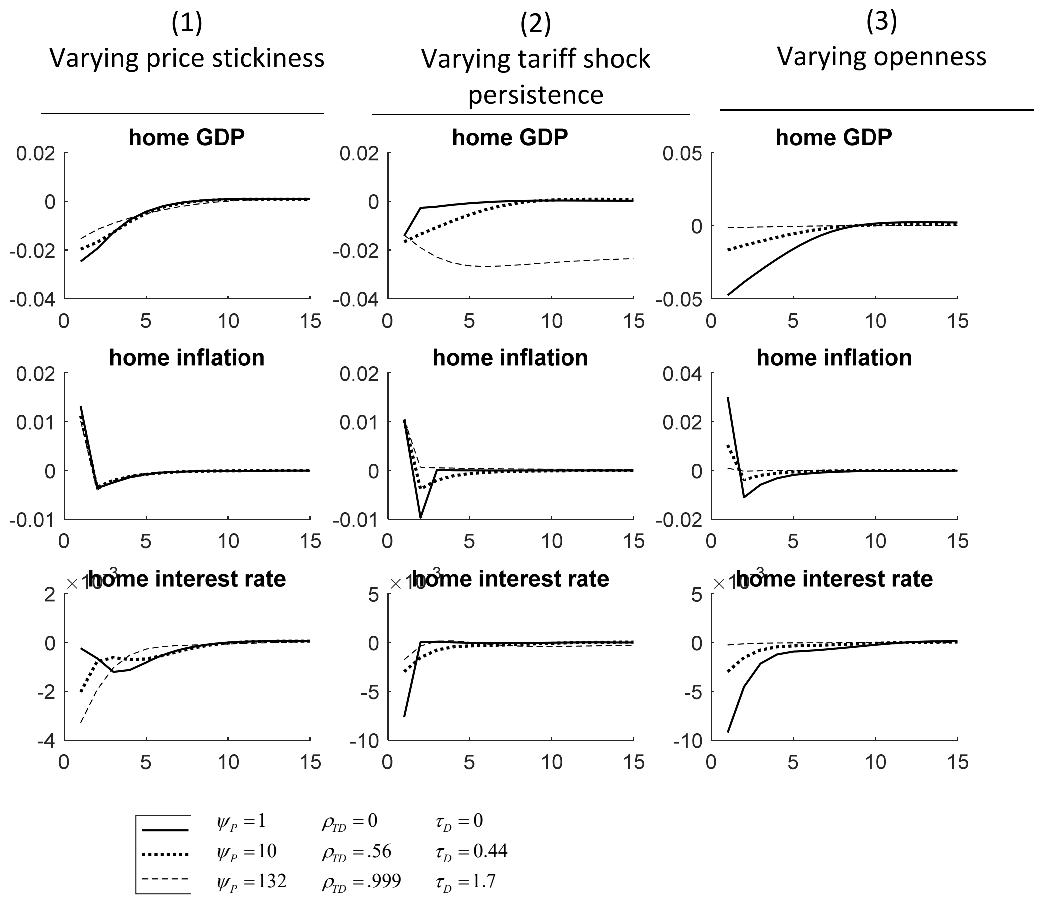
	common shock		independent shock	
	home	foreign	home	foreign
standard deviations in percent (difference from Ramsey case)				
GDP	1.13	0.15	0.05	-0.05
employment	0.49	0.25	-0.04	0.00
consumption	0.09	-0.19	-0.20	-0.26
firm entry investment	8.34	-6.56	-6.05	-7.83
number of firms	-0.56	-3.47	-2.71	-2.88
inflation	-0.53	0.01	-0.21	0.11
real excn. rate	-1.13	-1.13	-0.64	-0.64
unconditional means of variables (percent change from Ramsey case)				
GDP	0.013	-0.005	0.062	3.887
employment	-0.106	0.178	-0.018	0.140
consumption	0.162	-0.181	0.018	-0.131
firm entry investment	1.560	-1.853	0.120	-1.262
number of firms	1.560	-1.853	0.120	-1.262
Welfare (percent change from Ramsey case, conditional, in consumption units):				
	0.362	-0.528	0.051	-0.331

Appendix Figure 1. Impulse responses under a PPI-based Taylor rule to a symmetric tariff shock



Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

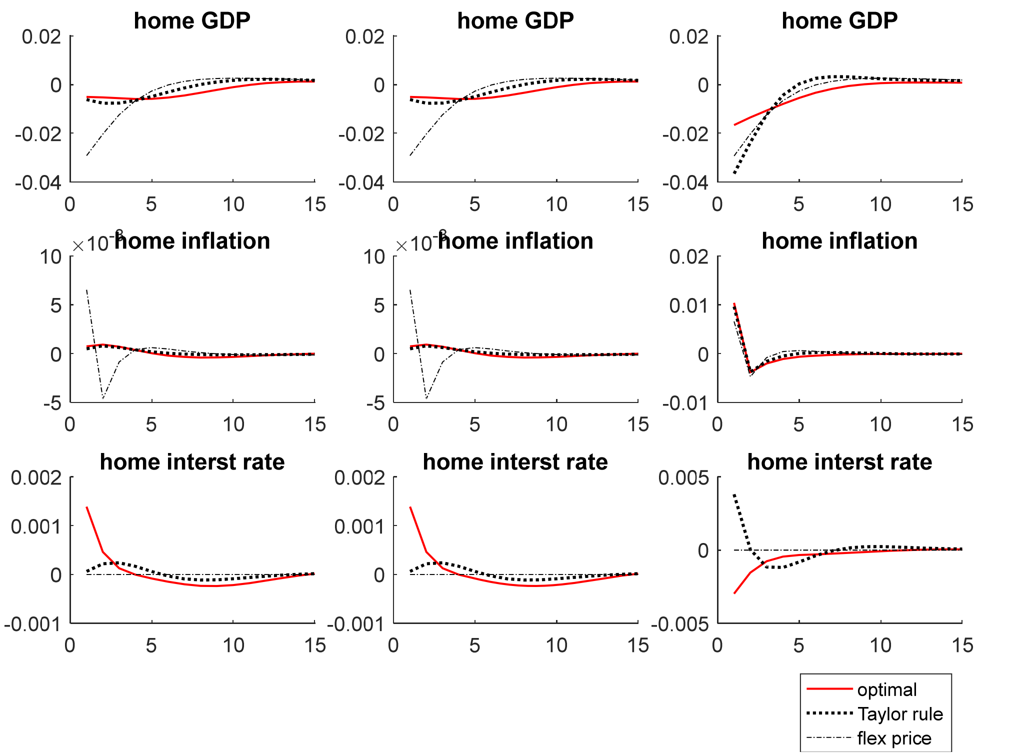
Appendix Figure 2. Sensitivity: impulse responses to a rise in tariff in both countries, under optimal policy



Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

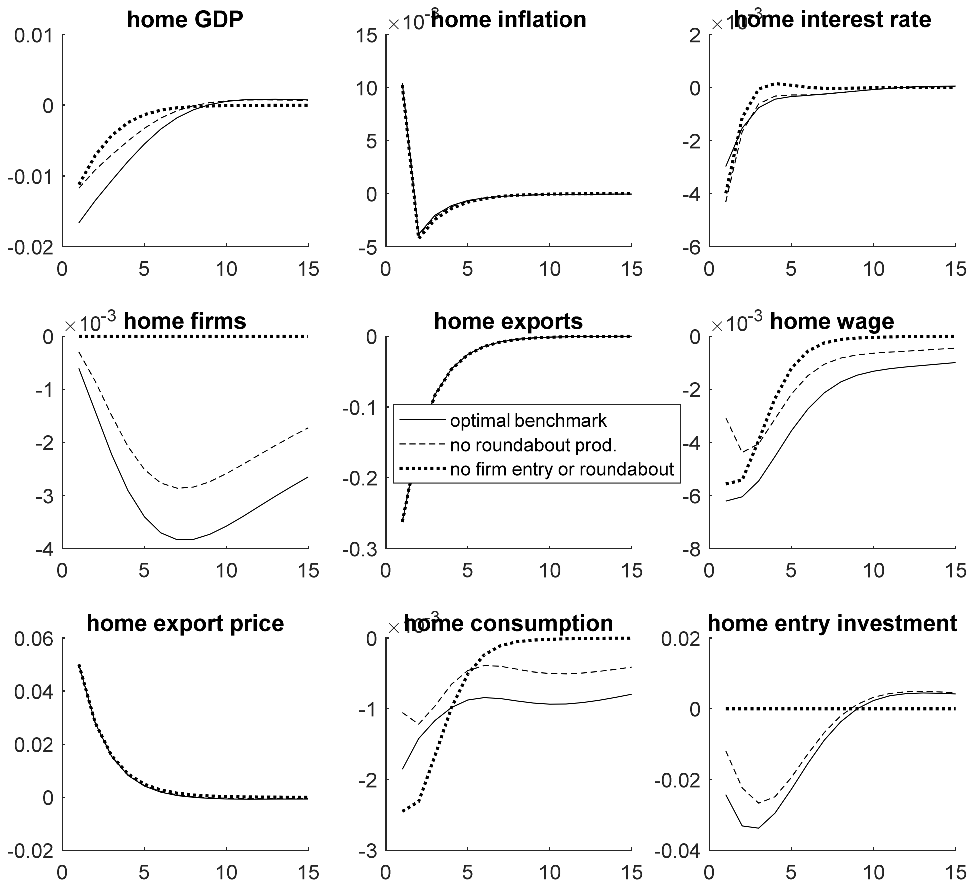
Appendix Figure 3. Impulse responses to a markup shock with varying specifications

(1) Shock only on exports	(2) Shock only on exports, International transfers	(3) Shock only on exports, International transfers, Not subject to stickiness



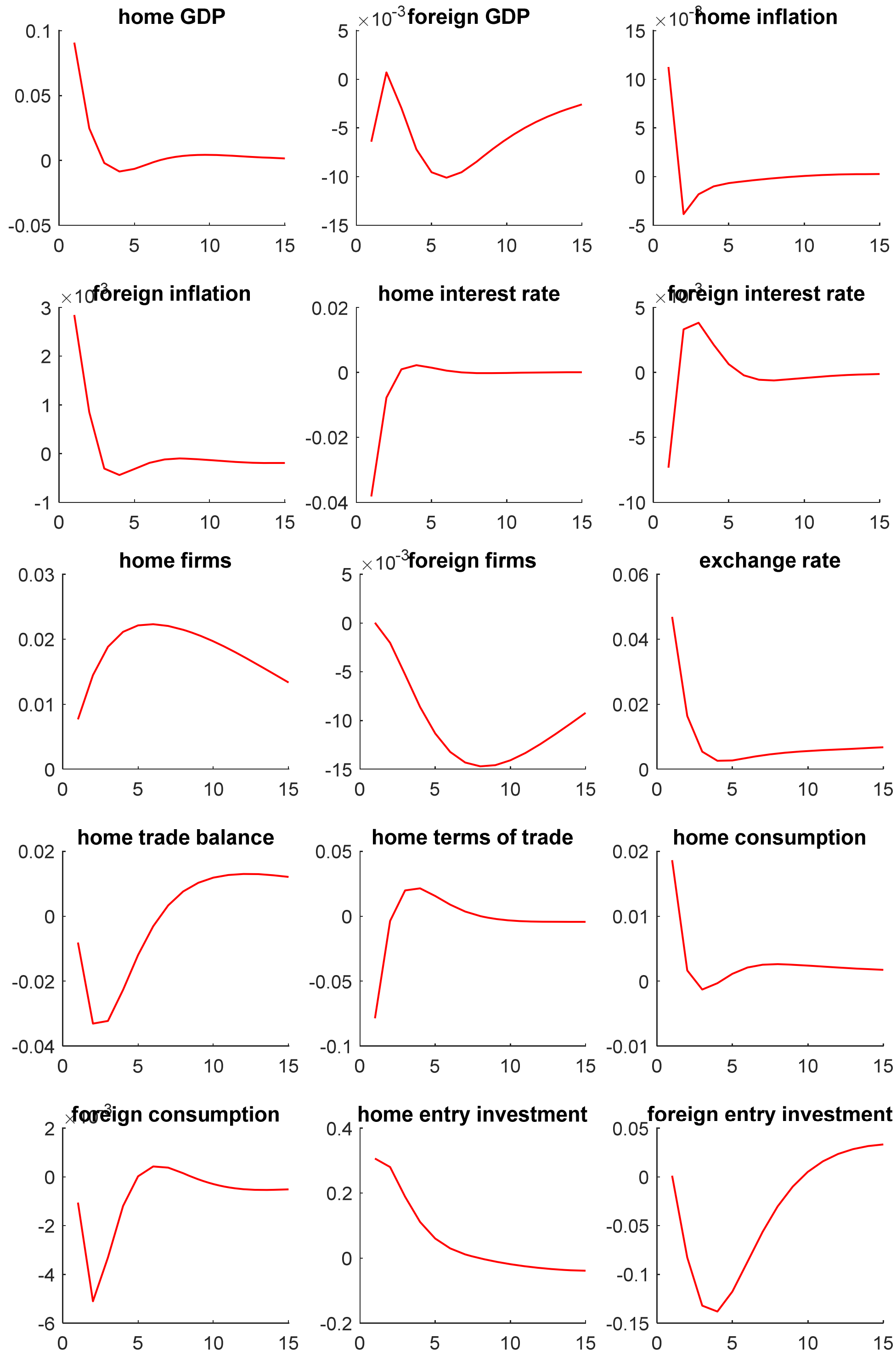
Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

Appendix Figure 4. Impulse responses to a rise in tariff in both countries, one-sector model, optimal policy for various model specifications



Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

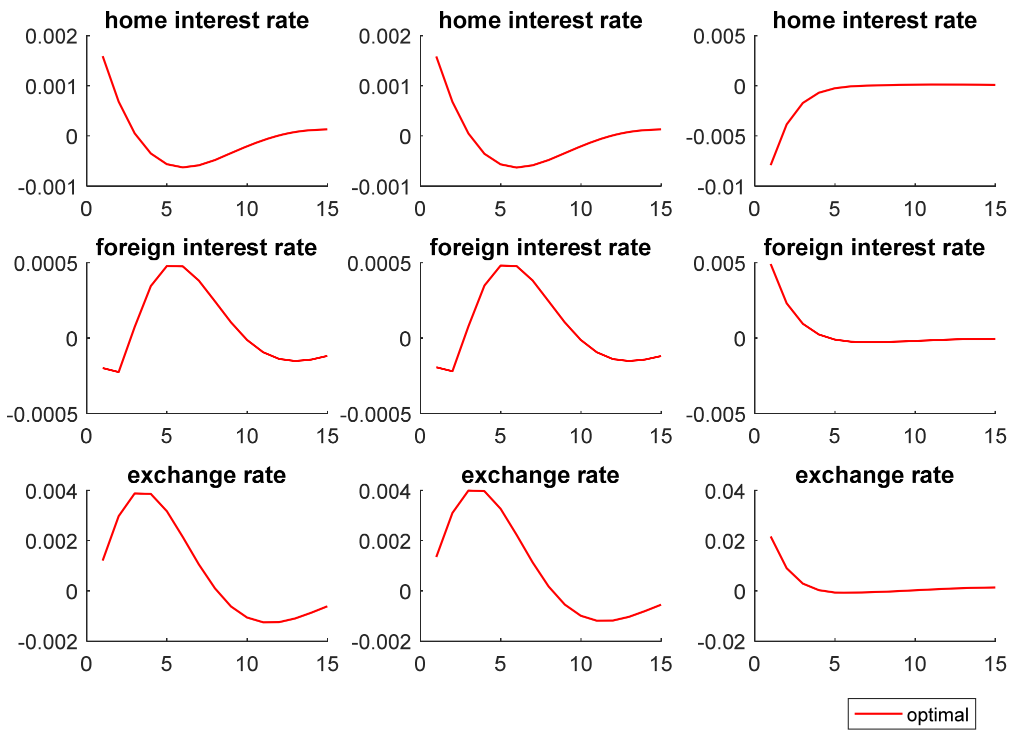
Appendix Figure 5. Ramsey optimal policy with zero weight on home welfare, foreign tariff shock (one sector model)



Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

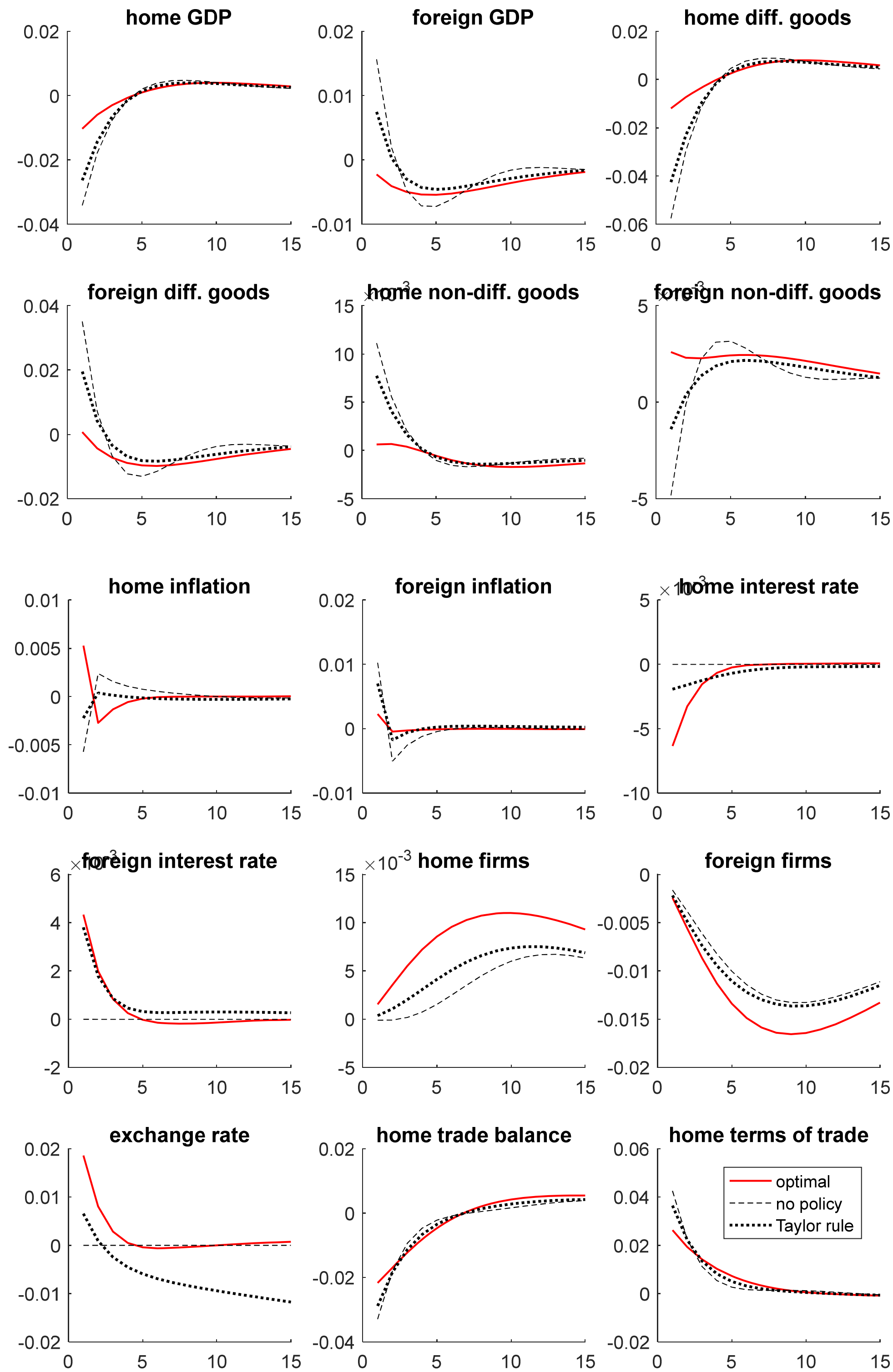
Appendix Figure 6. Impulse responses to a markup shock to home country, with varying specifications

(1) Shock only on exports	(2) Shock only on exports, International transfers	(3) Shock only on exports, International transfers, Not subject to stickiness

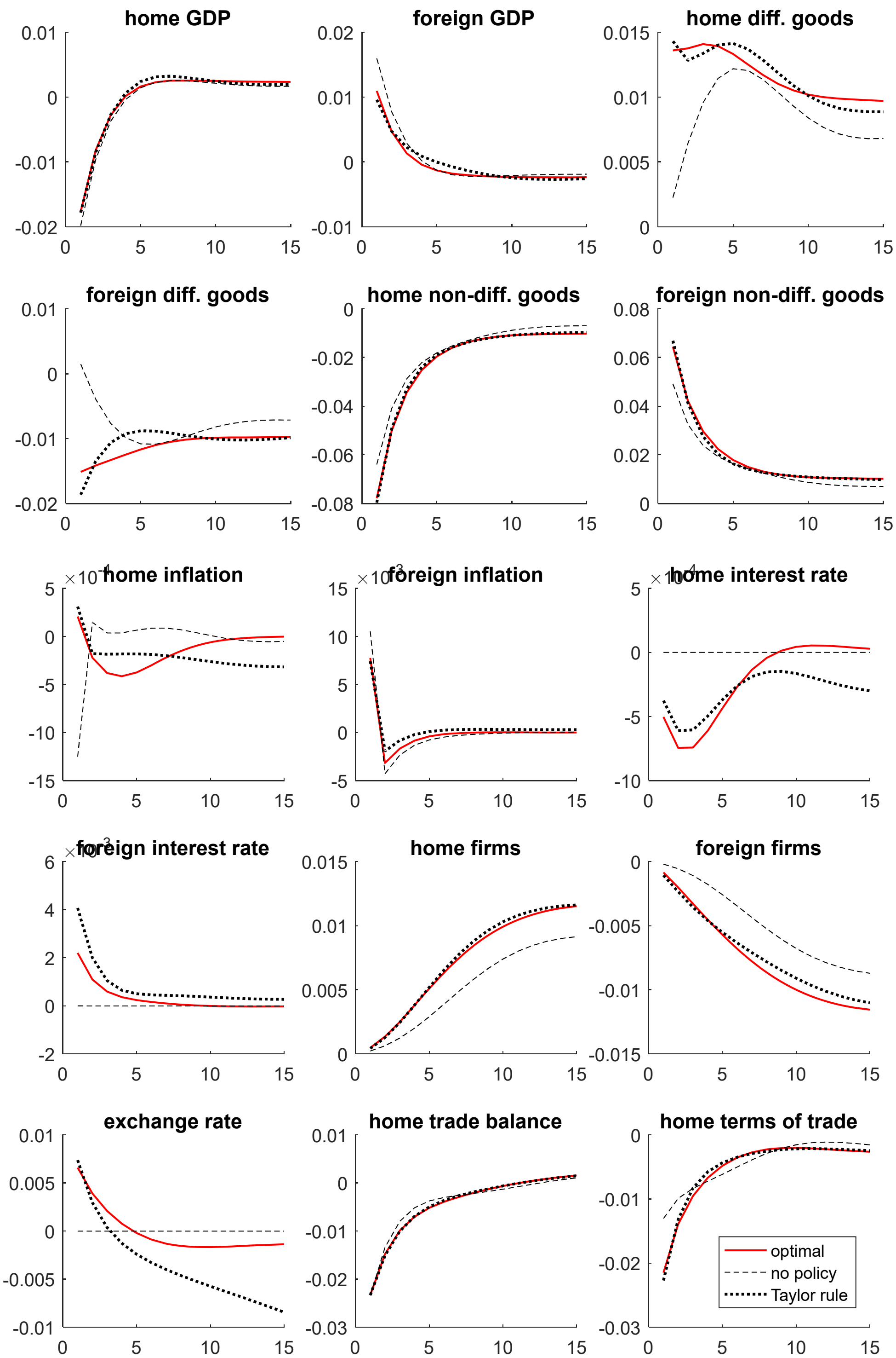


Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

Appendix Figure 7. Impulse responses to a rise in foreign tariff on home differentiated exports, with a nontraded non-differentiated sector

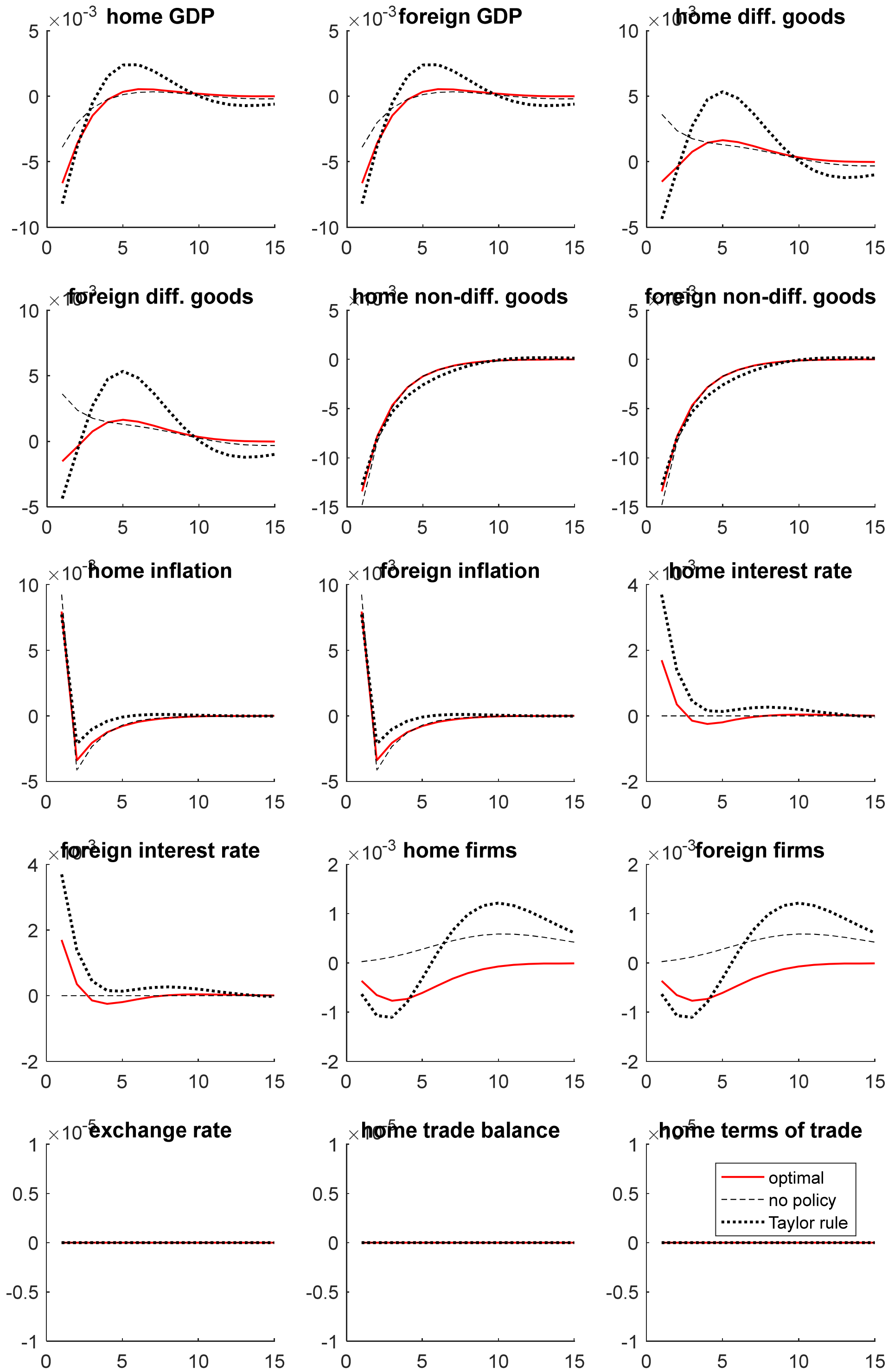


Appendix Figure 8. Impulse responses to a rise in foreign tariff on home non-differentiated exports, two-sector model



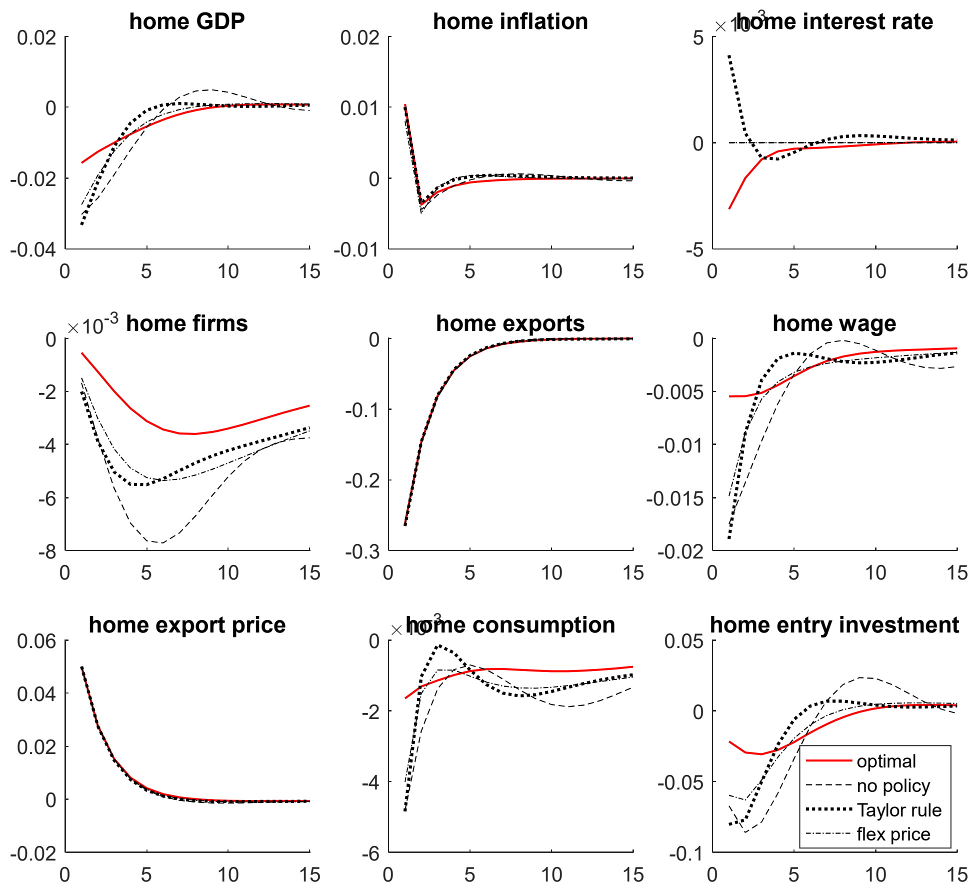
Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

Appendix Figure 9. Impulse responses to a rise in tariff on non-differentiated exports in both countries, two-sector model

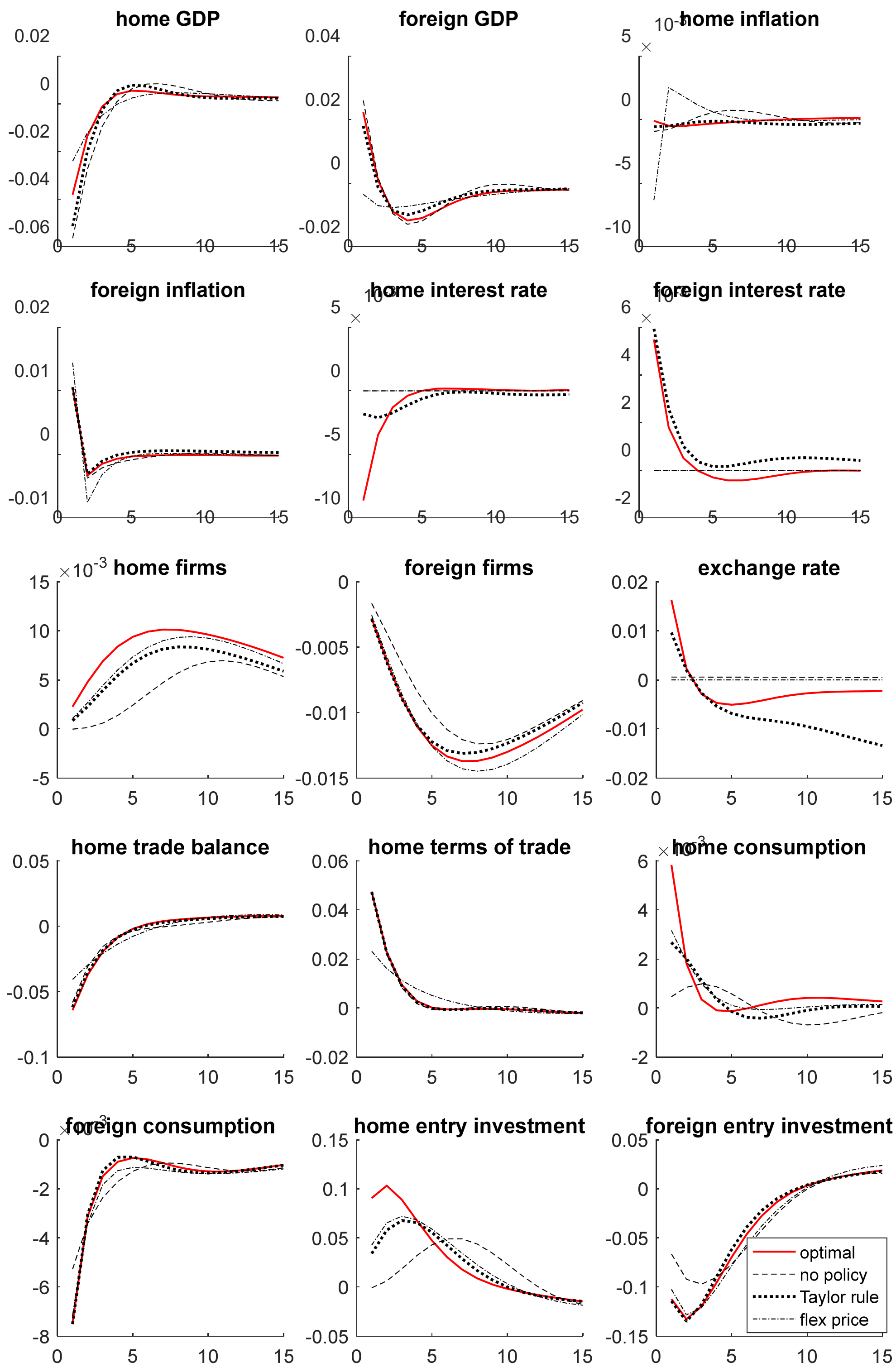


Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

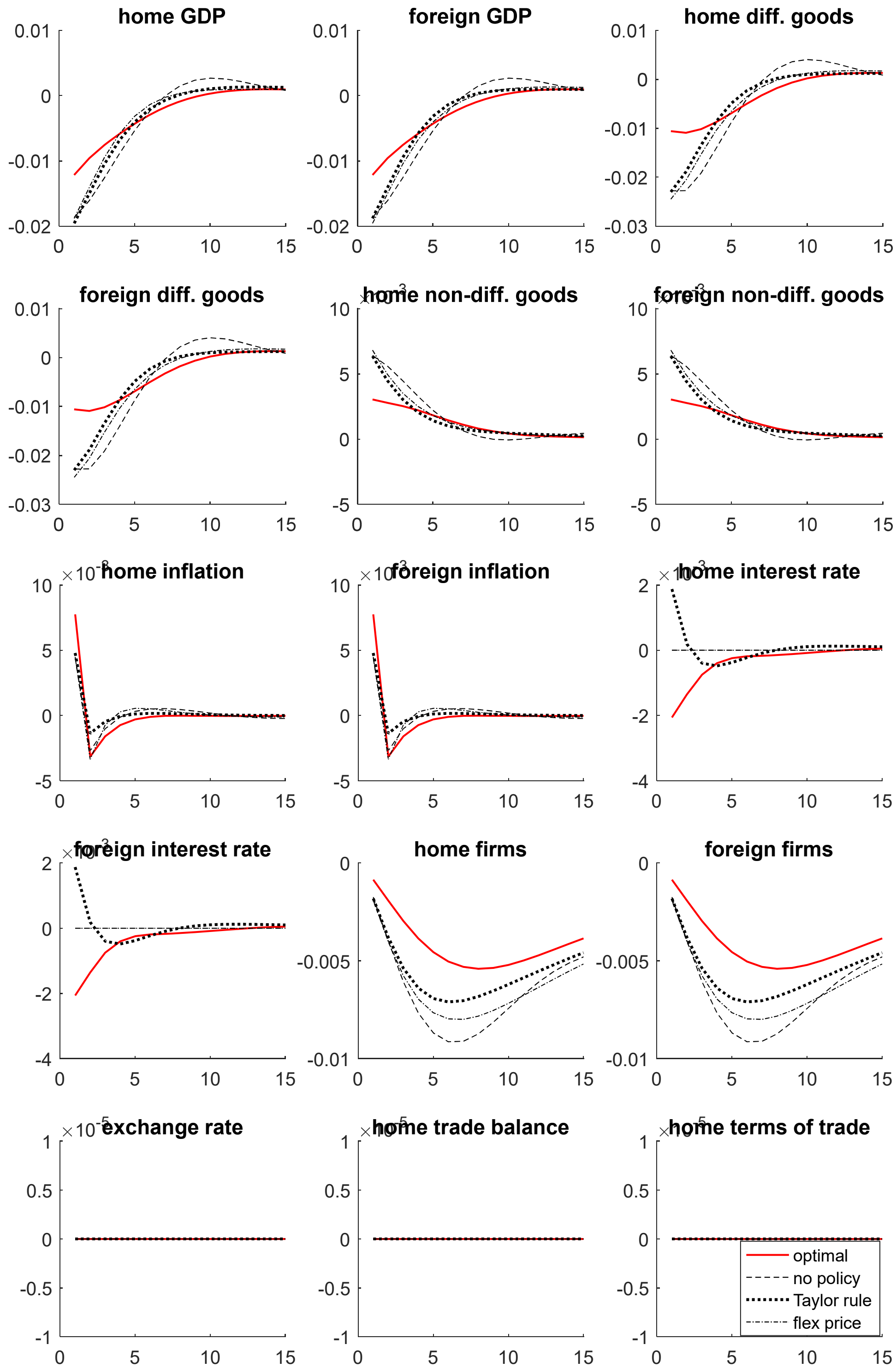
Appendix Figure 10. Impulse responses to a rise in tariff in both countries, one sector Model, LCP



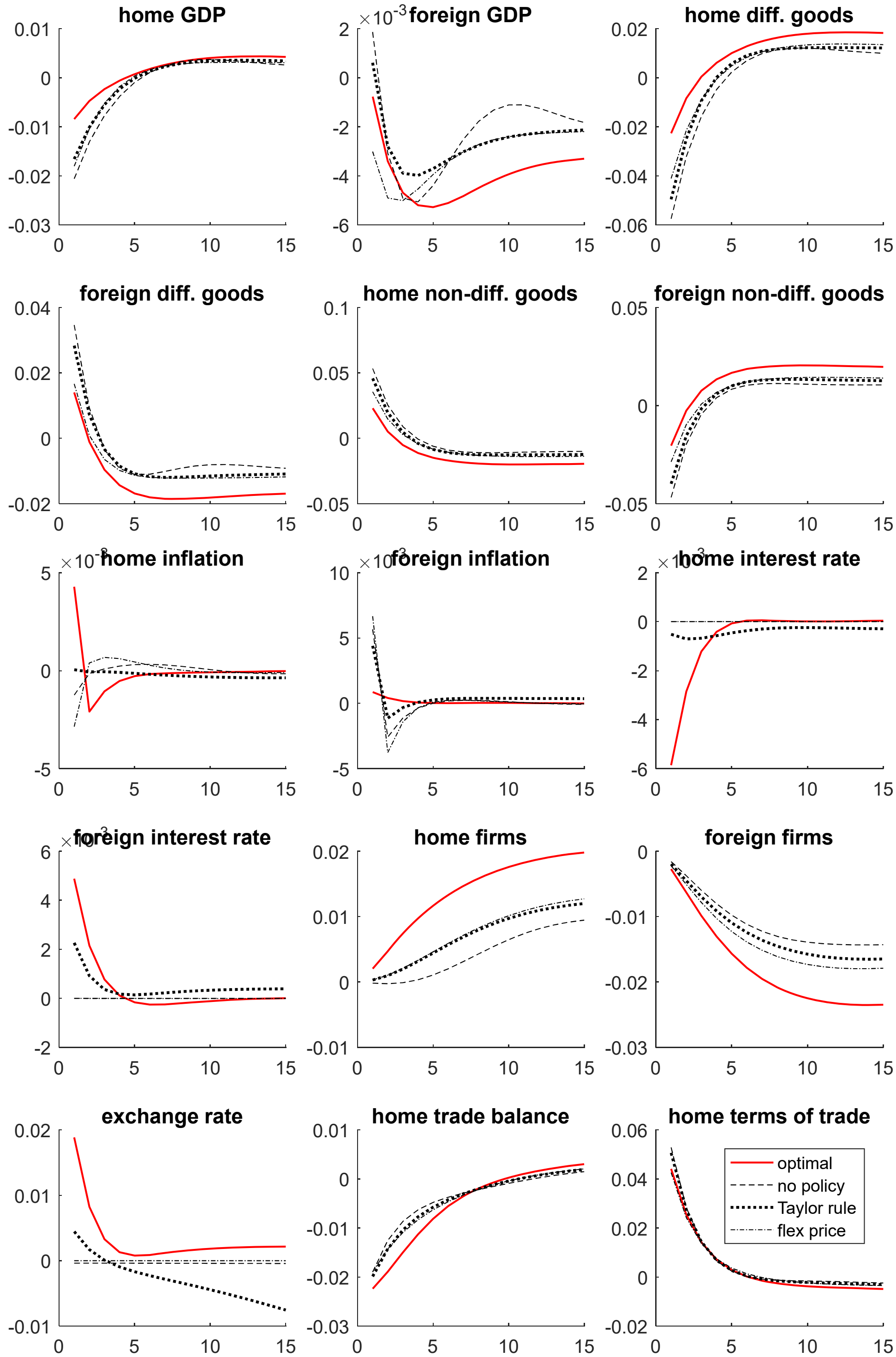
Appendix Figure 11. Impulse responses to a rise in foreign tariff on home exports, one-sector model, LCP



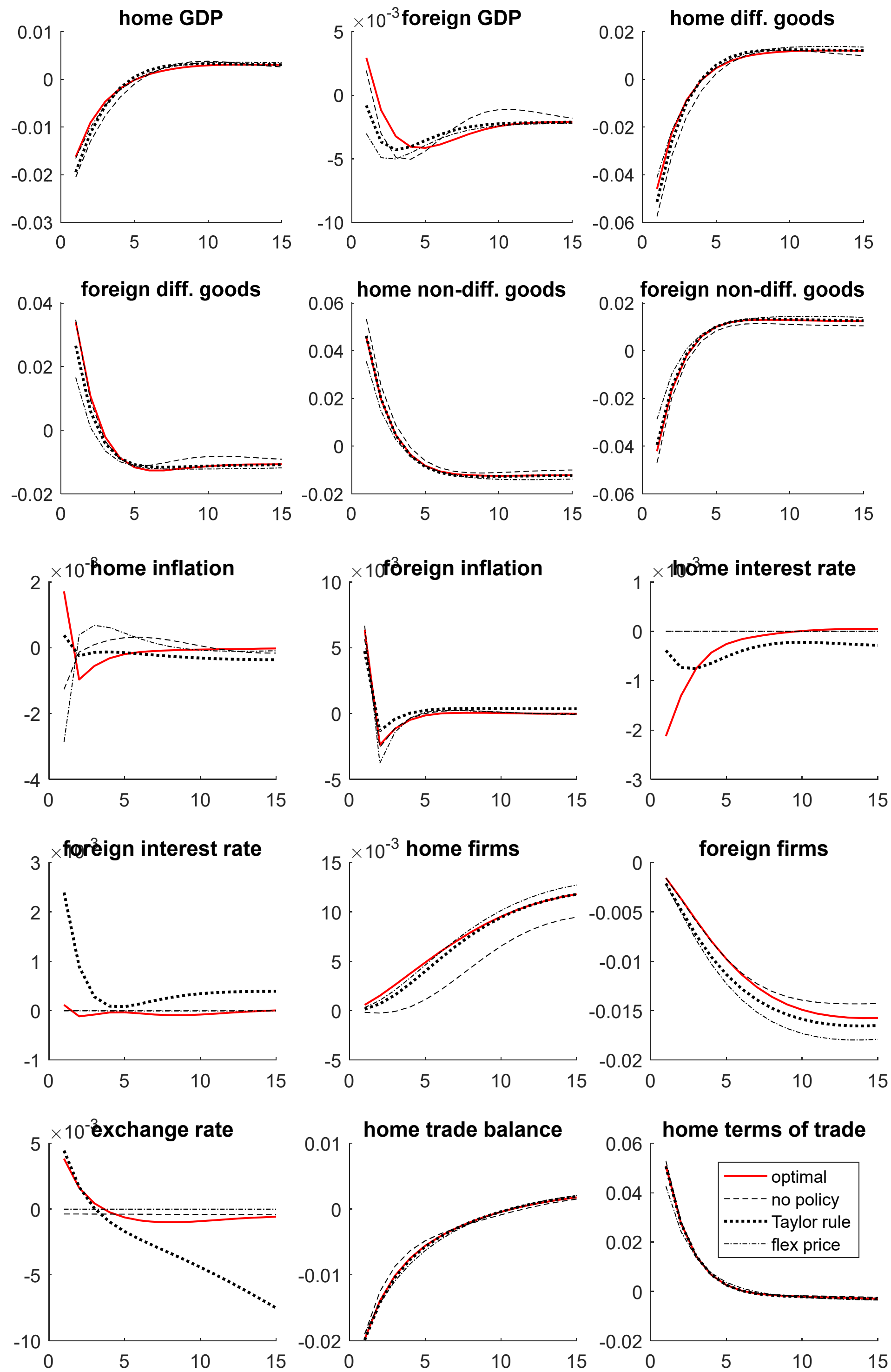
Appendix Figure 12. Impulse responses to a rise in tariff on differentiated exports in both countries, two-sector model, LCP



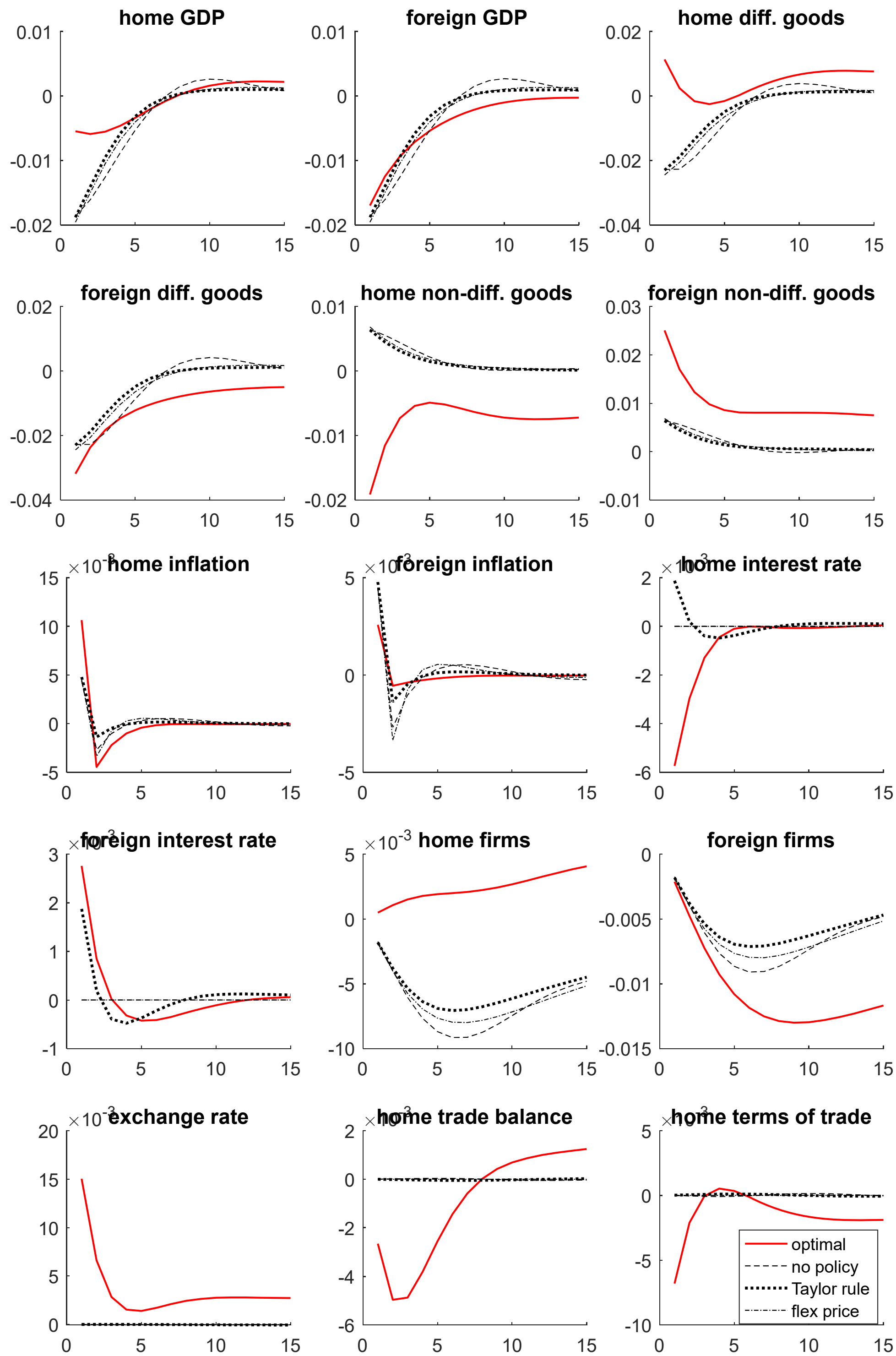
Appendix Figure 13. Impulse responses to a rise in foreign tariff on home differentiated exports, two-sector model, home country dominant currency (home PCP and foreign LCP)



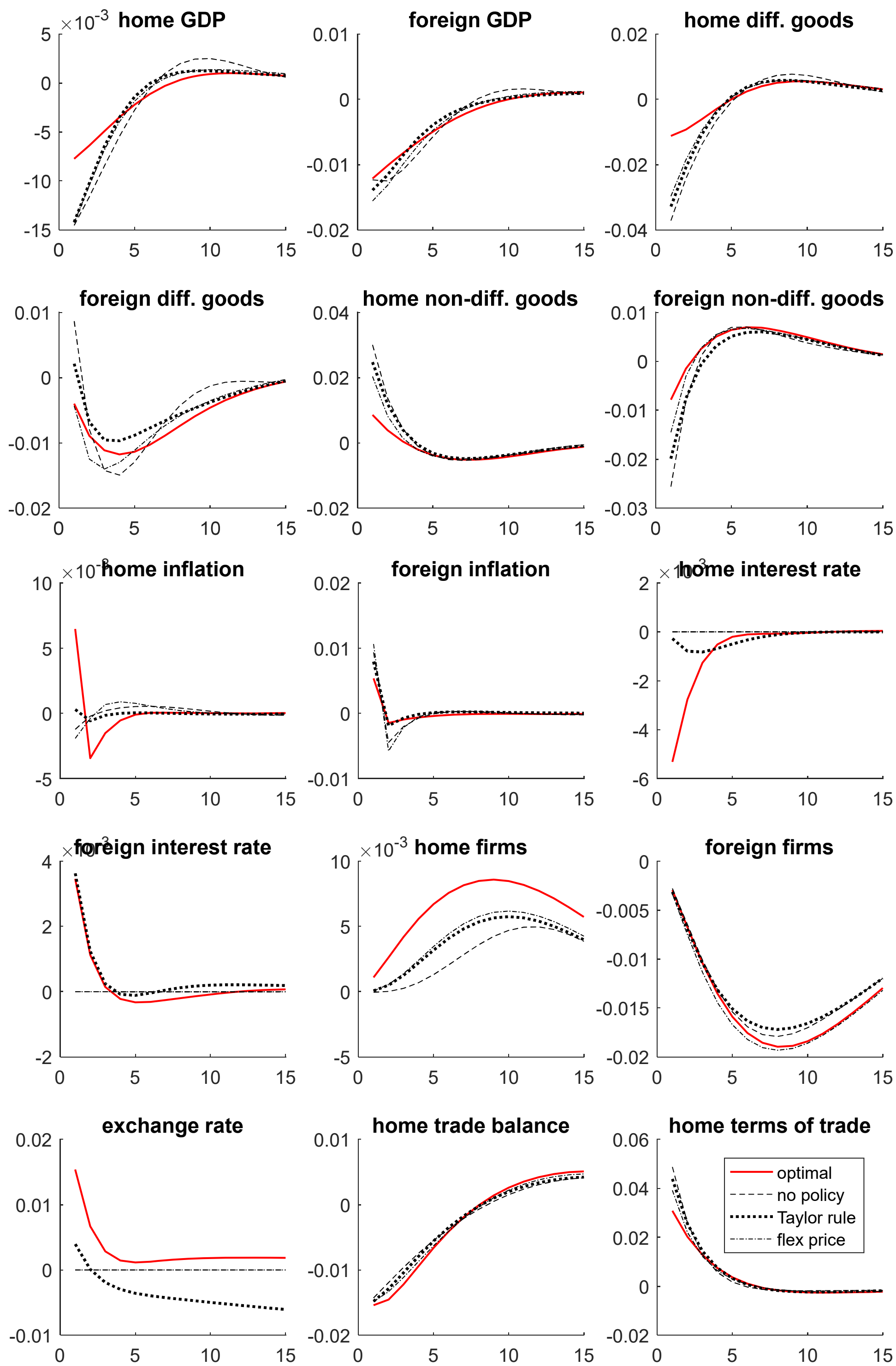
Appendix Figure 14. Impulse responses to a rise in foreign tariff on home differentiated exports, two-sector model, foreign currency dominant (home LCP and foreign PCP)



Appendix Figure 15. Impulse responses to a symmetric rise in tariff on differentiated goods in both countries, two-sector model, home currency dominant (home PCP and foreign LCP)



Appendix Figure 16. Impulse responses to a rise in foreign tariff on home differentiated exports, two-sector low pass-through model



Appendix Figure 17. Impulse responses to a symmetric rise in tariff on differentiated goods in both countries, two-sector low pass-through model