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## No Pain, All Gain? Exchange Rate Flexibility and the Expenditure-Switching Effect

by Yan Carrière-Swallow, Nicolás E. Magud, and Juan F. Yépez



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**No Pain, All Gain? Exchange Rate Flexibility and the Expenditure-Switching Effect[†]**

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**Abstract**

Theoretical models on the relationship between prices and exchange rates predict that the magnitude of expenditure switching affects the optimal choice of exchange rate regime. Focusing on the transmission of terms-of-trade shocks to domestic real variables we document that the magnitude of the expenditure switching effect is positively associated to the degree of exchange rate flexibility. Moreover, results show that flexible exchange rates allow for significant adjustment in relative prices, which in turn lowers the burden of adjustment on demand for domestic goods and, in some cases, facilitates a faster and more durable external adjustment process. These results, which are robust to accounting for possible non-linearities due to balance sheet effects or currency mismatches, shed new light on the shock absorbing properties of flexible exchange rates.

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# I. Introduction

Sharp movements in commodity prices in recent years affected the terms-of-trade of both commodity and non-commodity economies. This has led the general public and policymakers to focus on a long-dated and persistent question: how should countries respond to protracted terms-of-trade shocks? In particular, the debate has focused on whether exchange rate flexibility makes the process of external adjustment to these types of shocks less costly (in terms on less expenditure compression). This paper addresses this issue empirically.

Conceptually, external adjustment to a terms-of-trade shock can take place through changes in aggregate expenditure (expenditure changing effect) or changes in its composition (expenditure switching effect). On the one hand, the expenditure changing effect reflects the reduction in purchasing power associated with persistently weaker terms of trade, leading to a compression of domestic demand and thereby of imports. On the other hand, the expenditure-switching effect responds to a change in international prices, increasing exports while shifting the composition of domestic consumption and investment, away from foreign goods toward domestic goods on the demand side, as well as driving resources from the non-tradable to the domestic tradable sector on the supply side.[1]

For the external adjustment to be durable, both expenditure changing and expenditure switching effects must be observed. In an economy that needs to reduce an external imbalance, expenditure reduction without expenditure switching would be recessionary. To that end, exchange rate flexibility has been typically viewed as a key shock absorber for economies facing terms-of-trade shocks.[2] Nominal prices tend to be sticky, so exchange rate flexibility would be required for the expenditure switching effect to operate by enabling a faster accommodation of relative prices between home and foreign goods to facilitate the process of external adjustment.

It has been widely discussed in the literature (Devereux and Engel, 1998; Engel, 2003; Bacchetta and van Wincoop, 2005; and Gopinath and others., 2010) that the strength of the expenditure switching effect depends on the degree of price stickiness, the fraction of firms in the economy employing producer currency pricing (PCP, as opposed to local currency pricing, LCP), the distribution margin, and the degree of substitutability between domestic and foreign tradable goods. In response to real external shocks, an economy with a sizable expenditure switching effect would benefit from exchange rate flexibility, as nominal exchange rate changes would allow the adjustment of relative prices of goods across countries (Engel, 2003). This will stabilize output by boosting net exports, increasing export while directing domestic demand toward domestically produced goods.

[1] See the Appendix for a highly stylized model showing these effects interacting.

[2] See Graham and Wittlesley (1934), Friedman (1953), Mundell (1961), and Fleming (1962).

However, empirical work trying to assess the role of exchange rate flexibility in insulating output from real external shocks has resulted in opposing and inconclusive results. Earlier studies, using linear frameworks, have generally found a small response of GDP to real external shocks under more flexible exchange rate regimes (Edwards and Levy Yeyati, 2005; Broda, 2004). When non-linearities are introduced into such framework, for example by taking into account possible balance sheet effects, the argument in favor of flexible exchange rates as shock absorbers has been weakened (Towbin and Weber, 2013).

Recent empirical evidence of the role of exchange rate flexibility on the speed of external adjustment and on the presence of external imbalances has been more conclusive. Ghosh and others (2010) found that an external adjustment process is faster and less abrupt in economies under a flexible exchange rate arrangement and with moderate current account deficits. Non-linearities also matter, however. For example, large external current account deficits tend to be more persistent in flexible exchange rate regimes. However, this finding likely points to crisis episodes under intermediate and fixed exchange rate regimes, as well as periods of hyperinflation and of freely falling exchange rates (Eguren Martin, 2016).

Against this backdrop, we test the hypothesis that, during an external adjustment process to a real (external) shock, exchange rate flexibility is associated with a stronger expenditure switching effect, lowering the burden of adjustment on domestic demand. Flexibility would, in turn, make the external adjustment process shorter and less painful. We capture the mechanics of external adjustment using an interacted panel vector auto-regression framework. This framework allows the dynamic relationship between changes in imports, changes in domestic demand (i.e., the expenditure changing effect), and changes in the real effective exchange rate (i.e., the expenditure switching effect) to terms-of-trade shocks to vary with the degree of exchange rate flexibility. The analysis is done for a sample of 101 small open economies for the period 1990–2016.

We find that, in the immediate aftermath of the shock, a negative terms-of-trade shock causes a significant real depreciation only in economies under a flexible exchange rate arrangement. Economies with rigid exchange rate regimes actually appreciate in real, multilateral terms. Furthermore, we show that the magnitude of the real depreciation increases monotonically with the degree of exchange rate flexibility. The key transmission mechanism lies in the real *effective* exchange rate—which incorporates weighted real exchange rates of trading partners and export competitors. Economies with rigid exchange rates appreciate in real terms on impact owing to the depreciation of those economies with flexible exchange rate regimes given the lack of nominal domestic flexibility.

On the one hand, the larger adjustment in relative prices in economies with more flexible exchange rates translates into a smaller contraction in domestic demand, suggesting a stronger expenditure switching effect and a smoother process of external adjustment. On the other hand, the lack of relative price adjustment in economies with fixed exchange rates forces the external adjustment process to rely solely on a painful expenditure compression—

with imports contracting broadly one-to-one with domestic absorption. The latter process is a direct consequence of rigid nominal exchange rates coupled with trade partners and competitors' flexible exchange rates, which appreciate the domestic real exchange rate of those with rigid regimes. Lack of nominal flexibility triggers the deflationary pressure to rebalance the real exchange rate. Thus, all the adjustment effort lies in contracting volumes (domestic production and demand, as well as imports). The magnitudes of adjustment of external imbalances are broadly similar across exchange rate regimes in a linear model.[3] Thus, reducing external imbalances requires a much larger domestic demand compression in economies with a fixed exchange rate as compared to economies with higher exchange rate flexibility. These results, which are robust to accounting for possible non-linearities due to balance sheet effects or currency mismatches, shed new light on the shock absorbing properties of flexible exchange rates.

The rest of the paper is structured as follows. Section II provides a review of the relevant literature and relates this paper contribution to it. The data used in the analysis is described in Section III. Section IV presents the empirical strategy that underlies our analysis. The results and several robustness tests are presented in Section V and VI, respectively. Section VII concludes.

## II. Literature Review

In the literature on the relationship between exchange rates and prices the implications of a nominal exchange rate movement for real variables depend critically on the currency in which prices are rigid.[4] In the seminal contributions by Mundell (1961), Fleming (1962), Svensson and van Wijnbergen (1989), and Obstfeld and Rogoff (1995), the main assumption is that prices are sticky in the currency of the producing country (PCP). With this assumption, nominal exchange rate movements can change relative prices between home and foreign goods. Hence, nominal exchange rate changes can lead to expenditure switching, the traditional argument for flexible exchange rate arrangements. But if prices are fixed ex ante in consumers' currencies (LCP), exchange rate flexibility cannot achieve any relative price adjustment. In that case nominal exchange rate fluctuations have the undesirable feature that they lead to deviations from the law of one price (Betts and Deveraux, 2000, and Deveraux and Engel, 2003). With LCP, the case for floating exchange rates is weakened.

Thus, the magnitude of the expenditure switching effect can influence the choice of monetary and exchange rate policies. That is, an economy under PCP would exhibit a sizable expenditure-switching effect, therefore benefitting from a flexible exchange rate regime, while an economy under LCP and a low expenditure-switching effect would be better off

[3] However, the adjustment of imports is somewhat larger for floats if non-linearities are introduced to the model.

[4] A survey of this research is contained in the latest handbook chapter by Corsetti et al. (2010).

with a rigid exchange rate (Engel, 2003). Our contribution is to contrast these two theoretical predictions, by testing the role of exchange rate flexibility in the magnitude of the expenditure-switching effect. In a large sample of small open economies, we find that the expenditure-switching effect is in fact stronger in economies with more flexible exchange rate arrangements, and that the magnitude of the expenditure-switching effect increases monotonically with the degree of exchange rate flexibility.

Numerous studies have empirically focused on the role of the exchange rate as a shock absorber to terms-of-trade shocks in small open economies.[5] However, there has not been consensus regarding the effectiveness of flexible exchange rates to stabilize output following these shocks. Edwards and Levy Yeyati (2005), using a *de facto* classification of exchange rate regimes, find that indeed flexible exchange rate arrangements help reduce the real impact of terms of trade shocks, both in emerging and industrial economies. Similarly, Broda (2004) and Broda and Tille (2003) look at the response of real GDP to a terms-of-trade shock in a sample of developing countries and find a stronger output response under a peg. In contrast to these findings, Towbin and Weber (2013) find that in economies with a small share of homogeneous imports and a high degree of foreign currency debt, floating and fixed exchange rates display similar stabilization properties, as limited pass-through hinders the adjustment of relative prices under a float and contractionary balance sheet effects become important. Magud (2004 and 2010) shows that the optimality of the exchange rate to terms-of-trade shocks in the presence of currency mismatches depends on the degree of trade openness.

None of these papers, however, look at the mechanics of external adjustment after a real external shock accounting for expenditure switching and changing effects and their role in narrowing external flow imbalances. Our paper fills this gap. It looks at the dynamic relationship between changes in imports, changes in domestic demand (to capture expenditure-changing effects), and changes in the real effective exchange rate (to capture expenditure-switching effects) to terms-of-trade shocks in a sample of 101 economies. Our results are in line with the earlier empirical studies on the stabilization properties of flexible exchange rates, even when the role of potential currency mismatches and import structure are accounted for in the empirical model.

Finally, this paper is related to the literature on the link between exchange rate regimes and the speed and magnitude of external adjustment.[6] The findings regarding the former have been mixed, while strong current account reversals have been consistently associated with fixed exchange rate regimes. Chinn and Wei (2013) find that current account balances under

[5] See Levy-Yeyaty and Struzenneger (2003), Céspedes, Chang, and Velasco (2004), Devereux, Lane, and Xu (2006), Edwards and Levy-Yeyaty (2005), Gertler, Gilchrist, and Natalucci (2007), Magud (2004 and 2010), and Towbin and Weber (2013).

[6] See Clower and Ito (2012), Chinn and Wei (2013), Ghosh et al. (2010).

flexible regimes seem to be no less persistent than under fixed regimes. Ghosh and others (2010) outline an alternative view, and point out that floating regimes are associated with smaller external imbalances than fixed regimes, and that large current account reversals are less frequent under flexible arrangements. Differences are particularly large if non-linearities resulting from the magnitudes of external imbalances are factored in. For example, they suggest that current account balances tend to be more persistent under flexible exchange rate arrangements in the case of large deficits. The present study finds that following a terms-of-trade shock, the magnitude of adjustment of flow imbalances immediately after the shock is larger under floating regimes. However, the differences are less significant in medium-term responses. We also find that differences in the magnitude of adjustment are significantly larger in floats with low foreign debt levels.

## III. Data

We quantify the relative importance of expenditure-switching effects following a terms-of-trade shock using a sample covering yearly data for 101 economies during 1990-2017.[7] The data has the following restrictions: the sample does not include G7 countries and China, as the identifying assumption on the exogeneity of terms-of-trade shocks may not hold for large countries. Euro area countries are also excluded, as it is not possible to consider these economies as independent cross-sectional observations after 1998. Because of data quality concerns the study uses only countries with a PPP-adjusted GDP per capita greater than 1,000 U.S. dollars as of 2016. Small countries with a population of less than one million and observations where the annual change in domestic demand exceeds 20 percent are also dropped. Observations where annual changes in the real effective rate exceed 50 percent are also excluded from the analysis. The complete list of economies used in the analysis is presented in Table A.1 (in the Appendix).

The classification for the exchange rate regime comes from Ilzestky, Reinhart, and Rogoff (2017) *de facto* database, which assigns country–year observations to one of fifteen categories, ranging from “no separate legal tender” to “freely floating” in increasing degree of “flexibility.” In contrast to other available classifications, Ilzestky, Reinhart, and Rogoff (2017) include categories for “freely falling” and “dual markets in which parallel market data is missing.” Observations under these two categories are excluded from the analysis, as they typically took place during episodes of macroeconomic instability that are characterized by very high inflation rates, often reflected in high and frequent exchange rate depreciation. Classification of such episodes as floating, intermediate, or pegged is problematic, since the macroeconomic disturbances could be incorrectly attributed to the exchange rate regime.

[7] In contrast with earlier studies, we exclude observation before 1990, as commonly used exchange rate regime classifications are likely to be inaccurate due to the prevalence of dual or parallel markets and high inflation during 1970-1989 (Ilzestky, Reinhart, and Rogoff, 2017).

This index also provides a longer time coverage compared to other *de facto* exchange rate classifications.

Real domestic demand, real imports, and terms of trade are taken from the IMF's *World Economic Outlook* database and the REER (CPI based) measure was obtained from the IMF's *Information Notice System*.

Using the methodology put forward by Towbin and Weber (2013), we look into whether possible currency mismatches influence the relatively higher degree of expenditure-switching effects in economies with more flexible exchange rate arrangements. The measure used to capture possible currency mismatches is short-term external debt over total reserves, provided by the World Bank's *World Development Indicators* (WDI). This measure is preferred to long-term debt or debt-to-GDP ratios, as long-term debt is unlikely to translate into immediate vulnerabilities, and gaps between short-term debt and international reserves is a better measure for dollar financing needs.[8,9] To reduce sensitivity to outliers, the analysis uses log(1+*debt*), where *debt* is the debt-to-international reserves measure expressed in percentage points.

The paper also looks into the role of import structure on the pass-through of the exchange rate into relative prices and the magnitude of expenditure switching effects. Following Campa and Goldberg (2005), the share of primary commodities in a country's total imports of goods and services is used to measure the extent to which a country imports high pass-through goods. The share of primary commodities in total imports is proxied by the sum of agricultural goods, fuels, ores, and metals over total imports as provided by WDI. The measure used is log(1+*RAW*), where *RAW* is the import share of raw material in percentage points.

## IV. Model and Estimation

The empirical strategy is based on the panel vector autoregression (PVAR) framework with interacted terms introduced by Towbin and Weber (2013). The model captures the dynamic response of real imports, domestic demand, and the real effective exchange rate to a terms-of-trade shock. Interaction terms allow the model's coefficients to vary deterministically with the *de facto* classification provided by Ilzestky, Reinhart, and Rogoff (2017). The recursive interacted PVAR has the following form:

[8] Additionally, we have conducted a robustness check in which we used total debt, and short-term debt as a share of GDP. Quantitative results, not reported here, do not change.

[9] The analysis of Lane and Shambaugh (2010) shows that foreign debt is typically denominated in foreign currency.

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ \alpha_{0,it}^{2,1} & 1 & 0 & 0 \\ \alpha_{0,it}^{3,1} & \alpha_{0,it}^{3,2} & 1 & 0 \\ \alpha_{0,it}^{4,1} & \alpha_{0,it}^{4,2} & \alpha_{0,it}^{4,3} & 1 \end{pmatrix} \begin{pmatrix} \Delta TOT_{i,t} \\ \Delta DEM_{i,t} \\ \Delta REER_{i,t} \\ \Delta IMP_{i,t} \end{pmatrix} \tag{1}$$

$$= \gamma X_{i,t} + \sum_{l=1}^{L} \begin{pmatrix} \alpha_l^{1,1} & 0 & 0 & 0 \\ \alpha_{l,it}^{2,1} & \alpha_{l,it}^{2,2} & \alpha_{l,it}^{2,3} & \alpha_{l,it}^{2,4} \\ \alpha_{l,it}^{3,1} & \alpha_{l,it}^{3,2} & \alpha_{l,it}^{3,3} & \alpha_{l,it}^{3,4} \\ \alpha_{l,it}^{4,1} & \alpha_{l,it}^{4,2} & \alpha_{l,it}^{4,3} & \alpha_{l,it}^{4,4} \end{pmatrix} \begin{pmatrix} TOT_{i,t-l} \\ \Delta DEM_{i,t-l} \\ \Delta REER_{i,t-l} \\ \Delta IMP_{i,t-l} \end{pmatrix} + U_{it}$$

where $TOT_{it}$ is the log terms of trade; $DEM_{it}$ is log real domestic demand; $REER_{it}$ is log real effective exchange rate; and $IMP_{it}$ is log real imports. $U_{it}$ is a vector of uncorrelated iid shocks. $X_{it}$ is a vector of controls which includes country-specific intercepts $c_i$ as well as other exogenous controls, and $L$ is the number of lags. $\alpha_{l,it}^{j,k}$ are deterministically varying coefficients that are a function of the degree of exchange rate flexibility, and potentially also on short-term debt levels and on the import structure in subsequent robustness checks.

In order to capture differences in the responses depending of the degree of exchange rate flexibility, coefficients in (1) are augmented to include interaction terms:

$$\alpha_{l,it}^{j,k} = \beta_{l,1}^{j,k} + \beta_{l,2}^{j,k} \cdot PEG_{it} \tag{2}$$

where $PEG_{it}$ is the exchange rate classification from Ilzestky, Reinhart, and Rogoff (2017), ranging from 1 to 13 (IRR hereafter). In robustness checks, equation (2) is extended to include debt levels and import content, as well as the interaction terms of these variables with the exchange rate classification index.[10] All interaction terms enter also in levels as exogenous controls $X_{it}$.

Simultaneity issues are addressed in the identification of the empirical model by assuming that countries take the terms of trade as exogenously given, i.e. variations in the terms of trade can be regarded as an exogenous source of aggregate fluctuations. This assumption is common place in the existing related literature.[11] Impulse responses are computed to a ten percent reduction in the terms of trade at horizon *h*, of the levels of log domestic demand, log REER, and log real exports and imports (using the cumulative sum of the growth rates of these variables up to period *h*); and the cumulative change in real imports in period *h*.

Terms-of-trade dynamics are independent of country characteristics, that is $\alpha_l^{1,1} = \beta_{l,1}^{1,1}$ for all *l*. The coefficients are evaluated at specific values, which are used to compute impulse responses. Impulse responses are estimated for the full spectrum of exchange rate

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[10] See Towbin and Weber for a detailed description and discussion of the inclusion of debt levels and import structure as additional interaction terms in equation (2).

[11] See Schmitt-Grohé and Uribe (2017).

arrangements. When looking at the role external debt and import structure, the impulse responses are calculated using the lower ($20^{th}$) percentile and a higher ($80^{th}$) percentile value.

Each equation of the system is estimated using ordinary least squares (OLS), allowing for country fixed effects with two lags, following the Schwartz Criterion. As the impulse responses are non-linear functions of the OLS estimates, the procedure employs Runkle (1987) bootstrapping method to adjust for the fact that the data is in a panel format and to make use of the interaction terms. The algorithm can be summarized as follows:[12]

1. Estimate equation (1) by OLS

2. Draw error $\hat{\varepsilon}_{i,t}$ from a normal distribution N (0, $\hat{\Sigma}$), where $\hat{\Sigma}$ is the estimated covariance matrix.

3. Use $\hat{\varepsilon}_{i,t}$ , the observations of the sample in period *t*-1 and *t*-2, and the estimates of $\hat{\alpha}_{l,it}^{j,k}$, to simulate recursively the next period observations for the four variables in the PVAR. $\hat{\alpha}_{l,it}^{j,k}$ is estimated using equation (2) and the values of the exchange rate classification in period *t*.

4. After the first period is simulated for all variables in the system, interact the variables with the interaction terms and then repeat steps 2 and 3 for $t$=1,...,$T$ and $i$=1,…,$N$, where $T$ is the sample length and $N$ is the number of countries.

5. The artificial sample, together with the interaction variables, are then used to re-estimate the coefficients of the system. Cumulative IRFs are computed.

6. The procedure above (steps 2 to 5) is repeated 500 times. The 90 percent confidence intervals are drawn from the simulated estimates.

To test whether the responses of the variable of interest vary across alternative exchange rate regimes, the empirical distributions of the differences in the responses are obtained from the bootstrap simulations. For presentational purposes we focus on the differences between *de facto pegs* (score of 4 in IRR) and *managed floating* (score of 12 in IRR) regimes.[13]The fraction of the 500 simulations that lies above zero is reported. The bootstrap procedure automatically accounts for cross correlation between the impulse responses.

[12] See Towbin and Weber (2013) for a more detailed description.

[13] Ilzetzki, Reinhart, and Rogoff (2017) denote as pegs those regimes classified between 1 (no separate legal tender) and 9 (pre-announced crawling band that is wider than or equal to +/- 2 percent), while floats are those between 10 (*de facto* crawling band that is narrower or equal to +/- 5 percent) and 13 (freely floating).

## V. Results

Figure 1 shows impulse responses for the panel of 101 small open economies to a 10 percent reduction in the terms of trade over a 10-year window. Solid lines represent OLS point estimates. Dashed lines are confidence bands that include 90 percent of the bootstrap estimates, constructed according to Runkle's (1987) procedure described above.

Results show that the composition of adjustment varies with the exchange rate regime. In line with the theoretical predictions of the literature on optimal exchange rate policy (Betts and Deveraux, 2000; Deveraux and Engel, 2003; Engel 2003), larger expenditure switching effects are observed in economies under a *managed floating* regime as compared to countries under a *de facto peg* arrangement. For the former, in response to a 10 percent fall in the terms of trade, currencies depreciate around two percent in real terms on impact, and stabilize around 4 years after the initial shock. This adjustment of relative prices facilitates expenditure-switching effects to take a hold and hence lowers the burden of the adjustment process on domestic demand. For more rigid exchange rate regimes, however, as currencies appreciate in real terms following the terms-of-trade shock precisely owing to the rigidity in exchange rates, the burden of adjustment needs to fall solely on domestic demand, that is, in volumes.[14] The required initial decline in domestic demand is twice as large in these economies for the same adjustment to be observed. In contrast, the terms-of-trade shock has no effects on the level of domestic demand in economies under the more flexible arrangement after three years. This result is therefore in line with the classic theoretical argument that flexible exchange rates are better suited to absorb real shocks and confirms previous empirical findings (Edwards and Levy Yeyati, 2005; and Broda, 2004).

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[14] As documented in IMF (2017), the real appreciation in part due to the depreciation in trade partners' flexible currencies at a time when these countries have rigid regimes.

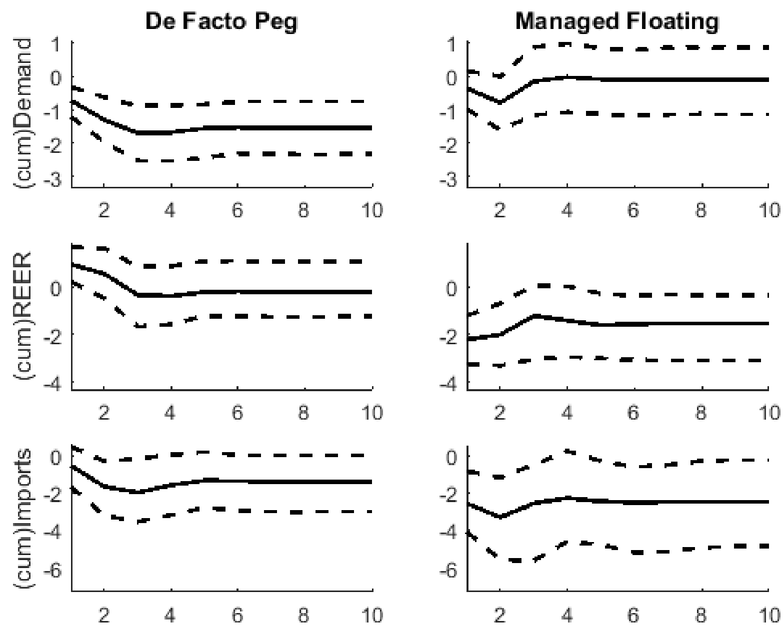


**Figure 1.** Impulse responses for a negative ten percent terms-of-trade shock for different exchange rate regimes.

The expenditure-switching effect in economies under floating arrangements is also evident in the performance of real imports. In these economies, despite having a smaller contraction in domestic demand, the decline in real imports (around 2 percent) is broadly similar to the one experienced by economies under pegs.[15] This comes as the result of the real depreciation following the terms-of-trade shock, which could potentially shift the composition of domestic absorption away from foreign goods toward domestic goods, making the adjustment process less painful in terms of forgone absorption. The lack of exchange rate flexibility (possibly coupled with other nominal rigidities) forces economies under with pegs to a more painful external adjustment process, relying solely on expenditure-changing effects.

Table 1 shows the difference in the cumulative impulse responses between *de facto pegs* and *managed floating* regimes in the IRR classification. Medium-term responses differ in at least 90 percent of the bootstrap simulations, except in the case of the adjustment in real imports, which is different across the two regimes in 75 percent of the simulations, respectively. The largest difference, both in magnitude and direction, is in the initial response of the REER to a terms-of-trade shock. Given that the REER appreciates in response to the shock in rigid regimes, the decline in imports is significantly smaller in these economies. However, the statistical significance between the medium-term response of real imports across regimes is

[15] Although not reported, the response of real exports is not significant in neither of the two regimes, as in Adler et al. (2017). This could be explained by the findings of Goldberg and Tille (2008), Gopinath (2015), Casas et al. (2016), and Boz et al. (2017), which document that most trade is invoiced in dominant currencies and hence expenditure switching occurs mainly through imports.

somewhat weak, pointing also towards no significant differences in the persistence of external flow imbalances, supporting earlier finding by Chinn and Wei (2013).

**Table 1**
Responses to a negative ten percent terms-of-trade shock for different exchange rate regimes

| | De Facto Peg | Managed Floating | Difference |
|---|---|---|---|
| Domestic Demand | | | |
| 1st year | -0.73*** | -0.37** | -0.36* |
| 3rd year | -1.70*** | -0.16 | -1.54*** |
| 5th year | -1.56*** | -0.10 | -1.46*** |
| REER | | | |
| 1st year | 0.94*** | -2.22*** | 3.16*** |
| 3rd year | -0.35 | -1.23** | 0.88* |
| 5th year | -0.33 | -1.62*** | 1.29** |
| Imports | | | |
| 1st year | -0.55* | -2.58*** | 2.03** |
| 3rd year | -2.00** | -2.57*** | 0.57* |
| 5th year | -1.35* | -2.47*** | 1.12* |

*, **, *** indicate that zero lies outside the 68, 90, 95% confidence bands.

With these estimates at hand, the generality of the findings presented above can be illustrated with simulations of the accumulated responses of domestic demand, relative prices, and real imports to terms-of-trade shocks across the whole spectrum of the IRR exchange rate regime classification (Figure 2).[16] The magnitude of the expenditure-switching effect increases monotonically with the degree of exchange rate flexibility. The depreciation of the currencies in real terms in response to the shock increases with the degree of exchange rate flexibility. This in turn allows a larger and less painful external adjustment process, that relies less in demand compression. These results are evidence of the benefits of increased exchange rate flexibility in the presence of expenditure-switching effects.

[16] The regimes classified as 14 (freely falling) and 15 (dual market in which parallel market data is missing) are excluded as these observations are not included in the PVAR estimation, as mentioned above.

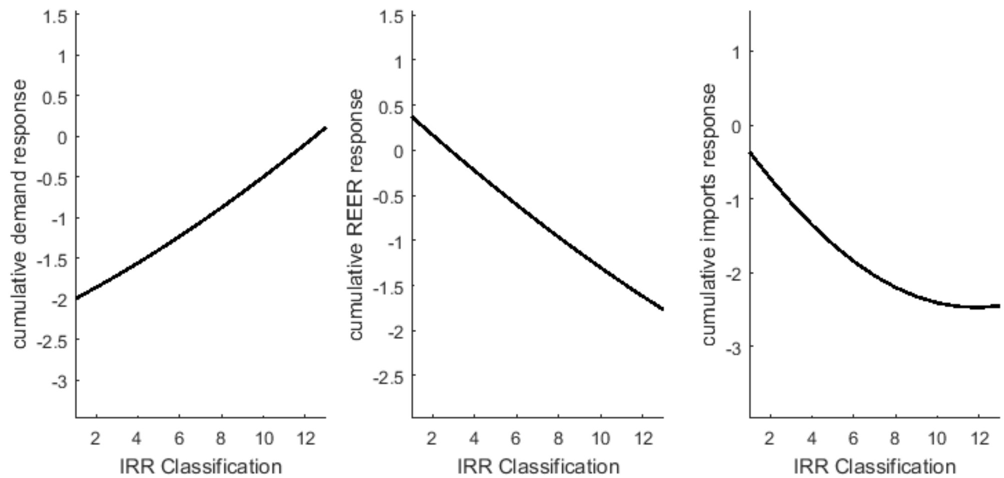


**Figure 2.** Cumulative response in the fifth year of domestic demand, relative prices, and real imports to a ten percent terms-of-shock, as a function of the exchange rate regime classification.

## VI. Robustness checks

Liability dollarization and low exchange-rate pass-through have been put forward as factors limiting the role the exchange rate as shock absorber to real shocks.[17] In an economy with high levels of foreign currency denominated debt, a depreciation would likely increase domestic leverage, which in turn puts upward pressure on borrowing costs, dampens investment, and weighs in domestic demand. At the same time, a low exchange-rate pass-through would prevent the occurrence of expenditure switching effects. If there is an incomplete exchange rate pass-through to the price of imported goods at the border, the relative price of domestic and imported goods would remain unaltered.[18] Finally, a large degree of exchange-rate pass-through to domestic prices could also hinder the expenditure-switching effect to kick in, as the increase in relative prices would offset the nominal depreciation, dampening the response of the real exchange rate. To test the robustness of the main findings presented above to these factors, the responses from the PVAR will be allowed to vary with the degree of liability dollarization and exchange-rate pass-through. As a benchmark, these variables are evaluated at a lower (20$^{th}$) percentile and a higher (80$^{th}$) percentile value.

[17]See Magud (2004 and 2010) and Towbin and Weber (2013) and the references therein.

[18] Gopinath (2015) has shown that pass-through to import prices is far from complete in the United States. On the other hand, Carrière-Swallow and others (2016) estimate that the exchange rate pass-through to import prices is close to complete in a large sample of advanced and emerging market economies.

## 1. *The role of foreign currency debt*

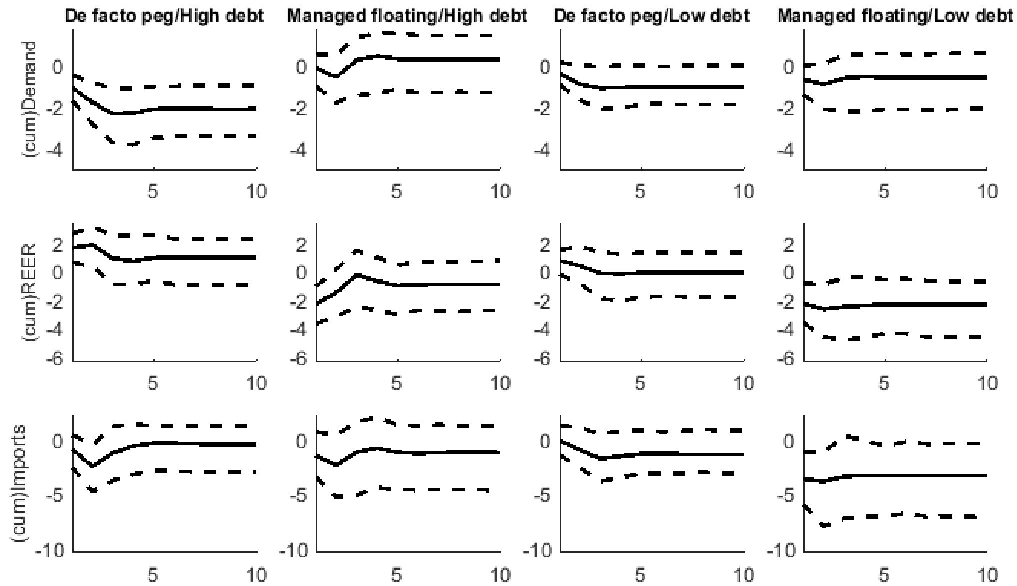


**Figure 3.** Cumulative response of domestic demand, relative prices, and real imports to a ten percent terms-of-trade shock as a function of the exchange rate regime classification and short-term external debt levels.

The degree of liability dollarization is captured by the ratio of short-term external debt to total reserves. This indicator is not available for advanced economies; hence this exercise is also a robustness test to check the sensitivity of the above findings to emerging and developing countries—which in turn are the ones potentially more exposed to currency mismatches. Figure 3 shows the response of the endogenous variables in the PVAR under different exchange rate regimes conditional on the degree of foreign currency indebtedness. Expenditure switching effects are still sizable in flexible exchange rate regimes. On impact, currencies depreciate by around 2.5 percent, but the medium-term reduction in relative prices is significantly larger in low debt economies under the floating arrangement. Possibly owing to lower currency mismatches, there is thus less "fear of floating."

Economies under pegs, however, face a real appreciation of their currencies, especially for those economies with high debt. Flexible exchange rates insulate better domestic demand if foreign debt is high: In the fifth year, the demand response under a float is not statistically significant, while demand has declined by more than 2 percent under pegs. The result of a smaller demand response under a float no longer holds for low foreign currency debt. However, due to the strong adjustment through relative prices, the reduction in imports is substantially larger for the low debt economies under a float (almost 2.5 times larger). This means that for broadly the same amount of demand compression, exchange rate flexibility allowed for a faster process of external adjustment. This is in line with the findings of Ghosh and others (2010) and Eguren Martin (2016), who document that flexible exchange rate regimes are associated with faster reversion of moderate current account imbalances.

**Table 2**
Responses to a negative ten percent terms-of-trade shock, conditional on short-term external debt and exchange rate regime

| | High debt | | | Low debt | | |
|---|---|---|---|---|---|---|
| | De Facto Peg | Managed Floating | Difference | De Facto Peg | Managed Floating | Difference |
| Domestic Demand | | | | | | |
| 1st year | -1.12*** | -0.20 | -0.92** | -0.46* | -0.77** | 0.31* |
| 3rd year | -2.46*** | 0.20 | -2.66*** | -1.18* | -0.70 | -0.48 |
| 5th year | -2.22*** | 0.26 | -2.48*** | -1.12* | -0.66* | -0.46 |
| REER | | | | | | |
| 1st year | 1.66*** | -2.43*** | 4.09*** | 0.73* | -2.41*** | 3.14*** |
| 3rd year | 0.87* | -0.31 | 1.18* | -0.18 | -2.60*** | 2.42** |
| 5th year | 0.92 | -1.10* | 2.02* | -0.16 | -2.47*** | 2.31** |
| Imports | | | | | | |
| 1st year | -0.98* | -1.51* | 0.53 | -0.14 | -3.80*** | 3.66*** |
| 3rd year | -1.35* | -1.24 | -0.11 | -1.87* | -3.56** | 1.69* |
| 5th year | -0.41 | -1.28 | 0.87 | -1.42* | -3.50*** | 2.08** |

*, **, *** indicate that the difference is non-zero in at least 68, 90, and 95% of the bootstrap simulations.

Pairwise comparisons of the impulse response functions to terms-of-trade shocks indicate a significant difference between *de facto pegs* and *managed floating* regimes when foreign currency debt is high, but not if it is low (Table 2). However, for the latter, the differences in the responses of the real effective exchange rate and real imports are significantly different, showing the relative strength of expenditure-switching effects in these economies. These results point towards the dominance of expenditure-switching effects over possible side effects from currency mismatches in economies with flexible exchange rate regimes following a real external shock.

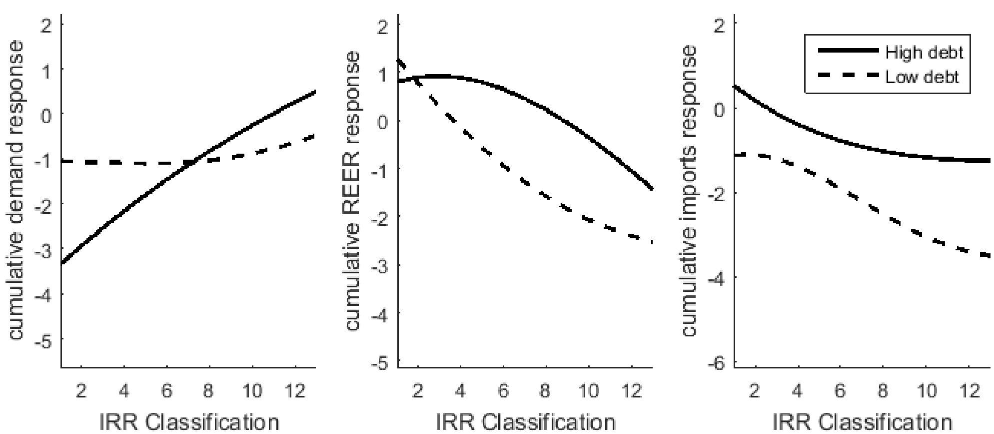


**Figure 4.** Cumulative response in the fifth year of domestic demand, relative prices, and real imports to a ten percent terms-of-shock, as a function of the exchange rate regime classification and short-term external debt levels.

Figure 4 presents the simulations of the accumulated responses to the terms-of-trade shock for the entire spectrum of the IRR exchange rate regime classification, splitting between high and low debt economies. Real currency depreciation increases with the degree of nominal exchange rate flexibility, though no longer in a monotonic fashion for high debt countries. Despite the similar response of domestic demand across different exchange rate regimes for low debt economies, the reduction in relative prices allows for a faster external adjustment process for economies under more flexible arrangements. The potentially lower presence of detrimental effects in low debt economies is conducive for larger expenditure-switching effects, evidenced by the larger depreciation and subsequent reduction in the level of real imports. Although the benefits of exchange rate flexibility are diminished in economies with high liability dollarization compared to the other scenarios (as in Magud 2010), the burden of adjustment on domestic demand continues to be larger in less flexible economies.

*2. The role of import structure*

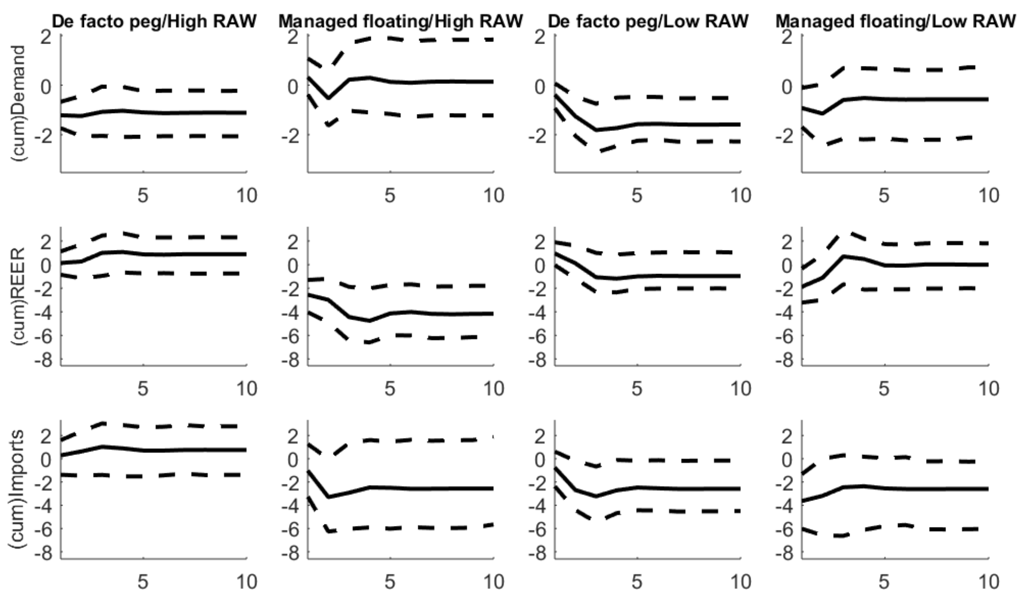


**Figure 5.** Cumulative response of domestic demand, relative prices, and real imports to a ten percent terms-of-trade shock as a function of the exchange rate regime classification and import composition.

This section looks at the role of import structure in limiting expenditure switching effects. The exercise assumes that a higher share of raw materials in total imports is associated with a larger exchange rate pass-through to domestic prices. Figure 5 shows the response of domestic demand, relative prices, and real imports in economies with a high and a low share of raw materials in total imports. In line with the theoretical predictions of the literature, expenditure-switching effects are stronger in economies under a flexible exchange rate arrangement and a high share of raw materials in total imports (Table 3). With a high share of raw materials and therefore a high exchange-rate pass-through, flexible exchange rates allow for a significant change in relative prices. This in turn allows consumers in these economies to substitute away from imported to domestic goods, lowering the burden of adjustment on domestic demand (i.e., expenditure changing effects). Despite the external shock not having significant effects on domestic demand, the contraction in real imports is larger than in pegs with a similar import structure.

The benefits of exchange rate flexibility are somewhat lower if the exchange-rate pass-though is low, as relative prices respond less to the depreciation; but the cost of adjustment is still lower than in economies with a low exchange-rate pass-through *and* that lack exchange rate flexibility.[19] While on impact the reduction in domestic demand is larger for countries with a *managed floating* arrangement, the medium-term effects of the shock on demand are negligible while for pegs strengthen and become more significant. On impact, economies under a float still experience a significant depreciation, albeit smaller than the depreciation experienced by floats with a high share of raw material. This depreciation, combined with the reduction in domestic demand, cause real imports to decline significantly, almost three times as much as economies with a *de facto peg* or floaters with a high exchange-rate pass-through.

**Table 3**
Responses to a negative ten percent terms-of-trade shock, conditional on import composition and exchange rate regime

| | High RAW | | | Low RAW | | |
|---|---|---|---|---|---|---|
| | De Facto Peg | Managed Floating | Difference | De Facto Peg | Managed Floating | Difference |
| Domestic Demand | | | | | | |
| 1st year | -1.21*** | -0.33 | -0.88*** | -0.39* | -0.92*** | 0.53* |
| 3rd year | -1.07** | 0.22 | -1.29** | -1.81*** | -0.60 | -1.29* |
| 5th year | -1.10** | 0.13 | -1.23** | -1.57*** | -0.57 | -1.00* |
| REER | | | | | | |
| 1st year | 0.14 | -2.55*** | 2.69*** | 0.95 | -1.87*** | 2.82*** |
| 3rd year | 1.02 | -4.44*** | 5.46*** | -1.07 | 0.69 | -1.76* |
| 5th year | 0.87 | -4.13*** | 5.00*** | -1.00 | -0.07 | -0.93 |
| Imports | | | | | | |
| 1st year | 0.30 | -1.02 | 1.32* | -0.75 | -3.63*** | 2.88*** |
| 3rd year | 1.03 | -2.92* | 3.95* | -3.23** | -2.45 | -0.78 |
| 5th year | 0.71 | -2.49 | 3.20* | -2.47** | -2.54* | 0.07 |

*, **, *** indicate that the difference is non-zero in at least 68, 90, and 95% of the bootstrap simulations.

As with foreign currency debt, simulations of the cumulative responses of the model's endogenous variables to the terms-of-trade shocks are constructed at different levels of exchange rate flexibility. Figure 6 shows the accumulated response of demand, relative prices, and imports in the fifth year for the entire spectrum of the IRR exchange rate arrangements. Consistent with theoretical underpinnings, expenditure-switching effects and the insulation ability of floats increase with the raw material share. While weak in the medium-term, expenditure-switching effects are significant for floats immediately after the shock, allowing for a smaller contraction in domestic demand in the fifth year (as compared to pegs with low exchange-rate pass-through). However, the external adjustment of external imbalances is similar for economies with the most flexible exchange rate arrangements regardless of import structure and for pegs with a low import content of raw materials.

[19] Having lower second round effects of depreciations on overall inflation could assuage the policymakers' "fear of floating," hence allowing nominal depreciations to translate into real depreciations and a considerable reduction of imports. As explained in Carrière-Swallow and others (2016) while the pass-through from depreciations to import prices are usually complete, second-round effects to domestic prices have declined substantially in recent years as monetary policy frameworks have become stronger and more credible.

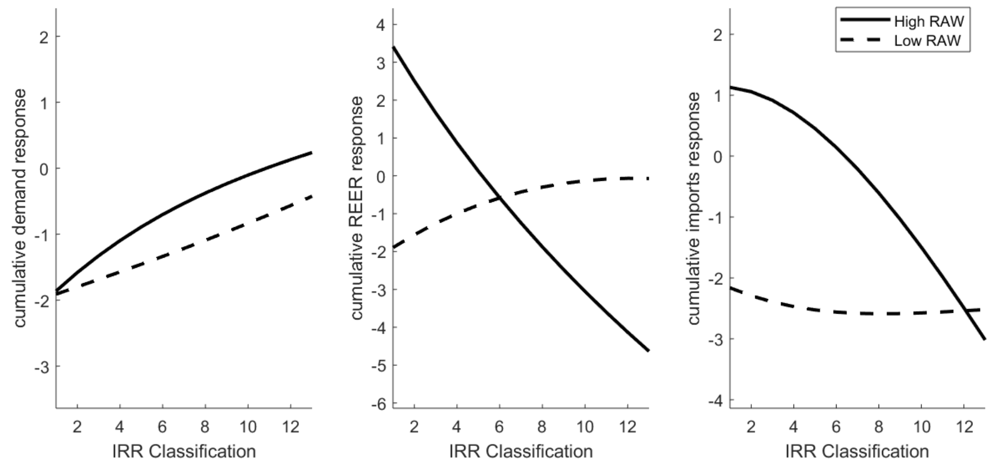


**Figure 6.** Cumulative response in the fifth year of domestic demand, relative prices, and real imports to a ten percent terms-of-shock, as a function of the exchange rate regime classification and import composition.

## VII. Conclusion

In principle, in the presence of real external shocks, an economy with a sizable expenditure-switching effect would benefit from a flexible exchange rate regime, as nominal exchange rate changes would allow the adjustment of relative prices of goods across countries. Hence, countries with more flexible exchange rate arrangements would exhibit a stronger expenditure effect following a real external shock. This paper provides empirical evidence that in practice, exchange rate flexibility does allow for significant adjustment in relative prices, lowering the burden of adjustment on domestic demand and complementing expenditure-changing effects for a faster and more durable external adjustment process following a real external shock.

The key role of exchange rate flexibility as a shock absorber and in facilitating external adjustment has been widely pointed out in the existing literature. However, the role of exchange rate flexibility in attenuating income effects during the adjustment process to real shocks has been given relatively little attention. The contribution of this paper is to provide an empirical measure capable of capturing the relative importance of the expenditure switching effect, and showing how this measure varies with the degree of exchange rate flexibility.

Previous studies have discussed the importance of accounting for differences in the frictions or economic structure that influence the response of real variables to real shocks. In particular, the role of currency mismatches and limited exchange-rate pass-through have been identified as limits of floating exchange rates in insulating output. This paper documents that, while these factors indeed weaken the capabilities of exchange rates in absorbing real shocks, the expansionary expenditure-switching effect is still significant and tends to dominate balance sheet effects and potential deleterious effects from currency mismatches.

# Appendix

**Table A.1**
Country sample

| | | |
|---|---|---|
| Albania | Georgia | Norway |
| Algeria | Ghana | Oman |
| Argentina | Greece | Pakistan |
| Australia | Guatemala | Panama |
| Austria | Honduras | Paraguay |
| Azerbaijan | Hong Kong SAR | Peru |
| Bangladesh | Hungary | Philippines |
| Belarus | India | Poland |
| Belgium | Indonesia | Portugal |
| Benin | Iran | Romania |
| Bolivia | Ireland | Russia |
| Botswana | Israel | Saudi Arabia |
| Brazil | Jordan | Senegal |
| Bulgaria | Kazakhstan | Singapore |
| Burkina Faso | Kenya | Slovak Republic |
| Cambodia | Korea | South Africa |
| Cameroon | Kuwait | Spain |
| Canada | Kyrgyz Republic | Sri Lanka |
| Chad | Latvia | Sweden |
| Chile | Lebanon | Switzerland |
| Colombia | Lithuania | Syria |
| Costa Rica | Macedonia, FYR | Tajikistan |
| Côte d'Ivoire | Malaysia | Tanzania |
| Croatia | Mali | Thailand |
| Czech Republic | Mauritania | Trinidad and Tobago |
| Denmark | Mauritius | Tunisia |
| Dominican Republic | Mexico | Turkey |
| Ecuador | Moldova | Ukraine |
| Egypt | Moldova | United Arab Emirates |
| El Salvador | Morocco | Uruguay |
| Equatorial Guinea | Netherlands | Venezuela |
| Estonia | New Zealand | Vietnam |
| Finland | Nicaragua | Zambia |
| Gabon | Nigeria | |

**A CONCEPTUAL MODEL**

To illustrate the logic in the empirical analysis above, this appendix presents an extremely simple, real, static model to emphasize the impact of the income effect on aggregate demand, that is to weigh expenditure-switching and expenditure-changing effects.

## A. Supply Side

Suppose an economy that produces two goods: nontradable goods, *N*, and home tradable goods, *H*, in a perfect competition environment, so that in equilibrium firms earn zero profits. Without loss of generality, assume an increasing and concave production function for nontradable goods, using labor (which is supplied inelastically) as the only input in production; namely:

$$y_t^N = g\left(L_t^N\right); \qquad g'(\bullet) > 0; \qquad g''(\bullet) < 0 \tag{1}$$

The production function of *H* goods uses labor and imports, *M*, to produce (which, for example, could be considered as either foreign capital or foreign inputs not available in the domestic economy,). It is given by:

$$y_t^H = f\left(L_t^H; M_t\right); \qquad f_L > 0; \qquad f_M > 0; \qquad f_{LL} < 0; \qquad f_{MM} < 0 \tag{2}$$

implying an increasing marginal product of each factor, at a decreasing rate. Owing to perfect competition and taking as given prices of goods and services and factors of production, optimally,

$$\frac{f_L}{f_M} = \frac{w}{p^M} \tag{3}$$

for the *H* good and $P^N g_L = w$ in the *N* sector. The marginal rate of transformation equals factors' relative price. Domestic Demand

Regarding domestic demand, assume a standard well-behaved concave utility function, in which the representative agent derives utility from consuming nontradable goods, $c^N$, home goods, $c^H$, and imports, $c^M$. Labor income is the only source of income to the representative consumer. Thus, the agent's optimization problem is given by

$$\max_{c^N, c^H, c^M} \quad u\left(c^N; c^H; c^M\right) \tag{4}$$

subject to the budget constraint

$$wL = p^N c^N + p^H c^H + p^M c^M; \qquad L = L_N + L_H \tag{5}$$

In equilibrium, the marginal rate of substitution between each type of good needs to equal the relative price, namely

$$\frac{u_M}{u_N} = \frac{p_M}{p_N}; \qquad \frac{u_M}{u_H} = \frac{p_M}{p_H}; \qquad \frac{u_H}{u_N} = \frac{p_H}{p_N} \tag{6}$$

## B. Market Clearing Conditions

Nontradable goods, by definition, exhaust production: $c^N = y^N$. Home goods can be either consumed by domestic residents, or exported. Given demand for export, $X$:

$$y^H = c^H + X \tag{7}$$

where the trade balance is $p^H X = p^M \left(c^M + M\right)$.

For inelastically supplied imports, $M^S$, the equilibrium implies $M^S = M + c^M$. The demand for exports is an decreasing function of the relative price of home goods (tradable goods produced abroad vs. home tradables, $p^M/p^H$, i.e., $X = X\left(p^M / p^H\right)$; with $X' > 0$.[20] Lastly, the price of imports $p^M$ is exogenously set in international markets.

## C. Response to a real depreciation

A real depreciation (which could be, for example, the equilibrium response to a negative income shock, or in a model with credit a capital outflows shocks) implies a higher relative price of imports, which is tantamount to a lower relative price for exports, i.e. a higher $p^M/p^H$. This is as a deterioration of the terms of trade. Thus, it represents a decrease in the purchasing power of home goods to acquire imports (more generally, with a continuum of Dixit-Stiglitz aggregators, a reduction in the purchasing power of the domestic basket of goods, i.e, a real depreciation). This increase in the relative price of the small open economy's imports, $p^M/p^H$, can be represented by an increase in the price of imports, $\Delta p^M > 0$, holding the price of home goods constant $\Delta p^H = 0$.

For the representative firm producing home goods, the degree of substitutability between its factors of production is key. If its production function is of the *Leontieff* type, with given

[20] Other factors could affect export demand, such as foreign income. Thus, the model is conditional on those other potential factors.

constant proportions of factors of production (i.e., with no substitutability of factors of production), the change in relative prices between imports and home goods requires lower wages in equilibrium. In this case optimality condition (3) can be specified as:

$$p^H = a_{HL} w + a_{HM} p^M \tag{8}$$

where $a_{ij}$ is the contribution of factor *j* to produce good *i*. Given the change in relative prices $\Delta p^M > 0$, $\Delta p^H = 0$, then (8) can be expressed as

$0 = a_{HL} \Delta w + a_{HM} \Delta p^M$, which results in $\Delta w = -\frac{a_{HM}}{a_{HL}} \Delta p^M \Rightarrow \Delta w < 0$.

The above shows that for this specific production function, the constant coefficient implies that to be able to produce at the new exogenous price, when firms face higher prices for their imports, in equilibrium they need to pay lower wage rates. In fact, the constant coefficient technology implies that higher import prices reduce the demand for imports, which in turn requires a decrease in the demand for labor. The latter, in equilibrium, decreases the inelastically supplied wages. In turn, this results in a negative income effect for consumers.

Having more flexibility in the production function in terms of combinations of imports and labor would reduce the use of imports and increase the use of labor along any isoquant. In the latter production function, however, for labor demand to increase, in equilibrium, wages need to decrease given the constant marginal rate of substitution, as shown in (3). Only in the limit, as $\lim_{M \to 0} f_L = \infty \Rightarrow \Delta w = 0$, which implies that as imports tend to zero the marginal product of imports tends towards infinity, wages remain constant (see more below).

For the consumer, the relative price change results in a change in the composition of her consumption basket. As the marginal utility of consuming imports increases with respect to the marginal utility of home and nontradable goods, the relative consumption of home and nontradable goods increase in terms of imports (see (6) above).

Moreover, the reduction in income (owing to the lower *w*) decreases the absolute consumption of all the consumption basket, regardless of the change in the composition of the latter. Given the market clearing condition for nontradable goods, the fall in demand for nontradable goods reduces the price of nontradable goods, $\Delta p^N < 0$, decreasing nontradable goods production.

The above, on the back of the fact that the absolute price of home goods is held constant, implies a lower relative price of nontradable goods. In turn, the latter results in a higher rate of marginal utility for home goods relative to nontradable goods (6), thus an increase in $c^N$ with respect to $c^H$. Overall, therefore, the effect of a real depreciation (weaker terms of trade) results in a lower level of aggregate domestic consumption, with a change in the composition of consumption, the latter implying a relative increase in the consumption of nontradable goods with respect to imports and home tradable goods, while home tradable goods increase relative to imports:

$$\Delta c < 0 \text{, with } \Delta c_N > \Delta c_H = 0 > \Delta c_M \tag{11}$$

In sum, one the one hand, the real depreciation lowers domestic demand. This negative income effect reduces output. On the other hand, however, owing to the real depreciation, external demand for home goods, i.e., exports increase. The latter, on the back of the increase in the demand for home and nontradable goods relative to imports (the change in the basket of consumption composition), is commonly referred to as the expenditure-switching effect. In turn, the expenditure-switching effect would improve the trade balance owing to an increase in foreign demand (for which domestic goods become cheaper) on the back if the reduction in imports due to the negative income effect. On balance, if the reduction in domestic demand resulting from the negative income effect is large enough, despite the improvement in the trade balance, domestic demand and real GDP will be lower. In the end, however, the overall impact on domestic activity hinges on which of these two effects dominate.

In other words, if the income effect dominates the substitution effect in the case of factors of production being perfect complements (as in the Leontieff constant proportions production function), a real depreciation results in lower domestic demand and output in the small open economy. The effect on the latter is stronger than on the former owing to the expenditure switching effect.

The above results also hold for a constant-returns to scale Cobb-Douglas production function $(y^H = L^{\alpha} M^{1-\alpha})$. It can be easily shown that the impact of a real depreciation $(\Delta p^M > 0$, $\Delta p^H = 0)$ has ambiguous effects on the production of home goods. Namely, given marginal product of labor and imports, $f_L = \frac{\alpha y^H}{L}$; $f_M = \frac{(1-\alpha) y^H}{M}$, and the optimality condition, then $M = \frac{(1-\alpha) wL}{\alpha p_M}$. Plugging the latter into the production function and taking the partial derivative with respect to $p^M$, after some manipulation, results in:

$$\frac{\partial y^H}{\partial p_M} = \left( \frac{1-\alpha}{\alpha} \frac{w}{p_M} \right)^{1-\alpha} \left[ -\frac{(1-\alpha)}{p_M} + \frac{\partial L}{\partial p_M} \right] \tag{12}$$

Given that $\partial L / \partial p_M > 0$, then $\dfrac{\partial y^H}{\partial p_M}$ is ambiguous. Moreover, the optimality condition for this production function implies $\dfrac{\alpha}{1-\alpha}\dfrac{M}{L} = \dfrac{w}{p_M}$. Plugging $L$ from the latter into $\partial L / \partial p_M$ results in $\partial L / \partial p_M = \dfrac{\alpha}{1-\alpha}\dfrac{M}{w} > 0$.

These results still imply that the overall effect on domestic output is ambiguous. Yet, it is always negative in terms of domestic demand.

In the case of a linear production function, with perfect substitutability of factors of production, corner solutions can arise. If the production function is given by $y^H = aL + bM$, the marginal product of labor equals $a$ and the marginal product of imports equals $b$. The marginal rate of substitution is $f_L/f_M=a/b$. Maximizing profits implies either producing using any combination of $(M,L)$ if and only if $a/b=w/p_M$, or corner solutions with only $M$ or only $L$ as the factor of production. In either case, the level of production of home goods remains unaltered. To the extent that export increase in response to the terms of trade shock, overall output could increase.

Adding the financial account balance to trade balance, higher U.S. interest rates (which are typically observed along with real depreciation in emerging market economies) would have an additional impact, reinforcing the above-mentioned effects. Higher U.S. real interest rates would trigger capital flows from emerging markets to the United States., depreciating EME's real exchange rates, i.e., a making nontradable goods cheaper (and imports more expensive not only with respect to nontradable goods, but also relative to home goods). This would amplify the results presented above. Adding a credit market in which firms borrow to invest enlarges the impact of capital flows. For instance, a real depreciation owing to capital outflows from emerging markets would likely cause a credit squeeze, which dampens economic activity, especially if the economy has currency mismatches. For the effects on credit and economic activity during capital inflow booms and capital flow reversals see Magud and others (2014) and Magud and Vesperoni (2015), respectively.

In turn, the impact of a terms-of-trade shock on domestic demand hinges on the flexibility of the exchange rate regime. Adler and others (2017) document that, historically, persistent negative terms-of-trade shocks are accompanied by real depreciation and external current account adjustment. Of the latter, most of adjustment in the trade balance is driven by import compression rather than export expansions. The latter speaks to the limited traction of the expenditure-switching effect which, on the back of the negative income shock, tilts the burden of the adjustment on domestic demand, reflected in a sharp reduction in the import volume. The less flexible the exchange rate regime is, the stronger the deflationary recession needed to adjust to the new real exchange rate—consistent with the weaker terms of trade. Exchange rate flexibility, on the contrary, generates inflationary pressures—the degree of which is conditional on the degree of exchange rate pass-through to domestic prices and the share of import content of each country.[21] At the same time, more flexibility strengthens the expenditure-switching effect, which has been shown to be very limited (see Adler and others, 2017, and IMF, 2017). A stronger expenditure-switching effect that increases output mitigates the impact of the income effect, resulting in a smaller reduction in domestic demand being needed to reach any level of external adjustment. Thus, the sacrifice in terms of domestic demand (and import) compression required to absorb the shock decreases in the degree of exchange rate flexibility, as we show below.

[21] See Carriere-Swallow and others (2017) for recent estimations of exchange rate pass-through, showing that despite higher import shares, which have an exchange rate pass-through to imports close to one, aggregate price exchange rate pass-through has been diminishing on the back of stronger monetary policy credibility.

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