Online Appendix
Terms-of-Trade Shocks are Not all Alike

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Abstract

This is an online Appendix for "Terms of Trade Shocks are Not all Alike" by Di Pace, Juvenal, and Petrella. Appendix A includes an extension of a small open economy model which features independent export and import price shocks. Appendix B describes the macroeconomic and commodity data sources, while Appendix C presents additional descriptive statistics. Appendix D details the derivation of impulse responses (IRFs) and forecast error variance decomposition (FEVD) for the empirical model. The construction of narrative series of exogenous price shocks is detailed in Appendix E. The empirical evidence on global demand and supply shocks is presented in Appendix F. Appendix G includes the cross-country and group heterogeneity results. Finally, Appendix H reports robustness exercises outlined in Section 6 of the paper.

JEL Classification: F41, F44
Keywords: Terms of Trade, Commodity Prices, Business Cycles, World Shocks.

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Appendix A Export Prices and Import Prices in the Extended MXN Model

The role of the terms-of-trade shocks for the business cycle of small open economies is traditionally studied within the MXN model (see Mendoza, 1995; Schmitt-Grohé and Uribe, 2018; and Schmitt-Grohé and Uribe, 2018, Chapter 8 for a textbook treatment). The MXN model features three types of goods (importable, exportable and nontradable), produced by three different sectors. In both exportable and importable sectors, production may not be equal to domestic absorption, giving rise to imports and exports in equilibrium. The model allows for both domestic savings, through the accumulation of physical capital, and foreign savings, through the decumulation of foreign debt.

We extend the MXN model along three dimensions. First, we allow for independent export and import price shocks, $p_t^{m,\$}$ and $p_t^{x,\$}$. To do so, we assume that the LOOP holds for imports and exports rather than for tradables.[1] This modification creates a wedge between the relative price of tradables (p_t^{τ}) and the real exchange rate (q_t). Second, we assume that debt is priced in terms of foreign consumption goods instead of tradable consumption goods. Third, we relax the assumption of labor market segmentation by introducing an Armington-type aggregator. While the first and second modifications are central for analyzing import and export price shocks separately (see Section A.2), the last one is introduced for analytical convenience, as it allows us to solve for the steady state in closed form.

In this Appendix, we examine the sensitivity of key endogenous variables' responses within the extended MXN model to individual export and import price fluctuations, considering alternative parametrizations and households' preferences, which include both additively separable and non-separable utility functions. We follow Canova and Paustian (2011) proposal of using theory to obtain a set of valid IRFs under realistic calibrations of the model. This approach allows us to derive the restrictions that are robust across alternative calibrations and/or specifications of the model. This analysis highlights that: (i) shocks to export prices and import prices have heterogeneous effects on macroeconomic aggregates; (ii) the theory presented here is not informative for signing the responses of GDP, consumption, investment and the trade balance; and (iii) the real exchange rate always appreciates after positive export and import price shocks.

The structure of Appendix A is as follows. Section A.1 outlines the MXN model (and modifications). Section A.3 introduces the model's calibration. A discussion of how the impulse responses to export and import price shocks change under alternative model calibrations is shown in Section A.4. Section A.5 offers a summary of the model equations. Lastly, Section A.6 focuses on the analytical derivation of the model's steady state.

A.1 The Model

The model specification and notation follows closely the textbook treatment of the MXN in Schmitt-Grohé and Uribe (2018, Chapter 8). In this section, we will briefly outline the primary components of the model, with a particular emphasis on the modifications we have made to the standard specification.

Households. The economy is populated by a representative household that maximizes life-

[1] As we have shown in Section 2 of the paper, assuming the LOOP for exports and imports implies that, under certain conditions, the LOOP also holds for tradable goods. The reverse (i.e. assuming the LOOP for tradables) does not guarantee the LOOP holds separately in importable and importable markets.

time utility

$$\mathcal{U}_0 = \mathbb{E}_0 \sum\nolimits_{t=0}^{\infty} \beta^t U\left(c_t, h_t\right),$$

where $\mathbb{E}_t$ denotes an expectation operator using information up to time t, $U\left(c_t, h_t\right)$ is a generic period utility function, c_t aggregate consumption and h_t aggregate hours worked.

The household maximizes their lifetime utility subject to a sequence of budget constraints of the form:

$$c_t + q_t d_t + \sum_{j \in (m,x,n)} i_t^j = q_t \frac{d_{t+1}}{1+r_t} + w_t h_t + \sum_{j \in (m,x,n)} u_t^j k_t^j - \sum_{j \in (m,x,n)} \frac{\phi_j}{2}\left(k_{t+1}^j - k_t^j\right)^2, \quad \text{(A.1)}$$

where d_t denotes the stock of debt (expressed in terms of foreign consumption goods), r_t is the interest rate on debt held from period t to $t+1$, and w_t is the aggregate real wage (denominated in terms of home consumption goods). Sectoral investment and capital stock are denoted by i_t^j and k_t^j, respectively, u_t^j is the associated rental rate of sectoral capital, and $\frac{\phi_j}{2}\left(k_{t+1}^j - k_t^j\right)^2$ is a sector-specific capital adjustment cost. The interest rate paid on debt is given by:

$$r_t = r^* + s + \psi\left(e^{d_{t+1}-\bar{d}} - 1\right), \quad \text{(A.2)}$$

where r^* is the (constant) world real interest rate, s the steady state value of the country spread, $\bar{d}$ the steady state level of debt and $\psi\left(e^{d_{t+1}-\bar{d}} - 1\right)$ denotes the debt elastic premium, which we introduce to ensure the stationarity in the stock of debt as in Schmitt-Grohé and Uribe (2003).[2]

An important deviation from the MXN model is that debt is priced in terms of foreign consumption goods instead of tradable consumption goods. We argue that this assumption is realistic given that external debt in emerging and developing economies is largely denominated in foreign currency, particularly in U.S. dollars, rather than in domestic currency. As explained in Section 2 of the paper, this is a key assumption to allow for terms-of-trade shocks not to be all alike.

Sector-specific capital stock accumulates according to the following law of motion:

$$k_{t+1}^j = i_t^j + (1-\delta) k_t^j \quad \text{for} \quad j = \{m, x, n\}, \quad \text{(A.3)}$$

where δ is the depreciation rate of physical capital.

The first order conditions are:

$$\begin{aligned} \lambda_t &= U_c\left(c_t, h_t\right), && \text{(A.4)} \\ \lambda_t w_t &= U_h\left(c_t, h_t\right), && \text{(A.5)} \\ \lambda_t\left[1 + \phi_j\left(k_{t+1}^j - k_t^j\right)\right] &= \beta \mathbb{E}_t \lambda_{t+1}\left[(1-\delta) + \phi_j\left(k_{t+2}^j - k_{t+1}^j\right) + u_{t+1}^j\right], && \text{(A.6)} \\ \lambda_t q_t &= \beta\left(1 + r_t\right) \mathbb{E}_t \lambda_{t+1} q_{t+1}. && \text{(A.7)} \end{aligned}$$

where λ_t is a Lagrange multiplier associated with equation (A.1). Note that the Euler equation with respect to debt, equation (A.7), is different from the standard MXN model.

The household chooses (intra-temporally) how much labor to supply to each sector by maxi-

[2] From now on, a variable without a time subscript will denote its steady state value.

mizing labor income, $\sum_{j\in(m,x,n)} w_t^j h_t^j$, subject to the labor aggregator, as in Horvath (2000):

$$h_t = \left[(\gamma_m)^{-\frac{1}{\kappa}} \left(h_t^m\right)^{\frac{1+\kappa}{\kappa}} + (\gamma_x)^{-\frac{1}{\kappa}} \left(h_t^x\right)^{\frac{1+\kappa}{\kappa}} + (\gamma_n)^{-\frac{1}{\kappa}} \left(h_t^n\right)^{\frac{1+\kappa}{\kappa}}\right]^{\frac{\kappa}{1+\kappa}}, \tag{A.8}$$

where w_t^j is a sectoral real wage (denominated in terms of home consumption goods) and h_t^j hours supplied in sector j, with $j = \{m, x, n\}$. γ_m, γ_x and γ_n are the shares of labor supplied to each sector (with $\gamma_m + \gamma_x + \gamma_n = 1$) and κ is a parameter controlling the degree of mobility of labor. When $\kappa = 0$, labor is prevented from moving across sectors. As $\kappa \to \infty$, at the margin, all sectors pay the same wage and perfect labor mobility is attained. For $\kappa < \infty$ hours worked are no longer perfect substitutes. An interpretation is that workers have a preference for diversity of labor and would choose to work closer to an equal number of hours in each sector, even in the presence of wage differentials.[3] The first order conditions of this problem are therefore:

$$w_t^j = w_t \left(\frac{h_t^j}{\gamma_j h_t}\right)^{\frac{1}{\kappa}} \quad \text{for} \quad j = \{m, x, n\}. \tag{A.9}$$

Firms Producing Final Goods. Final goods are produced using nontradable goods and a composite of tradable goods via the following technology:

$$a_t = \left[\chi_\tau^{\frac{1}{\mu_{\tau n}}} \left(a_t^\tau\right)^{1-\frac{1}{\mu_{\tau n}}} + (1-\chi_\tau)^{\frac{1}{\mu_{\tau n}}} \left(a_t^n\right)^{1-\frac{1}{\mu_{\tau n}}}\right]^{\frac{1}{1-\frac{1}{\mu_{\tau n}}}}, \tag{A.10}$$

where a_t denotes domestic aggregate absorption, a_t^τ domestic absorption of the tradable composite, a_t^n domestic nontradable absorption, $\mu_{\tau n}$ the elasticity of substitution between tradable and nontradable goods and χ_τ the tradable share in aggregate absorption. Final goods are sold to households, which then allocate them to consumption and investment purposes. Final good producers behave competitively. Profits are given by $a_t - p_t^\tau a_t^\tau - p_t^n a_t^n$, where p_t^τ and p_t^n are the relative price of tradable and nontradable goods in terms of home consumption goods, respectively. The first order conditions are:

$$p_t^\tau = \chi_\tau^{\frac{1}{\mu_{\tau n}}} \left(\frac{a_t^\tau}{a_t}\right)^{-\frac{1}{\mu_{\tau n}}} \quad \text{and} \quad p_t^n = (1-\chi_\tau)^{\frac{1}{\mu_{\tau n}}} \left(\frac{a_t^n}{a_t}\right)^{-\frac{1}{\mu_{\tau n}}}. \tag{A.11}$$

These expressions define the domestic demand functions for tradable and nontradable composite goods.

Firms Producing the Tradable Composite Goods. The tradable composite goods are produced combining importable and exportable goods as intermediate inputs via the following technology:

$$a_t^\tau = \left[\chi_m^{\frac{1}{\mu_{mx}}} \left(a_t^m\right)^{1-\frac{1}{\mu_{mx}}} + (1-\chi_m)^{\frac{1}{\mu_{mx}}} \left(a_t^x\right)^{1-\frac{1}{\mu_{mx}}}\right]^{\frac{1}{1-\frac{1}{\mu_{mx}}}}, \tag{A.12}$$

where a_t^m and a_t^x are the domestic absorption of importable and exportable goods, respectively. Here, χ_m is the share of importable goods in the tradable composite and μ_{mx} the elasticity of substitution between importable and exportable goods. Profits are given by $p_t^\tau a_t^\tau - p_t^m a_t^m - p_t^x a_t^x$, where p_t^m denotes the relative price of importable goods in terms of

[3] Labor market frictions are neutralized in the steady state, and the inefficiency associated with sectoral wage discrepancies is only temporary. This complementarity across labor types can help generating comovement between macro aggregates to export and import price shocks.

home consumption goods and p_t^x the relative price of exportable goods in terms of home consumption goods. Firms behave competitively. The first order conditions are:

$$\frac{p_t^m}{p_t^\tau} = \chi_m^{\frac{1}{\mu_{mx}}} \left(\frac{a_t^m}{a_t^\tau}\right)^{-\frac{1}{\mu_{mx}}} \quad \text{and} \quad \frac{p_t^x}{p_t^\tau} = (1-\chi_m)^{\frac{1}{\mu_{mx}}} \left(\frac{a_t^x}{a_t^\tau}\right)^{-\frac{1}{\mu_{mx}}}. \tag{A.13}$$

These two expressions represent the demand functions for importable and exportable goods.

Firms Producing Importable, Exportable, and Nontradable Goods. Importable, exportable, and nontradable goods are produced combining capital and labor via the following technology:

$$y_t^j = z_j \left(k_t^j\right)^{\alpha_j} \left(h_t^j\right)^{1-\alpha_j} \quad \text{for} \quad j = \{m, x, n\}, \tag{A.14}$$

where y_t^j is output in sector j, k_t^j sectoral capital services, h_t^j sectoral hours worked, α_j the capital share in sector j and z_j the level of sectoral technology. Profits of firms producing exportable, importable and nontradable goods are given by:

$$p_t^j z_j \left(k_t^j\right)^{\alpha_j} \left(h_t^j\right)^{1-\alpha_j} - w_t^j h_t^j - u_t^j k_t^j \quad \text{for} \quad j = \{m, x, n\}. \tag{A.15}$$

Firms behave competitively. The first order profit maximizing conditions are:

$$u_t^j = p_t^j \alpha_j z_j \left(\frac{k_t^j}{h_t^j}\right)^{\alpha_j - 1} \quad \text{and} \quad w_t^j = p_t^j (1-\alpha_j) z_j \left(\frac{k_t^j}{h_t^j}\right)^{\alpha_j}. \tag{A.16}$$

Competitive Equilibrium. In equilibrium the demand for final goods must be equal their supply:

$$a_t = i_t + c_t + \frac{\phi_m}{2}\left(k_{t+1}^m - k_t^m\right)^2 + \frac{\phi_x}{2}\left(k_{t+1}^x - k_t^x\right)^2 + \frac{\phi_n}{2}\left(k_{t+1}^n - k_t^n\right)^2. \tag{A.17}$$

The demand for nontradable goods must be equal to the production of nontradable goods:

$$y_t^n = a_t^n. \tag{A.18}$$

As foreign debt is expressed in terms of foreign consumption goods, the only market clearing condition that differs from the standard MXN model is the evolution of the current account:

$$\frac{q_t d_{t+1}}{1+r_t} - q_t d_t = p_t^m m_t - p_t^x x_t, \tag{A.19}$$

where m_t and x_t denote imports and exports quantities, and are given by:

$$m_t = a_t^m - y_t^m \tag{A.20}$$

and

$$x_t = y_t^x - a_t^x. \tag{A.21}$$

Aggregate output is defined as:

$$y_t = p_t^m y_t^m + p_t^x y_t^x + p_t^n y_t^n, \tag{A.22}$$

and aggregate investment as:

$$i_t = i_t^m + i_t^x + i_t^n. \tag{A.23}$$

The Law of One Price and the Terms of Trade. In order to close the model, we assume full pass-through from world prices to domestic export and import prices. Therefore, the LOOP holds separately for export and imports prices,

$$p_t^{x,\$} = \frac{p_t^x}{q_t} \tag{A.24}$$

and

$$p_t^{m,\$} = \frac{p_t^m}{q_t}. \tag{A.25}$$

We define the terms of trade (ToT) as the ratio between export and import prices,

$$ToT_t = \frac{p_t^{x,\$}}{p_t^{m,\$}}. \tag{A.26}$$

As argued in Section 2 of the main text, $p_t^{x,\$}$ and $p_t^{m,\$}$ are themselves terms-of-trade measures. For simplicity, we assume that $p_t^{x,\$}$ and $p_t^{m,\$}$ follow AR(1) processes of the form:

$$\ln\left(\frac{p_t^{x,\$}}{p^{x,\$}}\right) = \rho^x \ln\left(\frac{p_{t-1}^{x,\$}}{p^{x,\$}}\right) + \varsigma^x \varepsilon_t^x \tag{A.27}$$

and

$$\ln\left(\frac{p_t^{m,\$}}{p^{m,\$}}\right) = \rho^m \ln\left(\frac{p_{t-1}^{m,\$}}{p^{m,\$}}\right) + \varsigma^m \varepsilon_t^m, \tag{A.28}$$

where ρ^x and ρ^m denote the persistence of shock processes and ς^x and ς^m the scale of the innovations to the shocks which are drawn from a standard Normal distribution.

Observables. To make a valid comparison between the model's predictions and the empirical data, it is essential to express both in the same units. However, the data used in the empirical analysis are not stated in terms of home consumption goods. Macroeconomic data from WDI such as real GDP, consumption and investment are deflated by a Paasche GDP deflator. We follow the same approach as Schmitt-Grohé and Uribe (2018) in defining the observed measures for real GDP, real consumption, real investment and the trade balance to output ratio. The observable variables are defined below in Section A.5 (see equations A.82-A.85).

A.2 The Relative Price of Tradables and the Real Exchange Rate

In this section we show that, when we allow for independent export and import price shocks (and full pass through), the relationship between the relative price of nontradable goods and the real exchange rate (RER) may not be negative. In particular, we highlight that the choice of the calibration of certain structural parameters is important for assessing the response of the RER quantitatively. These derivations extend the ones presented in Section 2.2 of the paper where, to simplify the notation, we had assumed the specific case where $\mu_{mx} = 1$.

Recall that the real exchange rate is defined as

$$q_t = \mathcal{E}_t \frac{P_t^*}{P_t}, \tag{A.29}$$

where $\mathcal{E}_t$ denotes the nominal exchange rate, and P_t^* and P_t are the aggregate consumption price indices abroad and at home, respectively. In addition, the relative price of tradables is

$$p_t^{\tau} = \left[(1-\chi_m)\left(p_t^x\right)^{1-\mu_{mx}} + \chi_m \left(p_t^m\right)^{1-\mu_{mx}} \right]^{\frac{1}{1-\mu_{mx}}} . \tag{A.30}$$

Dividing through by q_t, we get

$$\left(\frac{p_t^{\tau}}{q_t}\right)^{1-\mu_{mx}} = (1-\chi_m)\left(p_t^{x,\$}\right)^{1-\mu_{mx}} + \chi_m \left(p_t^{m,\$}\right)^{1-\mu_{mx}} . \tag{A.31}$$

This expression states that $p_t^{x,\$}$ and $p_t^{m,\$}$ shocks create a wedge between p_t^{τ} and q_t and that, all else equal, there is a negative relationship between export and import price shocks and the real exchange rate. This argument is related to Catão and Chang (2015), who argue that, by allowing for shocks to the world relative price of food, the terms of trade and the real exchange rate can move in the same direction.[4]

Since full pass through from export and import prices to their domestic counterparts is assumed in the extended MXN model, the share of tradable goods in aggregate absorption (χ_{τ}) becomes a key parameter that determines the response of the real exchange rate. First, note that the relative price of tradable goods is inversely related to the relative price of nontradable goods,

$$p_t^{\tau} = \left[\frac{1-(1-\chi_{\tau})\left(p_t^n\right)^{1-\mu_{\tau n}}}{\chi_{\tau}} \right]^{\frac{1}{1-\mu_{\tau n}}} . \tag{A.32}$$

Second, substituting for the relative price of tradable goods and rearranging, we get the following expression:

$$(1-\chi_{\tau})\left(p_t^n\right)^{1-\mu_{\tau n}} = 1-\chi_{\tau}\left[(1-\chi_m)\left(p_t^{x,\$}\right)^{1-\mu_{mx}} + \chi_m \left(p_t^{m,\$}\right)^{1-\mu_{mx}} \right]^{\frac{1-\mu_{\tau n}}{1-\mu_{mx}}} q_t^{1-\mu_{\tau n}} . \tag{A.33}$$

Log-linearizing (around the steady state values of $p^n = p^{\tau} = q = 1$) gives

$$\frac{1-\chi_{\tau}}{\chi_{\tau}} \tilde{p}_t^n = -\left[(1-\chi_m)\,\tilde{p}_t^{x,\$} + \chi_m \tilde{p}_t^{m,\$} + \tilde{q}_t \right], \tag{A.34}$$

where a tilde over the variable denotes percentage deviations of a variable from its steady state value. If there are no international price shocks, this expression indicates a negative relation between the relative price of nontradable goods and the real exchange rate. This is not necessarily the case once the economy is hit by $p_t^{x,\$}$ and $p_t^{m,\$}$ shocks; i.e. the relative price of nontradable and the exchange rate can potentially move in the same direction. Thus, the shares of importable, exportable and nontradable absorption in the respective aggregators play an important role in determining the quantitative response of the real exchange rate.

A.3 Calibration

In order to study the transmission of price of export and price of import shocks within this model, we calibrate the following structural parameters of the model: α_m, α_x, α_n, β, γ_n, γ_x, δ, κ, μ_{mx}, $\mu_{\tau n}$, ρ^x, ρ^m, σ, ϕ_m, ϕ_x, ϕ_n, χ_m, χ_{τ}, ψ, ω and $\bar{d}$. We also need to choose a

[4] Due to the assumption of full pass-through, their world relative price of food is like a $p_t^{m,\$}$ shock in our framework. With respect to Catão and Chang (2015), our framework differs along two dimensions: (i) we consider nontradable goods, and (ii) we also work under the assumption of full pass-through from world export prices to domestic export prices.

Table A.1: Model Parametrization

Parameter	Description	Value
δ	Capital depreciation	0.1
$r^* + s$	Steady state interest rate paid on debt	0.0842
s_{y_n}	Share of nontradable output	0.49
$\frac{\alpha_x}{\alpha_n} = \frac{\alpha_m}{\alpha_n}$	Relative ratio of capital shares	1.1
κ	Labor mobility parameter	1

specific parametrization of the utility function. In the experiments that follow, we examine two distinct household preference specifications: Greenwood, Hercowitz, and Huffman's (1988, GHH) and additively separable preferences, as in Galí (2015) and Woodford (2003). These are detailed in Section A.4. From now on the parameter σ will denote a curvature parameter of the utility function, ω the inverse Frisch elasticity of labor supply and φ the disutility of labor. One period in the model corresponds to one year in the data.

Instead of selecting a single calibration of the model, we follow the approach of Canova and Paustian (2011) that consists of assessing the model predictions under alternative (but realistic) parametrizations. More specifically, this approach entails specifying the ranges of the parameter values and reporting the IRFs under alternative calibrations. Robust restrictions derived from theory can then be used for the identification of structural shocks in the empirical analysis.[5]

We start by calibrating a subset of parameters that we leave unchanged throughout the exercise. 1) We set the depreciation rate of physical capital (δ) to 0.1 following Mendoza (1991, 1995). 2) The value of the steady state interest rate, $r^* + s = 0.0842$, is in line with Aguiar and Gopinath (2007). Setting $\beta = 1/(1 + r^* + s)$ ensures that the steady-state level of debt coincides with the parameter $\bar{d}$. 3) The share of nontradable in aggregate output (s_{y_n}) is set to 0.49 in line with the data.[6] Given all other parameters of the model, this moment pins down the share of tradable in aggregate absorption (χ_τ). 4) We set the relative capital shares $\alpha_m/\alpha_n = \alpha_x/\alpha_n = 1.1$. This is in line with the values in Schmitt-Grohé and Uribe (2018) and is consistent with the assumption that in developing countries the nontradable sector is more labor intensive than the export or import producing sectors. Setting the relative capital shares (to be the same across sections) implies that there is a one to one mapping between α_n and the investment share. As a result, the capital shares are equal across m and x sectors. 5) The labor mobility parameter is set to $\kappa = 1$ as in Horvath (2000). Table A.1 shows the set of invariant parameters.

We randomly draw values for the structural parameters μ_{mx}, $\mu_{\tau n}$, ρ_x, ρ_m, σ, ψ, ϕ_m, ϕ_x, ϕ_n and ω from uniform distributions. The parameters μ_{mx} and $\mu_{\tau n}$ are centered around 1 and 0.5, respectively. The persistence of the shocks, given by ρ^m and ρ^x, is centered around 0.5. We choose the upper bounds of the distribution of parameters ϕ_m, ϕ_x, ϕ_n and ψ by taking the

[5]While Canova and Paustian (2011) calibrate all the structural parameters, we instead calibrate a mixture of structural parameters and steady state targets (and report the structural parameters implied by the chosen targets). We further conduct a series of normalizations to ease the computation of the steady state (see Section A.6 for details), which spare us from having to recompute the steady state of the model numerically for each parameters' configuration and therefore substantially ease the computational burden of the exercise.

[6]Using data from the World Bank's World Development Indicators (WDI), we calculate the nontradable shares for each of the 38 countries considered in the empirical analysis by taking the ratio between the value added in the services sector and the aggregate value added. The value of 0.49 is in line with the average country in our sample.

highest country estimate reported in Schmitt-Grohé and Uribe (2018). With the exception of the debt elastic premium (ψ), the lower bounds are set to zero. For σ, we calibrate the upper bound of the distribution at 2.1 and lower bound at 1 (logarithmic utility). Finally, for ω, we choose the lower value in line with Mendoza (1995) and the upper bound in line with Galí (2015) and Woodford (2003). The supports of the uniform distributions are specified in Table A.2.

We then target a range of moments, such as the investment share (s_i), the export share (s_x), the exportable absorption share (s_{a_x}), and the trade balance to output ratio (s_{tb}). These targets pin down the following structural parameters: the capital share in the nontradable sector (α_n), the share of importables in tradable absorption (χ_m), the disutility of labor (φ) and the steady state value of debt ($\bar{d}$).[7] For s_i, s_x and s_{tb}, we center the uniform distributions at the calibrated values reported in Schmitt-Grohé and Uribe (2018). The average share of the exportable sector, $s_{y_x} = s_x + s_{a_x}$, is set to 0.325, which is consistent with the fact that emerging countries exhibit a larger exportable sector. The parameter space is sufficiently large to generate substantial heterogeneity. This type of exercise in principle could help target the moments for a wide variety of emerging and developing countries.

We then conduct a series of normalizations so as to facilitate the computation of the steady state. The steady state values of export and import prices are normalized to $p^x = p^m = 1$. The level of productivity in the nontradable sector is set to $z_n = 1$. The steady state value of the real exchange rate ($q = 1$) pins down the productivity levels in the exportable and importable sectors (z_m and z_x). Parameters γ_m and γ_x (with $\gamma_n = 1 - \gamma_m - \gamma_x$) are chosen so that sectoral wages in the steady state are equalized across sectors.

A.4 Analyzing the IRFs from the Modified MXN Model

In Section 2 we showed that it is not possible to robustly sign any of the model responses except from that of the RER. In this section, we discuss in more detail the exercise that we report in Section 2 of the paper and highlight the sensitivity of those results to alternative specifications of household's preferences (GHH and additively separable). The choice of preferences is made deliberately to assess the importance of the strength of the wealth effect. Household's preferences turn out to be important for deriving the restrictions robustly. In the last part of this Section we report the IRFs corresponding to a simultaneous and equal increase in $p_t^{x,\$}$ and $p_t^{m,\$}$, which leaves the ToT invariant for the entire forecast horizon.

We draw the values of 13 parameters from uniform distributions at one time, re-calculate the steady state, solve the model, and compute impulse responses. We repeat the exercise $2,000$ times and only keep the simulations (and impulse responses) that result in a determinate outcome. Since some parameters affect the steady state, we re-compute the steady state after every iteration. Upon collecting the impulse responses, we subsequently report the maximum and minimum values observed across the impulse response horizon (spanning 10 years). The upper and lower bounds do not necessarily indicate the responses of a single parametrization or preference specification. Figure 2 in the main text effectively demonstrates that when we examine different model calibrations, we cannot find robust restrictions to determine the sign of the responses in the data. In the following two subsections, we will perform a similar analysis for GHH and additively separable preferences individually.

[7] Note that setting s_x and s_{a_x} together is equivalent to calibrating the share of exportable output in aggregate output (s_{y_x}).

Table A.2: Alternative Model Parametrizations

Parameter	Description	Support
	Structural Parameters	
μ_{mx}	Elasticity of substitution between x and m	$[0.5, 1.5]$
$\mu_{\tau n}$	Elasticity of substitution between τ and n	$[0.25, 0.75]$
σ	Inverse of the inter-temporal elasticity of substitution	$[1, 2.1]$
$\rho^x = \rho^m$	Persistence of $p_t^{x,\$}$ and $p_t^{m,\$}$ shocks	$[0.2, 0.75]$
ϕ_m	Capital adjustment cost - m	$[0, 80]$
ϕ_x	Capital adjustment cost - x	$[0, 80]$
ϕ_n	Capital adjustment cost - n	$[0, 80]$
ψ	Debt-elastic premium	$[0.01, 80]$
ω	Inverse of Frisch elasticity	$[0.455, 1]$
	Steady State Shares	
s_{a_x}	Exportable absorption share	$[0.05, 0.2]$
s_i	Investment share	$[0.15, 0.2]$
s_{tb}	Trade balance to output ratio	$[0, 0.02]$
s_x	Export share	$[0.15, 0.25]$

Notes: The values of s_{a_x} pin down those of χ_m, which in turn lie within the interval $[0.59, 0.90]$. The values of s_i pin down those of the capital share in the nontradable sector ($\alpha_n = [0.26, 0.35]$), the values of s_x those of the disutility of labor ($\varphi = [0.22, 0.73]$) and the values of s_{tb} those of debt ($\bar{d} = [0.03, 1.14]$). Setting $\alpha_x/\alpha_n = \alpha_y/\alpha_n$ implies a one to one mapping between s_i and α_n, which in turn requires that the values of $\alpha_m = \alpha_x$ lie in the interval $[0.29, 0.39]$. The parameter values for $\chi_\tau = [0.50, 0.51]$ ensure that the nontradable output share is always 0.49. Setting wages equal across sectors in the steady state implies that the values of γ_m and γ_x are within the intervals $[0.06, 0.30]$ and $[0.20, 0.44]$, respectively.

A.4.1 GHH Preferences

We follow Greenwood, Hercowitz, and Huffman (1988) in specifying household's preferences. This type of preferences are widely adopted for studying the business cycles properties of emerging economies (see Aguiar and Gopinath, 2007; Mendoza, 1991; Mendoza, 1995; and Schmitt-Grohé and Uribe, 2018, amongst others). This specification allows us to focus entirely on the interaction of foreign assets and domestic capital at the cost of eliminating the wealth effect on labor supply.

The period utility function is defined as:

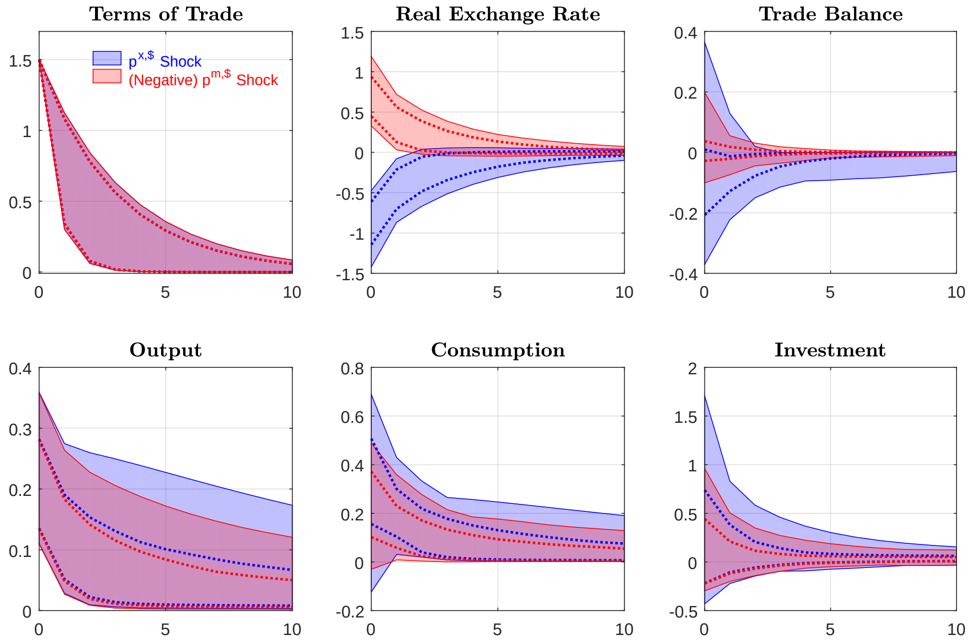
$$U(c_t, h_t) = \frac{\left(c_t - \varphi \frac{h_t^{1+\omega}}{1+\omega}\right)^{1-\sigma} - 1}{1-\sigma},$$

where σ denotes the inverse of the inter-temporal elasticity of substitution, φ is a disutility parameter and ω the inverse of the Frisch elasticity of labor supply. Note that h_t is the aggregator specified in equation (A.8). The first order conditions with respect to c_t and h_t are:

$$\lambda_t = \left(c_t - \varphi \frac{h_t^{1+\omega}}{1+\omega}\right)^{-\sigma}, \quad \text{(A.35)}$$

$$w_t = \varphi h_t^{\omega}, \quad \text{(A.36)}$$

Figure A.1: Extended MXN Model with GHH Preferences



Notes: This Figure shows the range of impulse responses (of main aggregates and real exchange rate) to export price shocks (in blue) and import price shocks (in red) in the extended MXN model featuring GHH preferences under alternative calibrations. The bands display the responses for the entire support. The areas between the dashed lines denote the 90 percent response intervals. We normalize the shocks so that they lead to a 1.5 percent increase in ToT. The main macroeconomic aggregates are expressed in constant prices as in the data. All variables are expressed in percentage deviations from steady state values except for the trade balance, which is shown in percentage points.

where λ_t is the Lagrange multiplier associated with equation (A.1). All remaining conditions can be found in Section A.5.

Figure A.1 illustrates the spectrum of impulse responses to positive export price shocks (in shaded blue) and negative import price shocks (in shaded red) under alternative parametrizations. It is evident that the output's initial response is consistently positive, irrespective of the parametrization. However, the trade balance, consumption, and investment responses cannot be definitively signed on impact. There is a noticeable degree of overlap between the shaded areas, but it is important to note that the economic impact may vary significantly across different shocks.[8] These findings reaffirm that the output response remains positive throughout the entire support; however, the range of responses for trade balance, consumption, and investment is notably sensitive to parametrization (both on impact and over time). The specific discrepancies will depend on the individual calibration. In accordance with Section 2 of the paper and Section A.2, a primary observation is that the real exchange rate appreciates following positive export price shocks and depreciates after negative import price shocks. A clear conclusion from this analysis is that, through the lens of the model, the range of responses to import and export price shocks does not mirror each other.

First, the results depend on the interplay between wealth and substitution effects, which arise from shifts in international price shocks. A positive wealth effect boosts domestic demand

[8]The upper and lower bands for each shock correspond to the minimum and maximum values and do not necessarily reflect the response of an individual parametrization.

for all types of goods (and output). Moreover, the complementarity between nontradable and tradable absorption contributes to expand economic activity. In turn, the rise in export prices (or decline in import prices) prompts a substitution from exportable goods towards importable and nontradable absorption. However, the intensity of these substitution and wealth effects varies across different shocks.

Second, a strong and positive output response is observed throughout the entire horizon. To gain insight, we log-linearize equation (A.36) as follows:

$$\tilde{w}_t = \omega \tilde{n}, \tag{A.37}$$

where ω is the slope of the supply curve. The greater the value of ω, the less responsive labor supply becomes to fluctuations in the real wage. The *aggregate labor supply* curve does not shift with changes in the marginal utility of wealth. As a result, positive export price shocks (and negative import price shocks) lead to increased wages and labor quantities in equilibrium. Thus, aggregate hours worked will lie along the aggregate supply curve. When households are richer, they consume more of all three goods and supply *more* labor in the expanding sectors without substituting labor for consumption.

A by-product of this type of preferences is that labor is more responsive to shocks, resulting in amplified output responses. If households supply more effort in equilibrium, then the marginal return of capital increases, leading to capital accumulation. Note that the return on sectoral capital will not only depend on labor supply (and the degree of labor mobility - κ) but also on how costly it is to accumulate assets (across sectors - ϕ_m, ϕ_x, ϕ_n - and across borders - ψ). The model is therefore likely to generate positive comovement between consumption and investment to international price shocks. If the economy is relatively autarkic (for higher values of ψ), the response of output will be particularly strong. The positive comovement is in line with what we observe in the empirical analysis.

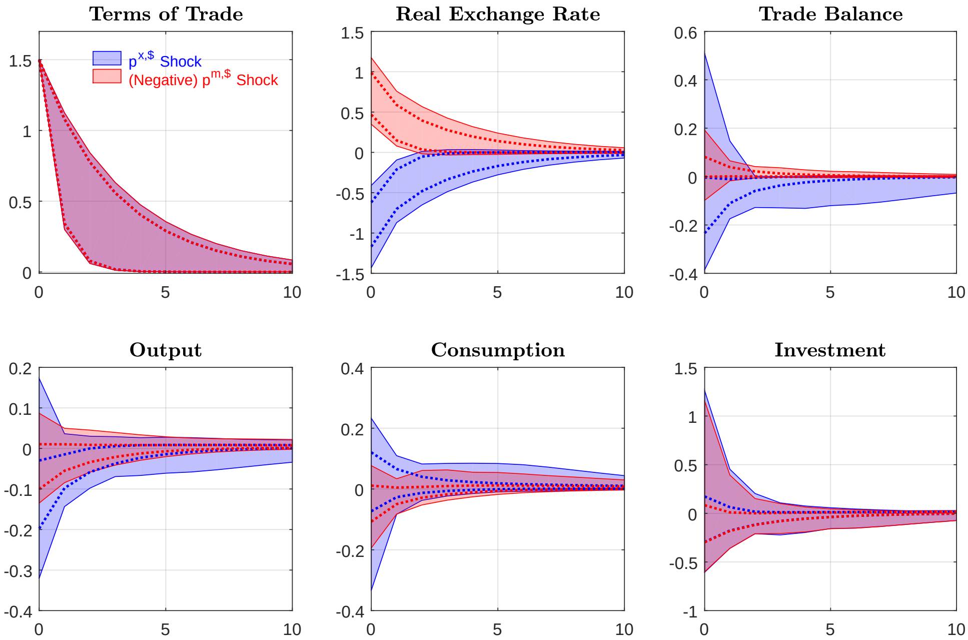
While positive $p_t^{x,\$}$ and negative $p_t^{m,\$}$ shocks are expansionary, there are significant differences in the way international price shocks transmit to the economy. The real exchange rate reacts differently to terms-of-trade shocks depending on whether shifts in ToT originate from $p_t^{x,\$}$ or $p_t^{m,\$}$ shocks. Positive export price shocks always generate an appreciation in the real exchange rate (i.e., the domestic economy becomes more expensive *vis-à-vis* the rest of the world). After a $p_t^{x,\$}$ shock, the relative price of nontradable goods and the real exchange rate tend to move in opposite directions. In line with Catão and Chang (2013, 2015), after a negative $p_t^{m,\$}$ shock, we observe a depreciation of the real exchange rate, which is the result of full pass-through from world to domestic import prices. The relationship between nontradable goods prices and the real exchange rate may no longer be negative. The behavior of the real exchange rate will have implications for allocations, affecting consumption, investment and the trade balance.

A.4.2 Additively Separable Preferences

We follow Woodford (2003) and Galí (2015) in specifying household's preferences. These type of preferences allow for a wealth effect (via changes in consumption) to shift labor supply. Let us define period utility as:

$$U(c_t, h_t) = \frac{c_t^{1-\sigma} - 1}{1-\sigma} - \varphi \frac{h_t^{1+\omega}}{1+\omega},$$

Figure A.2: Extended MXN Model with Separable Preferences



Notes: This Figure shows the range of impulse responses to export price shocks (in blue) and import price shocks (in red) in the extended MXN model featuring separable preferences under alternative calibrations. The colored bands report the responses for the entire support. Export price shocks are shown in blue and import price shocks in red. The areas between the dashed lines denote the 90 percent response intervals. We normalize the shocks so that they lead to a 1.5 percent increase in ToT. The main macroeconomic aggregates are expressed in constant prices as in the data. All variables are expressed in percentage deviations from steady state values except for the trade balance, which is shown in percentage points.

where σ, ω, φ and h_t are defined above. The household's first order conditions are therefore:

$$\lambda_t = c_t^{-\sigma}, \tag{A.38}$$

$$\lambda_t w_t = \varphi h_t^{\omega}, \tag{A.39}$$

where λ_t is the Lagrange multiplier associated with equation (A.1). The remaining first order conditions can be found in Section A.5.

In Figure A.2, we show the range of impulse responses to positive export price shocks (in shaded blue) and negative import price shocks (in shaded red) for various parametrizations under separable preferences. It is important to note that the direction of the impact response on macroeconomic aggregates can vary, being either positive or negative. Therefore, relying solely on economic theory cannot determine the direction of GDP responses to import and export price shocks in our empirical analysis. Additionally, the quantitative impact can vary considerably across shocks, depending on the specific set of parameters drawn. Consequently, the response of macroeconomic aggregates to import and export price shocks can differ significantly and may not necessarily mirror each other. Nevertheless, it is worth noting that the behavior of the real exchange rate is robust to the consideration of additively separable preferences; specifically, it appreciates following positive export price shocks and depreciates following negative import price shocks.[9]

[9] Household's preferences such as the ones postulated by King, Plosser, and Rebelo (1988) yield very similar

Similar to the model with GHH preferences, the responses of aggregate variables in our model are a result of the interplay between wealth and substitution effects brought about by the international price shocks. Specifically, the positive wealth effect boosts domestic demand for all types of goods (and output). In turn, the rise in export prices (fall in import prices) leads to a substitution from exportable to importable and nontradable absorption. This reasoning aligns with the model with GHH preferences, but now, the wealth effect has an impact on labor supply. This means that the *aggregate labor supply* curve does respond to changes in the marginal utility of wealth. As households become richer, they tend to consume more and supply fewer hours of labor. To better understand this concept, we can take equation (A.39) and log-linearize it to obtain:

$$\tilde{w}_t = \omega \tilde{n}_t + \sigma \tilde{c}_t. \tag{A.40}$$

Note that the second term of the above expression is absent in equation A.37. This condition states that, as households become richer and increase their consumption, the upward sloping supply curve shifts to the left (labor supply will fall as agents become richer). As a result, hours may fall in equilibrium, depending on the shifts in labor demand and the relative strength of the wealth effect (given by the value of σ). This in turn can result in negative impact responses of output to positive export (negative import) price shocks (as shown in Figure A.2).

Even with a positive sectoral impact that has the potential to decrease capital accumulation, a reduction in hours worked may reduce the return on sectoral capital relative to a model that does not include a wealth effect. This may explain why models exhibiting separable preferences may struggle in generating positive comovement between consumption and investment. This feature of the model with separable preferences is at odds with the empirical responses presented in the main text. As in the model with GHH preferences, an increase in export prices leads to a real exchange rate appreciation, while a decrease in import prices results in a depreciation. Thus, we conclude that the real exchange rate responses are robust to changes in household preferences.

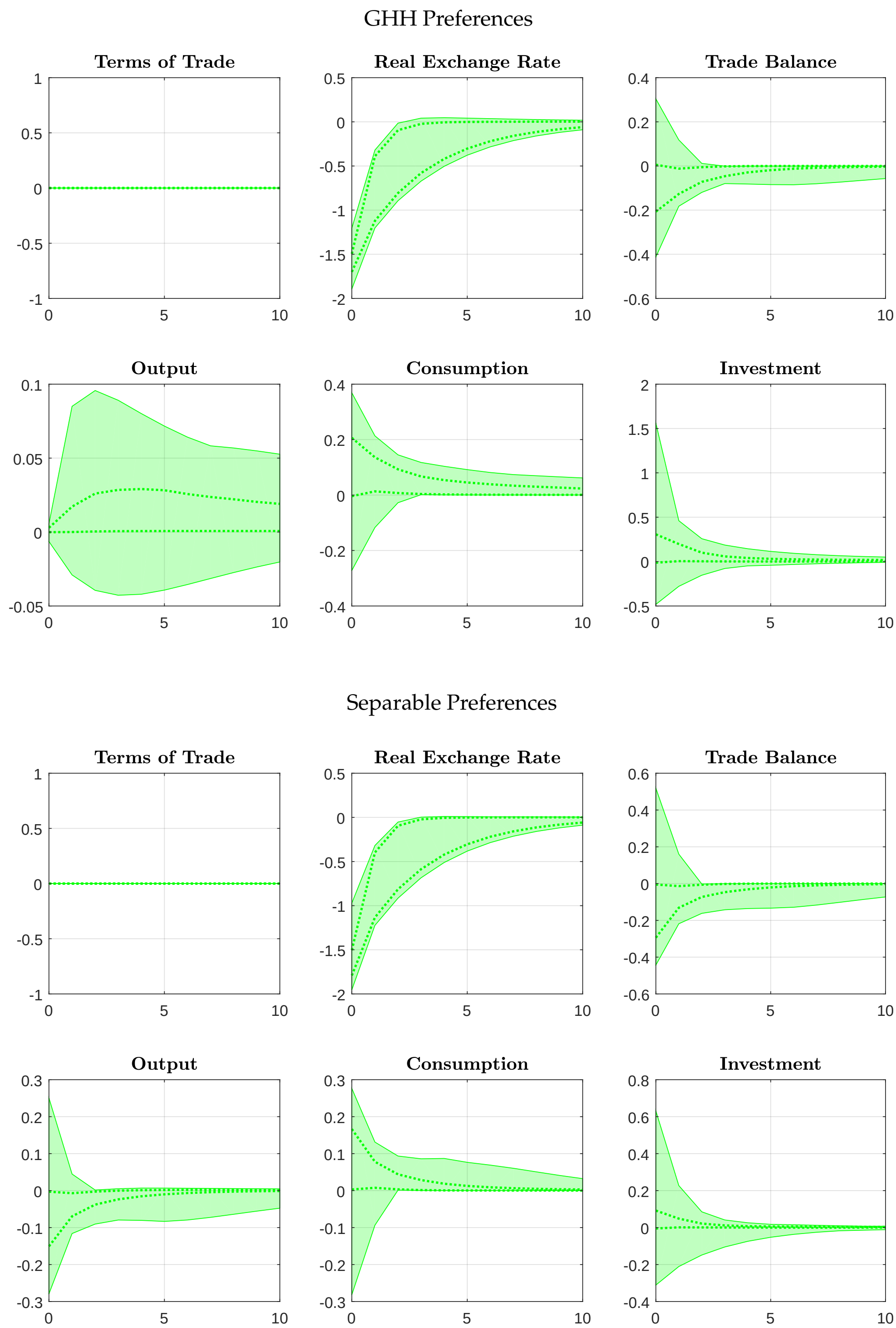
A.4.3 ToT-Neutral Shocks

In the standard MXN model, foreign prices influence the domestic economy solely through their impact on the ToT. However, when export and import prices are independent of each other, we can perform a simple experiment to investigate the extent to which the macroeconomic effects of foreign price shocks are a function of their impact on the ToT. To illustrate this, we can consider the extreme scenario of a simultaneous increase in $p_t^{x,\$}$ and $p_t^{m,\$}$ by the same amount. Assuming that the persistence of $p_t^{x,\$}$ and $p_t^{m,\$}$ shocks is the same, the ToT will remain unaffected for all periods. We refer to this experiment as a "ToT-neutral shock."

Figure A.3 illustrates the range of impulse responses (in shaded green) to a ToT-neutral shock under different parametrizations, for models with GHH preferences and additive separable preferences, respectively. Although there is uncertainty about the precise impact of these shifts in foreign prices on the domestic economy, our analysis suggests that, in most of the scenarios we considered (i.e., 90 percent, represented by the dashed lines), consumption and investment increase, while the trade balance falls. The response of output depends on the specific type of preferences examined. When analyzing the effects of foreign price movements separately, we observed that an increase in $p_t^{x,\$}$ and $p_t^{m,\$}$ leads to an appreciation of

results and we do not report them in the Appendix for brevity. Results are available upon request.

Figure A.3: ToT-Neutral Shocks



Notes: This Figure illustrates the range of impulse responses to (one percent standard deviation) ToT-neutral shocks in the extended MXN model under alternative calibrations. The green bands show the responses under alternative parametrizations. The top panel shows the responses under GHH preferences and the bottom panel the responses under separable preferences. The main macroeconomic aggregates are expressed in constant prices as in the data. The areas between the dashed lines denote the 90 percent response intervals. The main macroeconomic aggregates are expressed in constant prices as in the data. All variables are expressed in percentage deviations from steady state values except for the trade balance, which is shown in percentage points.

the exchange rate. Therefore, the ToT-neutral exercise highlights that shocks to $p_t^{x,\$}$ and $p_t^{m,\$}$ amplify the response of the RER. As a result, large movements in the RER can occur even when the movements in the ToT are relatively small.

A.5 Summary of Equations - Baseline

The full system of equations in the extended MXN model is given by:

Household's conditions and constraints:

Household's Preferences:

1. *GHH*

$$\lambda_t = \left(c_t - \varphi \frac{h_t^{1+\omega}}{1+\omega}\right)^{-\sigma}, \tag{A.41}$$

$$w_t = \varphi h_t^{\omega}, \tag{A.42}$$

2. *Separable*

$$\lambda_t = c_t^{-\sigma}, \tag{A.43}$$

$$\lambda_t w_t = \varphi h_t^{\omega}, \tag{A.44}$$

Remaining household's optimality conditions and constraints:

$$w_t^m = \left(\frac{h_t^m}{\gamma_m h_t}\right)^{\frac{1}{\kappa}} w_t, \tag{A.45}$$

$$w_t^x = \left(\frac{h_t^x}{\gamma_x h_t}\right)^{\frac{1}{\kappa}} w_t, \tag{A.46}$$

$$w_t^n = \left[\frac{h_t^n}{(1-\gamma_m-\gamma_x)\, h_t}\right]^{\frac{1}{\kappa}} w_t, \tag{A.47}$$

$$h_t = \left[\gamma_m^{-\frac{1}{\kappa}} \left(h_t^m\right)^{\frac{1+\kappa}{\kappa}} + \gamma_x^{-\frac{1}{\kappa}} \left(h_t^x\right)^{\frac{1+\kappa}{\kappa}} + (1-\gamma_m-\gamma_x)^{-\frac{1}{\kappa}} \left(h_t^n\right)^{\frac{1+\kappa}{\kappa}}\right]^{\frac{\kappa}{1+\kappa}}, \tag{A.48}$$

$$\lambda_t q_t = \beta\,(1+r_t)\,\mathbb{E}_t \lambda_{t+1} q_{t+1}, \tag{A.49}$$

$$r_t = r^* + s + \psi\left(e^{d_{t+1}-d} - 1\right), \tag{A.50}$$

$$\lambda_t\left[1+\phi_m\left(k_{t+1}^m - k_t^m\right)\right] = \beta \mathbb{E}_t \lambda_{t+1}\left[1-\delta+u_{t+1}^m + \phi_m\left(k_{t+2}^m - k_{t+1}^m\right)\right], \tag{A.51}$$

$$\lambda_t\left[1+\phi_x\left(k_{t+1}^x - k_t^x\right)\right] = \beta \mathbb{E}_t \lambda_{t+1}\left[1-\delta+u_{t+1}^x + \phi_x\left(k_{t+2}^x - k_{t+1}^x\right)\right], \tag{A.52}$$

$$\lambda_t\left[1+\phi_n\left(k_{t+1}^n - k_t^n\right)\right] = \beta \mathbb{E}_t \lambda_{t+1}\left[1-\delta+u_{t+1}^n + \phi_n\left(k_{t+2}^n - k_{t+1}^n\right)\right], \tag{A.53}$$

Laws of motion of physical capital:

$$i_t^m = k_{t+1}^m - (1-\delta)\, k_t^m, \tag{A.54}$$

$$i_t^x = k_{t+1}^x - (1-\delta)\, k_t^x, \tag{A.55}$$

$$i_{nt} = k_{t+1}^x - (1-\delta)\, k_t^n, \tag{A.56}$$

Absorption aggregators and optimality conditions of final goods firms:

$$a_t = \left[\chi_\tau^{\frac{1}{\mu_{\tau n}}} \left(a_t^\tau\right)^{1-\frac{1}{\mu_{\tau n}}} + \left(1-\chi_\tau\right)^{\frac{1}{\mu_{\tau n}}} \left(a_t^n\right)^{1-\frac{1}{\mu_{\tau n}}} \right]^{\frac{1}{1-\frac{1}{\mu_{\tau n}}}}, \tag{A.57}$$

$$p_t^\tau = \chi_\tau^{\frac{1}{\mu_{\tau n}}} \left(\frac{a_t^\tau}{a_t} \right)^{-\frac{1}{\mu_{\tau n}}}, \tag{A.58}$$

$$p_t^n = \left(1-\chi_\tau\right)^{\frac{1}{\mu_{\tau n}}} \left(\frac{a_t^n}{a_t} \right)^{-\frac{1}{\mu_{\tau n}}}, \tag{A.59}$$

$$a_t^\tau = \left[\chi_m^{\frac{1}{\mu_{mx}}} \left(a_t^m\right)^{1-\frac{1}{\mu_{mx}}} + \left(1-\chi_m\right)^{\frac{1}{\mu_{mx}}} \left(a_t^x\right)^{1-\frac{1}{\mu_{mx}}} \right]^{\frac{1}{1-\frac{1}{\mu_{mx}}}}, \tag{A.60}$$

$$\frac{p_t^m}{p_t^\tau} = \chi_m^{\frac{1}{\mu_{mx}}} \left(\frac{a_t^m}{a_t^\tau} \right)^{-\frac{1}{\mu_{mx}}}, \tag{A.61}$$

$$\frac{p_t^x}{p_t^\tau} = \left(1-\chi_m\right)^{\frac{1}{\mu_{mx}}} \left(\frac{a_t^x}{a_t^\tau} \right)^{-\frac{1}{\mu_{mx}}}, \tag{A.62}$$

Production functions and optimality conditions of intermediate firms:

$$y_t^m = z_m \left(k_t^m\right)^{\alpha_m} \left(h_t^m\right)^{1-\alpha_m}, \tag{A.63}$$

$$y_t^x = z_x \left(k_t^x\right)^{\alpha_x} \left(h_t^x\right)^{1-\alpha_x}, \tag{A.64}$$

$$y_t^n = z_n \left(k_t^n\right)^{\alpha_n} \left(h_t^n\right)^{1-\alpha_n}, \tag{A.65}$$

$$u_t^m = p_t^m \alpha_m z_m \left(k_t^m\right)^{\alpha_m - 1} \left(h_t^m\right)^{1-\alpha_m}, \tag{A.66}$$

$$u_t^x = p_t^x \alpha_x z_x \left(k_t^x\right)^{\alpha_x - 1} \left(h_t^x\right)^{1-\alpha_x}, \tag{A.67}$$

$$u_t^n = p_t^n \alpha_n z_n \left(k_t^n\right)^{\alpha_n - 1} \left(h_t^n\right)^{1-\alpha_n}, \tag{A.68}$$

$$w_t^m = p_t^m \left(1-\alpha_m\right) z_m \left(k_t^m\right)^{\alpha_m} \left(h_t^m\right)^{(-\alpha_m)}, \tag{A.69}$$

$$w_t^x = p_t^x \left(1-\alpha_x\right) z_x \left(k_t^x\right)^{\alpha_x} \left(h_t^x\right)^{(-\alpha_x)}, \tag{A.70}$$

$$w_t^n = p_t^n \left(1-\alpha_n\right) z_n \left(k_t^n\right)^{\alpha_n} \left(h_t^n\right)^{(-\alpha_n)}, \tag{A.71}$$

Market clearing conditions:

$$a_t = i_t + c_t + \frac{\phi_m}{2} \left(k_{t+1}^m - k_t^m\right)^2 + \frac{\phi_x}{2} \left(k_{t+1}^x - k_t^x\right)^2 + \frac{\phi_n}{2} \left(k_{t+1}^n - k_t^n\right)^2, \tag{A.72}$$

$$m_t = a_t^m - y_t^m, \tag{A.73}$$

$$x_t = y_t^x - a_t^x, \tag{A.74}$$

$$y_t^n = a_t^n, \tag{A.75}$$

$$\frac{q_t d_{t+1}}{1+r_t} - q_t d_t = p_t^m m_t - p_t^x x_t, \tag{A.76}$$

$$y_t = p_t^m y_t^m + p_t^x y_t^x + p_t^n y_t^n, \tag{A.77}$$

$$i_t = i_t^m + i_t^x + i_t^n, \tag{A.78}$$

LOOP and ToT:

$$p_t^{m,\$} = \frac{p_t^m}{q_t}, \tag{A.79}$$

$$p_t^{x,\$} = \frac{p_t^x}{q_t}, \tag{A.80}$$

$$ToT_t = \frac{p_t^{x,\$}}{p_t^{m,\$}}, \tag{A.81}$$

Observation equations:

$$y_t^o = p^m y_t^m + p^x y_t^x + p^n y_t^n, \tag{A.82}$$

$$c_t^o = \frac{c_t}{y_t} y_t^o, \tag{A.83}$$

$$i_t^o = \frac{i_t}{y_t} y_t^o, \tag{A.84}$$

$$tb_t = \frac{\left(\frac{p_t^x x_t}{y_t} - \frac{p_t^m m_t}{y_t}\right) y_t^o}{y}, \tag{A.85}$$

Shocks:

$$\ln\left(\frac{p_t^{x,\$}}{p^{x,\$}}\right) = \rho^x \ln\left(\frac{p_{t-1}^{x,\$}}{p^{x,\$}}\right) + \varsigma^x \varepsilon_t^x, \tag{A.86}$$

$$\ln\left(\frac{p_t^{m,\$}}{p^{m,\$}}\right) = \rho^m \ln\left(\frac{p_{t-1}^{m,\$}}{p^{m,\$}}\right) + \varsigma^m \varepsilon_t^m. \tag{A.87}$$

A.6 Steady State

We pin down the steady state analytically. We normalize $p^{x,\$} = 1$, $p^{m,\$} = 1$ and, thus, $ToT = 1$. Under LOOP, this implies that $p^\tau = q = 1$. We assume that the level of productivity is the same across import and export sectors ($z_x = z_m$) such that $p^\tau = 1$. It follows from equation (A.49) that

$$\beta = \frac{1}{1+r}, \tag{A.88}$$

where

$$r = r^* + s. \tag{A.89}$$

From the definition of output, equation (A.77), we get the share of tradable output in aggregate output $s_{y_\tau} = 1 - s_{y_n}$. The exportable output share is given by $s_{y_x} = s_x + s_{a_x}$. Thus, $s_{y_m} = s_{y_\tau} - s_{y_x}$. Using the trade balance and dividing by output, we can retrieve the share of imports, $s_m = s_x - s_{tb}$. From equations (A.51), (A.52) and (A.53), we can recover sectoral rental rates of physical capital

$$u^m = u^x = u^n = \frac{1}{\beta} - 1 + \delta. \tag{A.90}$$

Using the definition of aggregate investment, equation (A.78), and fixing the values of $\frac{\alpha_x}{\alpha_n}$ and $\frac{\alpha_x}{\alpha_n}$, we can recover the capital share in the nontradable sector that targets the investment-to-GDP ratio (s_i),

$$\frac{s_i}{\delta\left(\frac{\alpha_m}{\alpha_n}\frac{s_{ym}}{u^m} + \frac{\alpha_x}{\alpha_n}\frac{s_{yx}}{u^x} + \frac{s_{yn}}{u^n}\right)} = \alpha_n. \tag{A.91}$$

Then, we can easily recover capital shares in the exportable and importable sectors from the relative capital shares. Replacing the capital and labor demands of the tradable sector, equations (A.68) and (A.71), into the production function of the nontradable sector, equation (A.65), we can recover the wage rate by normalizing the level of productivity in the nontradable sector, z_n, to 1,

$$1 = \left(\frac{\alpha_n}{u^n}\right)^{\alpha_n}\left(\frac{1-\alpha_n}{w}\right)^{1-\alpha_n} \Rightarrow (1-\alpha_n)\left(\frac{\alpha_n}{u^n}\right)^{\frac{\alpha_n}{1-\alpha_n}} = w. \tag{A.92}$$

Given that the sectors and the capital shares are assumed to be the same in the exportable and importable sectors, it follows that $h^m = h^x$ (so long as $\frac{\alpha_x}{\alpha_n} = \frac{\alpha_x}{\alpha_n}$). Alternatively, $h^m \neq h^x$. Substituting the demand for capital, equation (A.67), into the production function in the exportable sector, equation (A.64), we can recover the level of productivity and hours worked in the exportable sector,

$$(y^x)^{1-\alpha_x} = z_x\left(\frac{\alpha_x}{u^x}\right)^{\alpha_x}(h^x)^{1-\alpha_x} \Rightarrow z_x = (y^x)^{1-\alpha_x} \Rightarrow h^x = \left(\frac{u^x}{\alpha_x}\right)^{\frac{\alpha_x}{1-\alpha_x}}. \tag{A.93}$$

Using equation (A.70), we get exportable output, $y^x = \frac{wh^x}{1-\alpha_x}$. Once we derive the value of output in the exportable sector, aggregate output is simply $y = \frac{y_x}{s_{y_x}}$, nontradable output $y^n = s_{y_n}y$, and importable output $y^m = s_{y_m}y$. From equation (A.69), we can obtain hours worked in the importable sector $h^m = (1-\alpha_m)y_m/w$. Using equation (A.66), we get the capital stock in the importable sector, $k^m = \alpha_m y^m/u^m$. From equation (A.71), it follows that $h^n = (1-\alpha_n)\,y^n/w$. Taking the ratio between equations (A.45) and (A.46), we get the following expression $\gamma_m h^x = \gamma_x h^m$. By dividing equations (A.46) and (A.47), we obtain

$$\gamma_x = (1-\gamma_m)\frac{h^x}{(h^n+h^x)}. \tag{A.94}$$

By combining the expressions above, we can recover the value of γ_m that guarantees that $w_m = w_x = w_n = w$.

$$\gamma_m\left(1+\frac{h^m}{(h^n+h^x)}\right) = \frac{h^m}{(h^n+h^x)} \Rightarrow \gamma_m = \frac{\frac{h^m}{(h^n+h^x)}}{1+\frac{h^m}{(h^n+h^x)}} \Rightarrow \gamma_m = \frac{1}{\frac{h^n+h^x}{h^m}+1}.$$

Since $wh = w^m h^m + w^x n^x + w^n h^n$, it follows that, in the steady state, labor is perfectly mobile,

$$h = h^m + h^x + h^m. \tag{A.95}$$

Using equations (A.67) and (A.68), yields $k^x = \alpha_x\frac{y^x}{u^x}$ and $k^n = \alpha_n\frac{y^n}{u^n}$. Dividing equation (A.57) by output y,

$$\frac{a}{y} = \left(\chi_\tau^{\frac{1}{\mu_{\tau n}}}\left(\frac{a^\tau}{y}\right)^{1-\frac{1}{\mu_{\tau n}}} + (1-\chi_\tau)^{\frac{1}{\mu_{\tau n}}}\left(\frac{y^n}{y}\right)^{1-\frac{1}{\mu_{\tau n}}}\right)^{\frac{1}{1-\frac{1}{\mu_{\tau n}}}},$$

and replacing equation (A.61) into (A.60), we get the share of importable absorption in tradable absorption,

$$\chi_m = \frac{1}{1+\left(\frac{s_{y_x}-s_x}{s_{y_m}+s_x-s_{tb}}\right)}. \tag{A.96}$$

The values of χ_m is chosen to match s_{tb}. First, use χ_m to retrieve the value of $\frac{a^\tau}{y}$. Then, use $\frac{a^\tau}{y} = \chi_\tau \frac{a}{y}$ that follows from equation (A.58) and replace into equation (A.57),

$$\chi_\tau = \frac{1}{\left(1 + \frac{s_{y_n}}{\frac{a^\tau}{y}}\right)}. \tag{A.97}$$

The value of χ_τ is such that s_{y_n} is attained. From equations (A.58), (A.59), (A.61) and (A.62), we obtain the following absorption demands $a^n = (1 - \chi_\tau)\, a$, $a^\tau = \chi_\tau a$, $a^m = \chi_m a^\tau$, $a^x = (1 - \chi_m)\, a^\tau$. Exports and imports can be retrieved as

$$x = s_x y, \tag{A.98}$$

$$m = x - s_{tb} y. \tag{A.99}$$

From equation (A.76), we get

$$\bar{d} = \frac{(x - m)(1 + r)}{r}. \tag{A.100}$$

From the sectoral law of motions of sectoral investment, equations (A.54), (A.55) and (A.56), it follows

$$i_m = \delta k_m, \quad i_x = \delta k_x, \quad i_n = \delta k_n. \tag{A.101}$$

Aggregate investment is simply,

$$i = s_i y. \tag{A.102}$$

And aggregate consumption can be retrieved from equation (A.72),

$$c = a - i. \tag{A.103}$$

Households' Preferences:

1. *GHH*: From labor supply relationships, we can obtain the value of φ that targets s_x,

   $$\varphi = \frac{w}{h^\omega}.$$

   The value of λ follows from equation (A.41),

   $$\lambda = \left(c - \varphi \frac{h^{1+\omega}}{1+\omega}\right)^{(-\sigma)}. \tag{A.104}$$

2. *Separable*: We obtain the value of λ from equation (A.43),

   $$\lambda = c^{(-\sigma)}.$$

   From labor supply relationships, we can obtain the value of φ that targets s_x,

   $$\varphi = \lambda \frac{w}{h^\omega}.$$

Finally, the macroeconomic aggregates in constant prices are easily recovered: $c^o = c$, $y^o = y$, $i^o = i$ and $tb = s_{tb}$.

Appendix B Data Sources

Our data set includes information on macroeconomic indicators, commodity prices, producer price indices (PPI), and country-specific sectoral export and import shares. This appendix describes the sources of data used in the paper.

B.1 Macroeconomic Data Sources

The country-specific macroeconomic data are from the World Bank's World Development Indicators (WDI) database. Specific details of these series are listed below.

Country-specific macro data:

1. GDP per capita in local currency units. Indicator code: NY.GDP.PCAP.KN
2. Gross capital formation as % of GDP. Indicator code: NE.GDI.TOTL.ZS
3. Imports of goods and services as % of GDP. Indicator code: NE.IMP.GNFS.ZS
4. Exports of goods and services as % of GDP. Indicator code: NE.EXP.GNFS.ZS
5. Households and NPISHs final consumption expenditure as % of GDP. Indicator code: NE.CON.PRVT.ZS
6. GDP per capita, PPP (constant 2005 international $). Indicator code: NY.GDP.PCAP.PP.KD
7. Consumer Price Index (2010=100). Indicator code: FP.CPI.TOTL
8. Official Exchange Rate (LCU per US$, period average). Indicator code: PA.NUS.FCRF
9. GDP per capita, PPP (constant 2017 international $). Indicator code: NY.GDP.PCAP.PP.KD
10. Net barter terms of trade index (2000 = 100). Indicator code: TT.PRI.MRCH.XD.WD

The WDI database does not include CPI data for Argentina. We therefore sourced the CPI for Argentina from Cavallo and Bertolotto (2016).

The criteria for a country to be included follows Schmitt-Grohé and Uribe (2018). A country needs to have at least 30 consecutive annual observations and belong to the group of poor and emerging countries. The latter is defined as all countries with average GDP per capita at PPP U.S. dollars of 2017 over the period 1980-2019 below 25,000 dollars according to the WDI database.

A total of 41 countries satisfy this criteria: Algeria, Argentina, Bangladesh, Bolivia, Brazil, Burkina Faso, Cameroon, Chad, Colombia, Congo, Cote d'Ivore, Dominican Republic, Egypt, Equatorial Guinea, Gabon, Ghana, Guatemala, Honduras, India, Indonesia, Jordan, Kenya, Madagascar, Malawi, Malaysia, Mauritius, Mexico, Morocco, Niger, Nigeria, Pakistan, Panama, Peru, Philippines, Senegal, South Africa, Sudan, Thailand, Tunisia, Türkiye and Uruguay. However, our final sample has 38 countries as we exclude Malaysia, Panama, and Tunisia. The reason for excluding these countries is that our constructed terms of trade measure does not mimic the terms of trade data from the WDI. Coincidentally, Schmitt-Grohé and Uribe (2018) highlight that Panama has faulty terms of trade data and therefore they exclude it from their sample. It is uncertain whether the same applies to the other two countries but we prefer to remain conservative and discard the countries for which our measure of terms of trade is not a good approximation of the official measure. Table B.1 reports the data coverage for each country.

Table B.1: Macro Data Coverage

Country	Data
Algeria	1980-2019
Argentina	1987-2019
Bangladesh	1986-2019
Bolivia	1980-2019
Brazil	1980-2019
Burkina Faso	1980-2019
Cameroon	1980-2019
Chad	1983-2019
Colombia	1980-2019
Congo, Dem. Rep.	1980-2016
Cote d'Ivoire	1980-2019
Dominican Republic	1980-2019
Egypt, Arab Rep.	1980-2018
Equatorial Guinea	1985-2019
Gabon	1980-2019
Ghana	1983-2019
Guatemala	1980-2019
Honduras	1980-2019
India	1980-2019
Indonesia	1980-2019
Jordan	1980-2018
Kenya	1980-2018
Madagascar	1980-2019
Malawi	1980-2019
Mauritius	1980-2019
Mexico	1980-2019
Morocco	1980-2019
Niger	1980-2019
Nigeria	1981-2018
Pakistan	1980-2019
Peru	1980-2019
Philippines	1980-2019
Senegal	1980-2019
South Africa	1980-2019
Sudan	1980-2018
Thailand	1980-2019
Türkiye	1980-2019
Uruguay	1980-2019

Notes: This Table shows the years of coverage of the macro data for each of the countries included in our sample.

World data:

1. Global Economic Activity: Real World GDP at 2010 prices and exchange rates is sourced from Haver Analytics (Indicator Code: A001GDPD@IMFWEO).

2. Global Inflation: Advanced economies consumer price inflation is souced from Haver Analytics (Indicator Code: A110PCIP@IMFWEO)

B.2 Export and Import Price Indices

As explained in the main text, we calculate country-specific export and import price indices denominated in US dollars using sectoral export and import shares, commodity prices, and sectoral U.S. PPI data as a proxy for manufacturing prices.

The weights for the calculation of export and import price indices are given by the products' trade shares. In order to calculate the trade shares, for each country, we obtain a time series of highly disaggregated product export and import values sourced from the MIT Observatory of Economic Complexity.[10] This dataset combines data from the Center for International Data from Robert Feenstra and UN COMTRADE. The product trade data are disaggregated at the 4-digit level and classified according to the Standard International Trade Classification, Revision 2 (SITC Rev. 2). Our sample consists of 988 categories but since we only have price information for 62 categories, the trade shares have to be reclassified so that we can match trade and price data. We therefore match the trade shares associated with each of the 988 categories with 46 commodity and 16 industry classifications for which we have price information. The matched information is then used to recalculate export and import shares for a total of 62 categories.[11] The sources of price data are detailed in Tables B.2 and B.3. Note that the manufacturing industries are classified according to the North American Industry Classification System (NAICS) code. In order to match the sectoral manufacturing price data with the trade shares, NAICS codes were reclassified to match with the SITC classification.

Once we have the series of weights obtained from the trade shares and prices for each of the categories, we calculate, for each country, the export and import price indices.

[10]The data can be accessed at `https://atlas.media.mit.edu/en/`.

[11]The number of categories is dictated by the price data.

Table B.2: List of Commodities

Commodity	Definition	Source
Crude oil	Average between Brent, Dubai and WTI	World Bank Commodity Price Data
Coal	Australian	World Bank Commodity Price Data
Natural gas	Natural gas index (average of Europe, US and Japan)	World Bank Commodity Price Data
Cocoa	International Cocoa Organization indicator	World Bank Commodity Price Data
Coffee	Average between arabica and robusta	World Bank Commodity Price Data
Tea	Average between Kolkata, Colombo and Mombasa	World Bank Commodity Price Data
Coconut oil	Philippines/Indonesia, bulk, c.i.f. Rotterdam	World Bank Commodity Price Data
Copra	Philippines/Indonesia, bulk, c.i.f. N.W. Europe	World Bank Commodity Price Data
Palm oil	Malaysia, 5% bulk, c.i.f. N. W. Europe	World Bank Commodity Price Data
Soybeans	US, c.i.f. Rotterdam	World Bank Commodity Price Data
Soybean oil	Crude, f.o.b. ex-mill Netherlands	World Bank Commodity Price Data
Soybean meal	Argentine 45/46% extraction, c.i.f. Rotterdam	World Bank Commodity Price Data
Barley	US, feed, No. 2, spot	World Bank Commodity Price Data
Maize	US, no. 2, yellow, f.o.b. US Gulf ports	World Bank Commodity Price Data
Rice	5% broken, white rice (WR), f.o.b. Bangkok	World Bank Commodity Price Data
Wheat	US, no. 1, hard red winter	World Bank Commodity Price Data
Banana	US import price, f.o.t. US Gulf ports	World Bank Commodity Price Data
Orange	navel, EU indicative import price, c.i.f. Paris	World Bank Commodity Price Data
Beef	Australia/New Zealand, c.i.f. U.S. port (East Coast)	World Bank Commodity Price Data
Chicken	Broiler/fryer, Georgia Dock, wholesale	World Bank Commodity Price Data
Sheep	New Zealand, wholesale, Smithfield, London	World Bank Commodity Price Data
Meat	Average of beef, chicken and sheep	World Bank Commodity Price Data
Sugar	World, f.o.b. at greater Caribbean ports	World Bank Commodity Price Data
Tobacco	General import , cif, US	World Bank Commodity Price Data
Cotton	Index	World Bank Commodity Price Data
Rubber	Any origin, spot, New York	World Bank Commodity Price Data
Aluminum	London Metal Exchange	World Bank Commodity Price Data
Iron ore	Spot in US dollar	World Bank Commodity Price Data
Copper	London Metal Exchange	World Bank Commodity Price Data
Lead	London Metal Exchange	World Bank Commodity Price Data
Tin	London Metal Exchange	World Bank Commodity Price Data
Nickel	London Metal Exchange	World Bank Commodity Price Data
Zinc	London Metal Exchange	World Bank Commodity Price Data
Gold	UK, 99.5% fine	World Bank Commodity Price Data
Platinum	UK, , 99.9% refined	World Bank Commodity Price Data
Silver	UK, , 99.9% refined	World Bank Commodity Price Data
Beverages	Index, 2010=100	World Bank Commodity Price Data
Food	Index, 2010=100	World Bank Commodity Price Data
Oils and Meals	Index, 2010=100	World Bank Commodity Price Data
Grains	Index, 2010=100	World Bank Commodity Price Data
Timber	Index, 2010=100	World Bank Commodity Price Data
Other Raw Mat.	Index, 2010=100	World Bank Commodity Price Data
Fertilizers	Index, 2010=100	World Bank Commodity Price Data
Metals and Minerals	Index, 2010=100	World Bank Commodity Price Data
Base Metals	Index, 2010=100	World Bank Commodity Price Data
Precious Metals	Index, 2010=100	World Bank Commodity Price Data

Notes: The first column of this Table shows the list of all commodities used for the calculation of export and import prices, the second column displays the definition used for each commodity price, and the last column shows the the data source.

Table B.3: List of Manufacturing Industries

Manufacturing Sector	Indicator Code	NAICS Code	Definition	Source
MUV Index			Index, nominal	World Bank
Processed Foods and Feeds	WPU02	311, 312	PPI Index	FRED
Textile products and apparel	WPU03	313, 314, 315	PPI Index	FRED
Hides, skins, leather, and related products	WPU04	316	PPI Index	FRED
Chemicals and allied products	WPU06	325	PPI Index	FRED
Rubber and plastic products	WPU07	326	PPI Index	FRED
Lumber and wood products	WPU08	321	PPI Index	FRED
Pulp, paper, and allied products	WPU09	322, 323	PPI Index	FRED
Metals and metal products	WPU10	331, 332	PPI Index	FRED
Machinery and equipment	WPU11	333	PPI Index	FRED
Electronic components and accessories	WPU1178	334	PPI Index	FRED
Electrical equipment, appliances, and component manufacturing	WPU117	335	PPI Index	FRED
Furniture and household durables	WPU12	337	PPI Index	FRED
Nonmetallic mineral products	WPU13	327	PPI Index	FRED
Transportation equipment	WPU14	336	PPI Index	FRED
Miscellaneous products	WPU15	339	PPI Index	FRED

Notes: The first column of this Table shows the list of manufacturing sectors used to calculate export and import prices, the second column lists FRED's indicator code, the third column describes the NAICS code associated with each manufacturing group, the penultimate column displays the definition, and the last column shows the data source.

Appendix C Additional Descriptive Statistics

This section includes additional details about the data. Specifically, Tables C.1-C.5 provide additional information about country specific export and import specialization for the entire sample as well as for four different subsamples of our data while Table C.6 provides additional descriptive statistics for the commodity terms of trade. Figure C.1 displays the volatity of the real exchange rate against export prices, import prices, and the terms of trade.

Table C.1: Commodity Imports and Exports (1980 - 2019)

	Comm. Imp. (%)	Comm. Exp. (%)	Main Comm. Imports			Main Exports		
Algeria	30.8	92.8	Food	Wheat	Met. & Min.	Crude oil	Natural gas	Fertilizers
Argentina	18.7	71.5	Natural gas	Met. & Min.	Crude oil	Soybean meal	Food	Crude oil
Bangladesh	36.8	16.5	Crude oil	Wheat	Cotton	Food	Other Raw Mat.	Tea
Bolivia	20.4	93.1	Met. & Min.	Crude oil	Wheat	Natural gas	Tin	Gold
Brazil	33.7	55.8	Crude oil	Fertilizers	Food	Iron ore	Coffee	Crude oil
Burkina Faso	29.4	92.2	Food	Crude oil	Met. & Min.	Cotton	Gold	Oils & Meals
Cameroon	32.6	94.6	Crude oil	Food	Met. & Min.	Crude oil	Timber	Cocoa
Chad	21.1	95.0	Food	Met. & Min.	Wheat	Cotton	Crude oil	Other Raw Mat.
Colombia	20.9	74.2	Crude oil	Food	Met. & Min.	Crude oil	Coffee	Coal
Congo, Dem. Rep.	29.4	68.4	Food	Crude oil	Met. & Min.	Copper	Met. & Min.	Crude oil
Cote d'Ivoire	40.6	89.9	Crude oil	Food	Rice	Cocoa	Coffee	Timber
Dominican Republic	29.4	38.0	Crude oil	Food	Met. & Min.	Sugar	Tobacco	Gold
Egypt, Arab Rep.	39.1	67.5	Wheat	Food	Met. & Min.	Crude oil	Food	Cotton
Equatorial Guinea	30.4	95.3	Met. & Min.	Beverages	Food	Crude oil	Timber	Cocoa
Gabon	23.3	95.7	Met. & Min.	Food	Crude oil	Crude oil	Timber	Met. & Min.
Ghana	27.9	88.6	Crude oil	Food	Met. & Min.	Cocoa	Aluminum	Gold
Guatemala	29.9	62.9	Crude oil	Food	Met. & Min.	Coffee	Food	Sugar
Honduras	28.2	59.8	Crude oil	Food	Met. & Min.	Coffee	Banana	Food
India	41.9	33.4	Crude oil	Gold	Fertilizers	Food	Crude oil	Met. & Min.
Indonesia	34.4	63.4	Crude oil	Met. & Min.	Food	Crude oil	Natural gas	Food
Jordan	37.1	57.9	Crude oil	Food	Met. & Min.	Fertilizers	Food	Met. & Min.
Kenya	29.7	77.0	Crude oil	Palm oil	Met. & Min.	Tea	Coffee	Food
Madagascar	26.6	69.4	Rice	Met. & Min.	Food	Food	Coffee	Met. & Min.
Malawi	23.3	90.3	Fertilizers	Met. & Min.	Food	Tobacco	Tea	Sugar
Malaysia	29.5	41.5	Food	Crude oil	Met. & Min.	Sugar	Food	Precious
Mauritius	19.8	34.1	Met. & Min.	Crude oil	Food	Crude oil	Food	Met. & Min.
Mexico	36.1	48.7	Crude oil	Wheat	Fertilizers	Food	Fertilizers	Orange
Morocco	29.1	34.5	Food	Met. & Min.	Tobacco	Crude oil	Met. & Min.	Food
Niger	24.4	96.6	Food	Met. & Min.	Crude oil	Crude oil	Natural gas	Cocoa
Nigeria	42.9	25.5	Crude oil	Palm oil	Fertilizers	Rice	Cotton	Food
Pakistan	30.2	84.1	Crude oil	Food	Met. & Min.	Copper	Gold	Zinc
Panama	28.2	28.1	Crude oil	Food	Met. & Min.	Food	Coconut oil	Copper
Peru	42.4	77.5	Crude oil	Food	Rice	Food	Oils & Meals	Fertilizers
Philippines	20.7	58.8	Crude oil	Met. & Min.	Food	Gold	Platinum	Coal
Senegal	27.0	96.9	Wheat	Food	Met. & Min.	Crude oil	Cotton	Grains
South Africa	30.8	38.0	Crude oil	Met. & Min.	Food	Food	Rice	Rubber
Sudan	31.3	33.7	Crude oil	Iron ore	Other Raw Mat.	Food	Met. & Min.	Crude oil
Thailand	31.6	61.3	Crude oil	Food	Met. & Min.	Beef	Food	Rice
Tunisia	28.6	35.8	Crude oil	Met. & Min.	Wheat	Crude oil	Food	Fertilizers
Türkiye	31.9	34.2	Crude oil	Iron ore	Other Raw Mat.	Food	Met. & Min.	Crude oil
Uruguay	31.7	60.5	Crude oil	Food	Fertilizers	Beef	Food	Rice
Median	29.7	63.4						

Table C.2: Commodity Imports and Exports (1980 - 1989)

	Comm. Imp. %	Comm. Exp. %	Main Imports						Main Exports					
Algeria	29.7	97.5	Met. & Min.	6.5	Food	5.0	Wheat	4.8	Crude oil	76.7	Natural gas	19.8	Beverages	0.3
Argentina	25.0	76.2	Natural gas	5.1	Crude oil	3.5	Met. & Min.	2.4	Food	10.0	Soybean meal	7.2	Soybeans	7.0
Bangladesh	42.5	36.2	Wheat	8.5	Crude oil	7.7	Cotton	5.9	Other R. M.	13.2	Food	11.9	Tea	4.8
Bolivia	17.2	96.0	Met. & Min.	6.2	Wheat	4.1	Food	2.6	Natural gas	39.4	Tin	25.6	Gold	6.4
Brazil	46.5	59.3	Crude oil	21.1	Wheat	5.1	Fertilizers	3.3	Coffee	11.1	Iron ore	9.2	Soybean meal	6.9
Burkina Faso	30.0	94.0	Food	8.4	Met. & Min.	4.7	Crude oil	4.6	Cotton	35.0	Oils & Meals	20.3	Gold	14.8
Cameroon	22.7	96.8	Met. & Min.	6.1	Crude oil	3.6	Food	3.5	Crude oil	49.3	Cocoa	14.5	Coffee	13.9
Chad	21.6	93.4	Food	5.6	Wheat	2.7	Rice	2.1	Cotton	79.0	Crude oil	5.9	Other R. M.	5.1
Colombia	23.7	82.6	Crude oil	8.1	Met. & Min.	2.7	Food	2.3	Coffee	50.0	Crude oil	10.9	Banana	7.1
Congo, Dem. Rep.	21.0	80.8	Crude oil	6.6	Food	4.1	Met. & Min.	3.3	Copper	37.3	Crude oil	13.7	Coffee	12.4
Cote d'Ivoire	35.2	93.7	Crude oil	11.4	Food	8.9	Met. & Min.	4.5	Cocoa	31.5	Coffee	24.1	Timber	15.2
Dominican Republic	27.3	61.0	Food	4.9	Met. & Min.	3.9	Fertilizers	3.0	Sugar	21.3	Coffee	8.9	Gold	7.2
Egypt, Arab Rep.	35.8	89.3	Wheat	6.5	Food	5.2	Met. & Min.	3.7	Crude oil	72.8	Cotton	7.8	Aluminum	2.8
Equatorial Guinea	36.5	94.7	Fertilizers	7.2	Food	6.3	Beverages	6.2	Cocoa	45.0	Timber	31.3	Orange	6.0
Gabon	17.5	93.4	Met. & Min.	6.8	Food	3.1	Crude oil	1.6	Crude oil	74.1	Timber	10.3	Met. & Min.	7.1
Ghana	28.4	94.7	Crude oil	6.1	Aluminum	5.5	Food	5.0	Cocoa	53.0	Aluminum	22.7	Timber	7.3
Guatemala	29.8	82.3	Crude oil	8.4	Met. & Min.	4.1	Food	3.9	Coffee	37.2	Food	10.6	Cotton	8.0
Honduras	22.6	90.2	Crude oil	5.3	Food	4.8	Met. & Min.	4.1	Banana	35.8	Coffee	22.3	Food	9.9
India	34.1	44.6	Crude oil	9.4	Fertilizers	4.8	Met. & Min.	2.2	Food	7.4	Crude oil	6.4	Iron ore	5.7
Indonesia	33.5	91.0	Crude oil	15.8	Met. & Min.	3.3	Rice	2.0	Crude oil	52.0	Natural gas	14.8	Timber	4.9
Jordan	39.0	71.1	Crude oil	13.5	Food	5.8	Met. & Min.	3.7	Fertilizers	44.5	Food	9.7	Crude oil	4.1
Kenya	29.5	87.5	Crude oil	13.2	Met. & Min.	2.9	Palm oil	2.4	Coffee	33.5	Tea	23.8	Food	9.5
Madagascar	31.7	91.7	Rice	12.2	Crude oil	5.4	Met. & Min.	3.7	Food	40.8	Coffee	32.8	Met. & Min.	5.2
Malawi	10.9	96.0	Met. & Min.	3.7	Food	1.8	Fertilizers	0.9	Tobacco	57.2	Tea	19.3	Sugar	10.2
Malaysia	31.3	71.0	Crude oil	11.5	Food	3.9	Met. & Min.	2.9	Crude oil	19.0	Timber	15.0	Rubber	13.0
Mauritius	23.9	58.9	Food	7.3	Met. & Min.	3.2	Other R. M.	1.9	Sugar	52.5	Food	2.9	Tea	1.6
Mexico	23.7	62.8	Met. & Min.	3.5	Maize	2.3	Other R. M.	2.2	Crude oil	43.2	Food	5.7	Coffee	2.2
Morocco	37.7	67.0	Crude oil	9.2	Wheat	4.5	Fertilizers	4.0	Fertilizers	27.4	Food	17.9	Orange	8.9
Niger	22.8	14.3	Met. & Min.	4.1	Food	3.8	Crude oil	3.5	Met. & Min.	7.1	Crude oil	2.8	Other R. M.	1.0
Nigeria	25.6	99.3	Food	6.2	Crude oil	6.0	Met. & Min.	4.9	Crude oil	95.7	Cocoa	2.1	Other R. M.	0.3
Pakistan	45.2	39.2	Crude oil	20.3	Fertilizers	3.8	Tea	3.0	Cotton	13.6	Rice	9.7	Food	4.7
Panama	20.6	49.2	Crude oil	8.5	Food	3.0	Met. & Min.	2.9	Banana	18.8	Food	12.7	Crude oil	5.5
Peru	25.8	88.7	Met. & Min.	3.6	Wheat	3.6	Food	2.8	Crude oil	18.4	Copper	17.7	Zinc	10.0
Philippines	32.0	54.4	Crude oil	13.9	Food	2.9	Met. & Min.	2.3	Coconut oil	8.0	Food	7.6	Copper	7.0
Senegal	36.3	92.4	Food	8.0	Crude oil	6.1	Rice	5.1	Food	35.7	Oils & Meals	18.5	Fertilizers	17.4
South Africa	12.5	65.6	Met. & Min.	3.5	Other R. M.	1.5	Food	1.2	Coal	10.4	Gold	9.1	Platinum	8.9
Sudan	33.0	96.0	Crude oil	7.3	Wheat	5.9	Food	4.2	Cotton	35.3	Other R. M.	16.3	Grains	8.8
Thailand	30.3	66.2	Crude oil	11.3	Food	2.9	Met. & Min.	2.8	Food	22.9	Rice	11.8	Rubber	7.4
Tunisia	33.2	56.9	Crude oil	11.4	Met. & Min.	3.5	Wheat	2.9	Crude oil	32.0	Fertilizers	10.1	Food	9.7
Türkiye	37.2	59.0	Crude oil	21.5	Fertilizers	2.3	Iron ore	1.9	Food	14.6	Grains	7.7	Crude oil	7.7
Uruguay	31.9	61.4	Crude oil	12.7	Other R. M.	2.6	Fertilizers	2.6	Gold	15.9	Beef	12.6	Other R. M.	9.9
Median	29.7	82.3		7.3		3.9		3.0		35.3		11.9		7.1

Table C.3: Commodity Imports and Exports (1990 - 1999)

	Comm. Imp. %	Comm. Exp. %	Main Imports						Main Exports					
Algeria	36.9	85.6	Food	8.4	Wheat	8.0	Met. & Min.	3.2	Crude oil	60.6	Natural gas	23.9	Fertilizers	0.3
Argentina	18.1	69.7	Met. & Min.	2.7	Food	2.1	Crude oil	2.0	Food	11.8	Soybean meal	9.0	Crude oil	8.4
Bangladesh	31.9	15.6	Wheat	5.0	Crude oil	4.9	Food	3.8	Food	9.3	Other R. M.	2.8	Fertilizers	1.2
Bolivia	22.6	91.2	Wheat	4.8	Met. & Min.	3.7	Food	3.3	Natural gas	17.4	Tin	11.4	Gold	8.8
Brazil	30.6	49.3	Crude oil	7.9	Food	3.9	Coal	2.5	Iron ore	7.9	Coffee	4.9	Soybean meal	4.9
Burkina Faso	27.8	92.2	Food	6.9	Crude oil	5.2	Met. & Min.	3.5	Cotton	55.5	Gold	16.7	Food	7.4
Cameroon	28.8	96.4	Met. & Min.	4.7	Food	4.6	Crude oil	4.0	Crude oil	40.0	Timber	21.0	Cocoa	8.6
Chad	25.6	95.3	Wheat	5.5	Food	3.9	Met. & Min.	3.8	Cotton	83.0	Other R. M.	11.1	Oils & Meals	0.6
Colombia	21.4	72.8	Crude oil	3.8	Food	2.6	Met. & Min.	2.3	Coffee	22.1	Crude oil	21.8	Banana	7.2
Congo, Dem. Rep.	26.3	53.9	Food	5.4	Wheat	4.4	Met. & Min.	2.8	Copper	16.2	Met. & Min.	12.3	Crude oil	10.4
Cote d'Ivoire	30.6	90.0	Food	9.6	Crude oil	6.2	Met. & Min.	3.3	Cocoa	38.9	Timber	11.0	Coffee	10.8
Dominican Republic	26.2	24.6	Crude oil	7.6	Food	4.0	Met. & Min.	2.6	Sugar	4.7	Tobacco	4.0	Precious	3.6
Egypt, Arab Rep.	38.1	70.0	Wheat	9.2	Food	4.0	Timber	3.5	Crude oil	52.9	Food	4.8	Cotton	3.0
Equatorial Guinea	43.1	94.1	Beverages	9.2	Met. & Min.	7.5	Food	6.5	Timber	54.3	Crude oil	23.5	Cocoa	10.5
Gabon	22.6	97.0	Food	5.5	Met. & Min.	4.6	Beef	1.8	Crude oil	73.3	Timber	14.7	Met. & Min.	8.0
Ghana	24.3	80.2	Met. & Min.	4.5	Crude oil	4.0	Food	3.4	Cocoa	33.9	Aluminum	17.4	Timber	11.5
Guatemala	29.9	59.5	Crude oil	9.9	Food	4.4	Met. & Min.	3.0	Coffee	20.7	Food	10.0	Sugar	8.2
Honduras	29.8	57.2	Crude oil	10.2	Food	5.7	Met. & Min.	3.0	Banana	17.1	Food	15.9	Coffee	14.2
India	36.1	30.2	Crude oil	12.3	Fertilizers	3.7	Gold	2.8	Food	5.1	Met. & Min.	3.7	Iron ore	2.8
Indonesia	28.8	54.7	Crude oil	8.7	Met. & Min.	2.8	Other R. M.	2.5	Crude oil	16.1	Natural gas	10.7	Food	5.6
Jordan	34.0	71.1	Food	5.8	Sugar	3.8	Wheat	3.6	Fertilizers	55.4	Food	5.1	Sheep	3.3
Kenya	24.0	80.6	Crude oil	4.3	Met. & Min.	2.9	Sugar	2.2	Tea	25.9	Coffee	19.2	Food	17.6
Madagascar	22.1	74.9	Food	4.7	Met. & Min.	3.7	Crude oil	2.3	Food	42.8	Coffee	13.4	Met. & Min.	4.6
Malawi	22.1	90.8	Fertilizers	5.3	Met. & Min.	4.4	Maize	2.7	Tobacco	67.2	Tea	9.4	Sugar	5.5
Mauritius	25.4	34.0	Food	6.3	Crude oil	4.0	Met. & Min.	2.7	Sugar	26.3	Food	3.3	Precious	1.6
Mexico	20.6	28.0	Met. & Min.	4.5	Food	2.6	Crude oil	2.1	Crude oil	14.0	Food	4.3	Met. & Min.	2.5
Morocco	38.9	46.1	Crude oil	11.0	Wheat	3.9	Fertilizers	3.0	Food	19.4	Fertilizers	13.0	Orange	5.3
Niger	29.5	20.3	Food	6.2	Sugar	3.6	Met. & Min.	3.5	Crude oil	15.6	Cotton	0.9	Food	0.8
Nigeria	20.0	98.3	Food	4.3	Met. & Min.	4.0	Crude oil	2.8	Crude oil	93.8	Cocoa	1.7	Rubber	0.8
Pakistan	42.7	18.9	Crude oil	12.7	Wheat	5.3	Palm oil	5.2	Cotton	6.8	Food	2.9	Rice	2.6
Peru	32.9	82.0	Crude oil	8.1	Wheat	4.0	Food	3.6	Copper	20.6	Zinc	12.6	Food	8.6
Philippines	27.9	27.5	Crude oil	10.5	Food	2.8	Met. & Min.	1.7	Food	6.8	Copper	3.4	Coconut oil	3.2
Senegal	40.0	86.6	Food	8.1	Crude oil	5.9	Rice	5.7	Food	44.6	Oils & Meals	14.2	Fertilizers	11.2
South Africa	15.4	64.7	Met. & Min.	2.9	Crude oil	2.3	Food	1.3	Gold	13.6	Platinum	9.2	Coal	8.6
Sudan	29.5	95.8	Wheat	8.1	Food	6.3	Met. & Min.	3.2	Cotton	29.1	Grains	17.9	Other R. M.	17.4
Thailand	25.2	34.2	Crude oil	8.6	Met. & Min.	3.3	Food	2.7	Food	14.4	Rice	4.4	Rubber	3.6
Türkiye	33.3	30.6	Crude oil	11.2	Iron ore	3.0	Other R. M.	2.6	Food	10.3	Met. & Min.	3.5	Tobacco	2.8
Uruguay	26.6	51.7	Crude oil	8.2	Food	2.9	Met. & Min.	2.4	Beef	11.8	Food	11.5	Rice	6.8
Median	26.6	69.7		6.2		4.0		2.8		20.6		10.3		5.5

Table C.4: Commodity Imports and Exports (2000 - 2009)

	Comm. Imp.	Comm. Exp.	Main Imports						Main Exports					
Algeria	29.8	96.1	Food	6.9	Wheat	6.5	Met. & Min.	3.2	Crude oil	67.0	Natural gas	28.0	Fertilizers	0.3
Argentina	15.9	70.9	Met. & Min.	2.6	Crude oil	2.2	Fertilizers	1.8	Crude oil	12.7	Soybean meal	10.8	Food	9.9
Bangladesh	37.5	7.8	Crude oil	7.8	Cotton	4.7	Food	3.8	Food	5.2	Other Raw Mat.	1.0	Fertilizers	0.6
Bolivia	25.4	89.3	Crude oil	7.4	Food	3.6	Met. & Min.	3.4	Natural gas	29.8	Soybean meal	11.7	Crude oil	7.2
Brazil	31.4	51.2	Crude oil	13.1	Fertilizers	3.4	Food	2.1	Iron ore	8.5	Crude oil	5.4	Soybeans	4.8
Burkina Faso	31.7	89.8	Crude oil	7.0	Food	6.0	Met. & Min.	3.1	Cotton	66.2	Grains	6.5	Sugar	4.1
Cameroon	35.5	96.1	Crude oil	13.1	Food	4.5	Met. & Min.	3.4	Crude oil	47.2	Timber	18.9	Banana	8.0
Chad	19.2	96.2	Met. & Min.	4.5	Wheat	4.1	Food	3.6	Crude oil	49.1	Cotton	39.0	Other Raw Mat.	7.4
Colombia	20.5	65.8	Food	3.1	Crude oil	2.5	Met. & Min.	2.1	Crude oil	25.5	Coal	12.8	Coffee	7.6
Congo, Dem. Rep.	36.3	49.8	Food	7.6	Wheat	5.3	Crude oil	4.6	Met. & Min.	22.8	Crude oil	12.5	Copper	6.3
Cote d'Ivoire	46.2	93.2	Crude oil	19.5	Rice	8.2	Food	6.8	Cocoa	45.6	Crude oil	14.2	Food	7.6
Dominican Republic	30.7	22.8	Crude oil	10.0	Food	4.6	Met. & Min.	2.7	Tobacco	5.2	Precious	4.0	Food	2.7
Egypt, Arab Rep.	43.5	58.6	Wheat	6.3	Crude oil	5.5	Food	3.9	Crude oil	28.2	Natural gas	8.1	Food	6.3
Equatorial Guinea	20.8	95.9	Met. & Min.	7.2	Beverages	4.0	Food	2.7	Crude oil	87.2	Timber	4.4	Natural gas	3.0
Gabon	27.1	96.1	Food	5.6	Met. & Min.	4.7	Crude oil	3.1	Crude oil	73.6	Timber	14.1	Met. & Min.	7.4
Ghana	33.4	87.5	Crude oil	12.9	Food	4.3	Met. & Min.	3.5	Cocoa	45.3	Food	11.4	Timber	7.5
Guatemala	32.8	49.4	Crude oil	13.1	Food	4.8	Met. & Min.	2.8	Food	11.3	Coffee	10.2	Banana	6.4
Honduras	34.2	29.9	Crude oil	13.4	Food	6.2	Met. & Min.	2.6	Food	9.3	Coffee	6.8	Banana	4.0
India	42.7	31.1	Crude oil	13.0	Gold	8.8	Coal	2.8	Crude oil	5.8	Food	3.8	Met. & Min.	3.6
Indonesia	44.6	48.4	Crude oil	23.7	Food	2.6	Other Raw Mat.	2.6	Crude oil	10.7	Natural gas	7.7	Coal	4.4
Jordan	35.4	45.3	Crude oil	10.7	Food	4.6	Wheat	2.2	Fertilizers	27.8	Food	6.2	Met. & Min.	2.6
Kenya	36.4	74.3	Crude oil	17.4	Palm oil	2.8	Met. & Min.	2.3	Tea	18.8	Food	18.1	Other Raw Mat.	15.3
Madagascar	22.3	50.4	Food	4.8	Met. & Min.	3.7	Crude oil	2.3	Food	39.1	Other Raw Mat.	2.3	Met. & Min.	1.9
Malawi	29.7	87.8	Crude oil	5.4	Fertilizers	4.2	Tobacco	4.2	Tobacco	61.0	Tea	8.7	Sugar	8.2
Malaysia	32.0	33.9	Crude oil	8.5	Food	8.0	Met. & Min.	2.8	Sugar	17.6	Food	9.2	Precious	2.8
Mauritius	18.4	22.5	Met. & Min.	4.4	Crude oil	3.1	Food	1.9	Crude oil	12.6	Food	3.1	Met. & Min.	2.6
Mexico	34.8	40.5	Crude oil	11.2	Wheat	3.4	Natural gas	2.7	Food	17.4	Fertilizers	9.8	Crude oil	3.6
Morocco	31.6	36.3	Food	6.8	Tobacco	4.8	Palm oil	3.8	Crude oil	29.0	Natural gas	1.8	Food	1.2
Niger	26.6	98.4	Food	5.9	Crude oil	4.2	Wheat	3.7	Crude oil	90.7	Natural gas	5.2	Cocoa	1.1
Nigeria	44.6	18.0	Crude oil	20.0	Palm oil	4.1	Cotton	2.3	Rice	5.5	Food	3.0	Crude oil	2.4
Pakistan	35.6	81.3	Crude oil	15.1	Food	2.7	Met. & Min.	2.6	Copper	19.5	Gold	12.1	Food	9.8
Panama	24.9	12.2	Crude oil	11.3	Food	2.5	Wheat	1.1	Food	2.7	Banana	1.5	Copper	1.2
Peru	48.2	72.4	Crude oil	17.2	Rice	6.9	Food	6.7	Food	37.6	Crude oil	9.5	Oils & Meals	7.5
Philippines	27.0	52.2	Crude oil	15.1	Met. & Min.	2.1	Food	1.3	Platinum	11.1	Gold	7.6	Coal	6.5
Senegal	19.2	98.3	Wheat	4.0	Food	3.9	Met. & Min.	3.9	Crude oil	77.5	Grains	5.7	Sheep	4.3
South Africa	31.4	25.0	Crude oil	14.1	Met. & Min.	3.5	Food	2.4	Food	7.9	Crude oil	3.1	Rubber	3.0
Sudan	30.2	20.5	Crude oil	10.2	Iron ore	2.8	Gold	2.5	Food	6.1	Met. & Min.	3.9	Crude oil	2.7
Thailand	37.3	59.5	Crude oil	18.5	Food	3.9	Fertilizers	2.4	Beef	15.3	Food	13.1	Rice	5.7
Tunisia	27.1	27.8	Crude oil	7.9	Natural gas	2.9	Met. & Min.	2.7	Crude oil	11.1	Food	7.2	Fertilizers	4.8
Türkiye	28.0	21.7	Crude oil	7.4	Iron ore	3.3	Gold	2.7	Food	6.2	Met. & Min.	4.5	Crude oil	2.0
Uruguay	34.6	65.0	Crude oil	16.0	Food	3.9	Fertilizers	2.6	Beef	16.3	Food	13.0	Soybeans	7.5
Median	31.6	52.2		10.0		4.1		2.7		18.8		7.7		4.4

Table C.5: Commodity Imports and Exports (2010 - 2019)

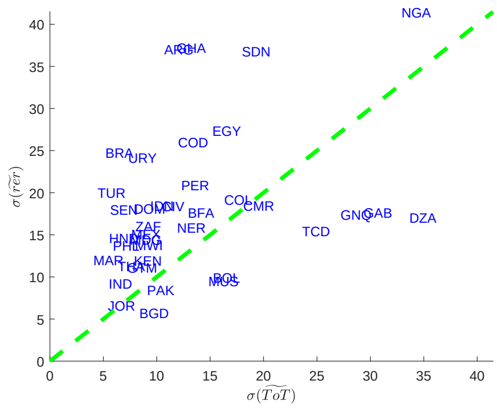
	Comm. Imp.	Comm. Exp.	Main Imports						Main Exports					
Algeria	26.8	91.8	Food	5.4	Met. & Min.	4.3	Wheat	4.3	Crude oil	48.3	Natural gas	41.6	Fertilizers	1.0
Argentina	15.7	69.1	Natural gas	4.4	Met. & Min.	2.4	Fertilizers	1.5	Soybean meal	15.6	Food	10.0	Soybean oil	6.1
Bangladesh	35.1	6.5	Palm oil	5.4	Cotton	5.2	Fertilizers	4.4	Food	3.2	Other Raw Mat.	1.4	Met. & Min.	0.4
Bolivia	16.3	95.7	Met. & Min.	3.4	Food	3.3	Crude oil	2.8	Natural gas	44.1	Gold	12.6	Zinc	8.6
Brazil	26.4	63.5	Crude oil	6.4	Fertilizers	4.2	Food	2.9	Iron ore	11.5	Soybeans	8.9	Crude oil	7.4
Burkina Faso	27.9	92.8	Food	4.0	Fertilizers	3.5	Met. & Min.	3.3	Gold	55.9	Cotton	21.1	Grains	9.1
Cameroon	43.5	88.9	Crude oil	15.2	Food	7.4	Rice	4.9	Crude oil	39.4	Cocoa	18.8	Timber	12.3
Chad	17.9	95.0	Met. & Min.	6.0	Food	3.3	Wheat	2.5	Crude oil	89.2	Other Raw Mat.	2.7	Met. & Min.	1.7
Colombia	18.0	75.6	Food	3.4	Met. & Min.	2.3	Maize	2.0	Crude oil	36.4	Coal	14.7	Coffee	6.5
Congo, Dem. Rep.	34.1	89.0	Met. & Min.	6.5	Food	6.2	Crude oil	5.7	Copper	43.2	Met. & Min.	28.9	Crude oil	12.3
Cote d'Ivoire	50.2	82.5	Crude oil	23.0	Food	6.7	Rice	6.4	Cocoa	40.4	Crude oil	9.8	Rubber	6.2
Dominican Republic	33.4	43.6	Crude oil	7.4	Food	5.5	Natural gas	3.6	Gold	11.4	Tobacco	7.6	Food	4.6
Egypt, Arab Rep.	39.2	52.0	Food	4.8	Crude oil	4.2	Natural gas	3.8	Crude oil	12.1	Food	11.1	Gold	6.3
Equatorial Guinea	21.2	96.5	Met. & Min.	8.9	Beverages	4.0	Food	2.4	Crude oil	76.7	Natural gas	18.4	Timber	0.9
Gabon	26.0	96.2	Met. & Min.	5.3	Food	5.2	Chicken	2.7	Crude oil	72.9	Met. & Min.	13.3	Timber	8.7
Ghana	25.5	92.1	Food	5.5	Met. & Min.	4.6	Rice	3.0	Gold	34.7	Cocoa	23.2	Crude oil	14.1
Guatemala	27.0	60.2	Food	5.9	Crude oil	3.5	Met. & Min.	2.8	Food	13.2	Sugar	9.6	Coffee	7.9
Honduras	26.4	62.0	Food	7.4	Crude oil	3.5	Met. & Min.	2.5	Coffee	20.2	Food	14.3	Palm oil	5.3
India	54.6	27.6	Crude oil	25.1	Gold	8.8	Coal	3.6	Precious	4.4	Food	3.6	Met. & Min.	2.8
Indonesia	30.5	59.7	Crude oil	9.2	Food	3.0	Met. & Min.	2.7	Coal	11.4	Palm oil	10.3	Natural gas	7.2
Jordan	40.0	44.2	Crude oil	10.1	Food	5.9	Natural gas	3.7	Fertilizers	20.7	Food	10.8	Met. & Min.	2.8
Kenya	29.1	65.4	Crude oil	10.4	Palm oil	3.4	Met. & Min.	2.4	Tea	21.2	Other Raw Mat.	12.9	Food	12.3
Madagascar	30.2	60.5	Met. & Min.	5.7	Food	4.8	Rice	3.6	Food	29.7	Nickel	13.3	Met. & Min.	8.6
Malawi	30.4	86.7	Fertilizers	9.7	Met. & Min.	3.4	Tobacco	3.1	Tobacco	48.2	Sugar	9.3	Tea	6.3
Malaysia	36.6	39.2	Food	13.8	Crude oil	3.0	Met. & Min.	3.0	Food	19.2	Sugar	11.8	Precious	1.8
Mauritius	16.4	23.0	Met. & Min.	3.7	Food	2.0	Natural gas	1.4	Crude oil	9.1	Food	4.0	Met. & Min.	2.6
Mexico	33.0	41.1	Crude oil	7.4	Natural gas	4.2	Met. & Min.	3.0	Food	16.1	Fertilizers	13.7	Met. & Min.	2.7
Morocco	32.6	67.1	Rice	6.9	Food	6.7	Met. & Min.	2.9	Met. & Min.	38.7	Rice	6.2	Palm oil	5.8
Niger	25.5	90.3	Food	6.7	Met. & Min.	4.0	Wheat	3.6	Crude oil	76.4	Natural gas	8.9	Rubber	1.6
Nigeria	39.2	25.9	Crude oil	12.9	Palm oil	4.5	Food	3.2	Rice	8.7	Food	4.8	Met. & Min.	2.2
Pakistan	26.5	84.3	Crude oil	8.2	Met. & Min.	3.2	Food	2.9	Copper	26.1	Gold	21.7	Food	10.7
Panama	27.9	18.4	Crude oil	9.0	Food	4.0	Met. & Min.	1.6	Food	3.7	Copper	2.1	Coconut oil	2.0
Peru	44.9	58.5	Crude oil	12.8	Rice	6.7	Food	5.7	Food	24.0	Gold	11.9	Met. & Min.	4.3
Philippines	28.0	52.8	Crude oil	14.2	Met. & Min.	2.2	Food	1.9	Platinum	8.5	Gold	7.9	Met. & Min.	7.3
Senegal	26.5	97.5	Sugar	6.0	Food	5.8	Met. & Min.	4.1	Crude oil	48.1	Gold	27.3	Grains	8.9
South Africa	36.3	26.6	Crude oil	13.5	Gold	4.3	Met. & Min.	3.9	Food	7.2	Rubber	3.4	Met. & Min.	3.0
Sudan	24.5	24.8	Iron ore	3.5	Gold	3.0	Crude oil	2.5	Food	6.5	Met. & Min.	5.3	Gold	4.0
Thailand	30.5	72.6	Crude oil	10.9	Food	4.4	Fertilizers	2.7	Beef	22.4	Food	13.7	Soybeans	10.4
Tunisia	27.1	27.8	Crude oil	7.9	Natural gas	2.9	Met. & Min.	2.7	Crude oil	11.1	Food	7.2	Fertilizers	4.8
Türkiye	28.0	21.7	Crude oil	7.4	Iron ore	3.3	Gold	2.7	Food	6.2	Met. & Min.	4.5	Crude oil	2.0
Uruguay	34.6	65.0	Crude oil	16.0	Food	3.9	Fertilizers	2.6	Beef	16.3	Food	13.0	Soybeans	7.5
Median	28.0	63.5		7.4		4.0		2.9		20.7		10.8		6.1

Table C.6: Commodity Terms of Trade: Descriptive Statistics

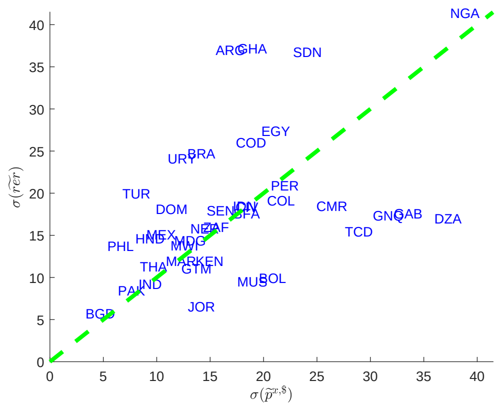
	$\sigma(\widetilde{p}_c^{x,\$})/\sigma(\widetilde{p}^{x,\$})$	$\sigma(\widetilde{p}_c^{m,\$})/\sigma(\widetilde{p}^{m,\$})$	$\sigma(\widetilde{ToT}^c)/\sigma(\widetilde{ToT})$
Median	1.47	2.94	0.76
# countries > 1	38	38	9

Notes: σ denotes standard deviation; $p_c^{x,\$}$ ($p_c^{m,\$}$) and $p^{x,\$}$ ($p^{x,\$}$) are the commodity export (import) price and our export (import) price indices, respectively; ToT^c is the commodity terms of trade measure while ToT is the terms of trade measure calculated using our export and import price indices. The standard deviations are the standard deviation of the percentage deviations of the series from the trends.

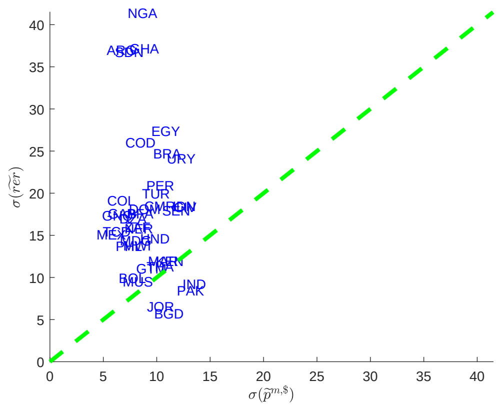
Figure C.1: Volatility of the Real Exchange Rate and the Terms of Trade



Volativity of RER vs. ToT



Volatility of RER vs. Export Prices



Volatility of RER vs. Import Prices

Notes: The first Figure shows the volatility of the RER, $\sigma(\widetilde{rer})$, *vis-à-vis* the volatility of ToT, $\sigma(\widetilde{ToT})$. The second Figure includes $\sigma(\widetilde{rer})$ *vis-à-vis* the volatility of the price of exports, $\sigma(\widetilde{p}^{x,\$})$. The last one depicts the volatility of RER *vis-à-vis* the volatility of the price of imports, $\sigma(\widetilde{p}^{m,\$})$.

Appendix D Derivations of IRFs and FEVDs

In this section we derive the closed form expressions for the impulse responses and the forecast error variance decomposition for the model introduced in Section 4. The dynamics of the foreign bloc of variables follows a VAR(1)

$$\mathbf{z}_{k,t} = \mathbf{a}_k + \mathbf{A}_{1k}\mathbf{z}_{k,t-1} + \mathbf{A}_{0k}^{-1}\mathbf{u}_{k,t},$$

with $\mathbf{u}_{k,t} \sim N(0,\mathbf{I})$ denoting the structural shocks with normalized variance. The dynamics of each country-specific variable is specified as

$$x_{ik,t} = \rho_{0k} + \rho_{1k}x_{ik,t-1} + \gamma_{0k}\mathbf{z}_{k,t} + \gamma_{1k}\mathbf{z}_{k,t-1} + \varepsilon_{ik,t},$$

where $\varepsilon_{k,t} \sim N\left(0,\sigma_k^2\right)$. The combination of the two equations allows us to compute recursively the IRFs associated to any of the specific shocks κ. Specifically, for horizon s:

$$IRF_{k,i}(s,\kappa) = \begin{cases} \gamma_{0k}\mathbf{A}_{0k}^{-1}\iota_\kappa & s=0 \\ \sum_{h=1}^{s}\left[\rho_{1k}^{h-1}\gamma_{1k}\mathbf{A}_{1k}^{s-h} + \rho_{1k}^{j}\gamma_{0k}\right]\mathbf{A}_{0k}^{-1}\iota_\kappa, & s>0 \end{cases}$$

where ι_κ is an $n \times 1$ selection vector of the same size of $\mathbf{z}_{k,t}$ and the only non zero element is in the κ-th place and is set to 1. Similarly, we can easily compute the s-steps ahead forecast error for each variable as

$$x_{ik,t+s} - \mathsf{E}_{t-1}(x_{ik,t+s}) = \sum_{j=0}^{s}\rho_{1k}^{j}\varepsilon_{ik,t-j} + \gamma_{0k}\mathbf{A}_{0k}^{-1}\mathbf{u}_{k,t} + \sum_{j=1}^{s}\sum_{h=1}^{j}\left[\rho_{1k}^{h-1}\gamma_{1k}\mathbf{A}_{1k}^{j-h} + \rho_{1k}^{j}\gamma_{0k}\right]\mathbf{A}_{0k}^{-1}\mathbf{u}_{k,t-j}.$$

Therefore the s-steps ahead forecast error variance can be written as

$$FEV_{k,i}(s) = \mathbf{B}_s\Omega_{u,k}\mathbf{B}_s' + b_s^2\sigma_{i,k}^2,$$

with $\Omega_{u,k} = \mathbf{A}_{0k}^{-1}\left(\mathbf{A}_{0k}^{-1}\right)'$, $\sigma_{i,k}^2 = \mathsf{Var}(\varepsilon_{ik,t})$, $\mathbf{B}_s = \gamma_{0k} + \sum_{j=1}^{s}\sum_{h=1}^{j}\left[\rho_{1k}^{h-1}\gamma_{1k}\mathbf{A}_{1k}^{j-h} + \rho_{1k}^{j}\gamma_{0k}\right]$ and $b_s^2 = \frac{1-\rho_{1k}^{s+1}}{1-\rho_{1k}}$. The share of variance associated with the shock κ can then be computed as

$$FEVD_{k,i}(s,\kappa) = \frac{\mathbf{B}_s\mathbf{A}_{0k}^{-1}\iota_\kappa\iota_\kappa'\left(\mathbf{A}_{0k}^{-1}\right)'\mathbf{B}_s'}{\mathbf{B}_s\Omega_{u,k}\mathbf{B}_s' + b_s^2\sigma_{i,k}^2}.$$

For $s=1$, this boils down to

$$FEVD_{k,i}(1,\kappa) = \frac{\gamma_{0k}\mathbf{A}_{0k}^{-1}\iota_\kappa\iota_\kappa'\left(\mathbf{A}_{0k}^{-1}\right)'\gamma_{0k}'}{\gamma_{0k}\Omega_{u,k}\gamma_{0k}' + \sigma_{i,k}^2}.$$

Summing over the contribution of all the foreign shocks we obtain $\gamma_{0k}\Omega_{u,k}\gamma_{0k}'/\left(\gamma_{0k}\Omega_{u,k}\gamma_{0k}' + \sigma_{i,k}^2\right)$ which is exactly what we report in Figure 1.

Appendix E Narrative Approach

This appendix outlines the steps followed to create a narrative series of exogenous price shocks for the analyzed commodities. To achieve this, we examined historical documents to identify instances of significant commodity price fluctuations that were not influenced by the state of the economy (i.e., were not demand-driven). Subsequently, we categorized each episode as a negative or positive price shock based on the direction of the price change. Ultimately, this classification will determine whether a country experiences a negative or positive export or import price shock depending on whether it is an exporter or importer of that particular commodity.

The series were constructed by using a number of sources: Food and Agriculture Organization (FAO) reports, publications from the International Monetary Fund (IMF) and the World Bank (WB), newspaper articles, academic papers and a number of online sources. In order to establish some rules at the time of selecting the dates, we followed the criteria listed below.

1. The event has to be important enough to affect a commodity market at a global level. Examples of these are natural disasters or weather related shocks in key areas where the commodity is produced, major geopolitical events, and unanticipated news on the volume of global production or demand of commodities.

2. The event should have an unambiguous effect on the price of the commodity.

3. The event has to be unrelated to important macroeconomic developments such as the global financial crisis or a US recession. This aims at eliminating endogenous responses of commodity prices to the state of the economy.

By using this criteria we were able to identify 27 episodes of exogenous commodity price shocks that are unrelated to business cycle fluctuations. Of these events, 18 are favorable commodity price shocks and 9 are negative price shocks. In what follows we document the dates selected, organizing the commodities in the following subgroups: (1) Agriculture: Food and Beverage Commodities, (2) Agriculture: Raw Materials, (3) Fertilizers, (4) Metals and Mineral Commodities. At the end of this section, we document some country-specific assumptions.

E.1 Agriculture: Food and Beverage Commodities

i. Coffee

Year of Event: 1986.
Type of Event: Positive price shock.

A report from the International Coffee Organization (ICO) states that in 1986 Arabicas were in short supply following a drought in Brazil which triggered a large price increase.[12] In fact, our data show that between 1985 and 1986 Arabica coffee prices increased from 3.23 dollars per kilo to 4.29 dollars per kilo.

According to the IMF Primary Commodities Report from May 1987, "a prolonged period of dry weather in 1985 in the major coffee producing states of Parana, São Paulo, and Minas Gerais seriously disrupted and greatly reduced the flowering of coffee trees, which normally occurs between mid-September and early November. The rains that occurred in early November and in early December were insufficient to reverse the damage caused ot the 1986

[12]Report available at: `http://www.ico.org/news/icc-111-5-r1e-world-coffee-outlook.pdf`.

crop. The 1986 crop in Brazil (April 1986-March 1987) was about 11 million 60-kilogram bags compared with the 26-28 million bag harvest which might have been expected with normal weather on an off-year in the two-year Brazilian production cycle." The same report highlights that coffee prices in 1986 averaged two thirds above those in the third quarter of 1985.

Newspaper Articles. A number of newspaper articles document the severity of the drought and the consequences on prices. An example is listed below.

Drought Damages Brazilian Coffee, The Washington Post (January 29, 1986):[13]

"A six-month drought has destroyed more than half of Brazil's coffee crop, leaving many local farmers devastated while promising large financial gains for speculators with coffee beans to hoard, as the cost of a cup of coffee rises around the world."

Year of Event: 1994.
Type of Event: Positive price shock.

According to a report from the International Coffee Organization (ICO), climate shocks which affected coffee prices were recorded in Brazil in 1994.[14] Our data are in line with this observation given that we observe that Arabica coffee prices increased from 1.56 dollars per kilo in 1993 to 3.31 in 1994.

Newspaper Articles. A newspaper article from the New York Times documents that the climate shock of 1994 in Brazil is related to a frost. Some important aspects of the article are quoted in what follows.

New Frost Hits Brazilian Coffee, New York Times (July 11, 1994):[15]

"Frost struck in Brazil's biggest coffee-growing state early today, and farmers said the effects were harsher than a freeze that hit two weeks ago."

"(...)Coffee prices soared after the previous cold snap late last month, which destroyed one-third of next year's crop. Brazil is the largest coffee producer, accounting for about a quarter of world production. A threat to its crop can drastically affect world coffee prices(...)."

ii. Cereal[16]

Year of Event: 1985.
Type of Event: Negative price shock.

De Winne and Peersman (2016) document that favorable weather in North America and exceptionally good cereal harvest in Western Europe in the fourth quarter of 1984 led to a decline in cereal prices. A report from the FAO indicates that "In developed countries food and agricultural production has gone up between 5% and 5.5%. Much of this increase is a consequence of the North American recovery from the sharp decline of 1983, reflecting both

[13] Article available at: `https://www.washingtonpost.com/archive/politics/1986/01/29/drought-damages-brazilian-coffee/94a07436-4f78-4f46-b4e7-d3924b13a2e3/?utm_term=.4fd4b80da637`.

[14] Report available at: `http://www.ico.org/news/icc-111-5-r1e-world-coffee-outlook.pdf`.

[15] Article available at: `https://www.nytimes.com/1994/07/11/business/new-frost-hits-brazil-coffee.html`.

[16] In our sample, we use cereal as a proxy for the category "food" as we observe that many countries are net food importers and evidence suggests that cereals are by far the most important source of food consumption. This fact is documented by the FAO and further information can be found at `http://www.fao.org/docrep/006/Y4683E/y4683e06.htm`.

increased plantings and favorable weather. Western Europe also had exceptionally good harvests of cereals, and some progress was made in the USSR and Eastern Europe."[17] Our data reveal a decline in grain prices from 1984 to 1985, when the index went from 63.27 to 53.54.

Year of Event: 1988.
Type of Event: Positive price shock.

As it will be explained below, in 1988 we observe positive price shocks for wheat, corn and soybean, therefore implying a positive price shock for cereal.

Year of Event: 1997.
Type of Event: Negative price shock.

As documented in De Winne and Peersman (2016), in 1996 the FAO issued a favorable forecast for world 1996 cereal output.[18] The largest increase was expected in coarse grains output, mostly in developed countries. Overall, global cereal production increased by 7.8 percent that year and this translated into lower prices. Our data show that the cereal price index experienced a sharp reduction from 1996 to 1997, going from 83.61 to 64.76.

Year of Event: 2010.
Type of Event: Positive price shock.

De Winne and Peersman (2016) report that cereal output was seriously affected by adverse weather conditions in key producing countries in Europe. A group of countries that includes the Russian Federation, Kazakhstan and Ukraine suffered from a heatwave and droughts while the Republic of Moldova had floods. According to a report from the FAO, "International prices of grain have surged since the beginning of July in response to drought-reduced crops in CIS exporting countries and a subsequent decision by the Russian Federation to ban exports."[19]

iii. Cocoa

Year of Event: 2002.
Type of Event: Positive price shock.

According to a report from the International Cocoa Organization, the increase in cocoa prices in 2002 was largely due to an attempted coup on 19th September in Cote d'Ivore, which is the leading cocoa producing country. Uncertainty over potential disruptions emanating from the sociopolitical crisis and civil war pushed prices to a 16-year high at 2.44 dollars per tonne in October 2002.[20] Our data show that between 2001 and 2002 cocoa prices increased from 1.07 dollars per kilo to 1.78 dollars per kilo.

Newspaper Articles. A newspaper article from the New York Times documents the cocoa price increase originated in Cote d'Ivore in 2002. Some important aspects of the article are quoted below.

War Inflates Cocoa Prices But Leaves Africans Poor, New York Times (October 31, 2002):[21]

[17] Available at: http://www.fao.org/docrep/017/ap664e/ap664e.pdf.
[18] The FAO document is available at: http://www.fao.org/docrep/004/w1690e/w1690e02.htm#I2.
[19] Available at: http://www.fao.org/docrep/012/ak354e/ak354e00.pdf.
[20] https://www.icco.org/about-us/international-cocoa-agreements/cat_view/30-related-documents/45-statistics-other-statistics.html.
[21] Article available at: https://www.nytimes.com/2002/10/31/business/war-inflates-cocoa-prices-but-leaves-africans-poor.html.

"As civil war raged in Ivory Coast, the world's biggest cocoa producer, speculative traders here and in New York sent prices this month to 17-year highs."

iv. Corn

Year of Event: 1988.
Type of Event: Positive price shock.

The severe drought that affected the Farm Belt had a significant impact on corn prices in the 1988/1989 crop years. According to Karrenbrock (1989) corn yields were the most affected by the drought.[22] Our data feature a clear increase in corn prices from 1987 to 1988. In particular, prices went from 75.70 per tonne in 1987 to 106.89 per tonne in 1988.

Newspaper Articles. A newspaper article from the Los Angeles Times and another article from the New York Times document the severity of the drought and the impact on corn prices. Some important aspects of the articles are quoted below.

Commodities: Grain Prices Skyrocket in Response to Drought Report, Los Angeles Times (July 14, 1988):[23]

"Grain and soybean futures prices blasted out of their recent slump Wednesday in response to the government's report of severe drought damage to crops and forecasts for more hot, dry weather in the Farm Belt."

"Besides slashing its 1988 corn production estimate by 29% to a five-year low of 5.2 billion bushels, the USDA estimated soybean plantings this year at 58.52 million acres, a figure below the market's expectations, analysts said."

"(...) corn was 10 cents to 27.5 cents higher, with July at $3.335 a bushel; oats were 10 cents to 25.5 cents higher, with July at $3.045 a bushel, and soybeans were 30 cents to 69 cents higher, with July at $9.485 a bushel."

Drought Cutting U.S. Grain Crop 31% This Year, Los Angeles Times (August 12, 1988):[24]

"The Agriculture Department estimated that this nation's corn harvest might total no more than 4.47 billion bushels, down 2.6 billion bushels from last year."

"Analysts predicted that prices of corn and soybeans would rise sharply Friday."

v. Wheat

Year of Event: 1988.
Type of Event: Positive price shock.

A report from the FAO highlights some facts that are useful to understand the positive price shock in 1988.[25] Relevant aspects of the report are quoted below:

"World production of wheat fell again in 1988 to an estimated 511 million tons, slightly less than in the previous year but considerably below the last peak of 538 million tons in 1986.

[22] https://research.stlouisfed.org/publications/review/1989/05/01/the-1988-drought-its-impact-on-district-agriculture/.

[23] Article available at: http://articles.latimes.com/1988-07-14/business/fi-8706_1_grain-prices.

[24] Article available at: https://www.nytimes.com/1988/08/12/business/drought-cutting-us-grain-crop-31-this-year.html.

[25] Commodity Review and Outlook 1988-89, Food and Agriculture Organization of the United Nations, page 53.

This decline was mainly the result of smaller crops in North America, where the wheat area decreased further and the principal growing areas suffered from the worst drought in half a century. But there were declines in wheat production in Central and South America as well (...)"

Our data indicate that wheat prices went from 112.90 dollars per metric ton in 1987 to 145.20 dollars per metric ton in 1988.

vi. Soybeans

Year of Event: 1988.
Type of Event: Positive price shock.

The World Bank "Price Prospects for Major Primary Commodities, 1988-2000" documents that in 1988 there were droughts in the USA which severely affected soybean production.[26] In order to put the severity of the drought into perspective, it is important to mention that the report explains that in 1980 the United States produced 65 percent of the world's soybeans, and prices were close to a historical high at $296 per tonne. Therefore, it is not surprising to conclude that such a severe drought in a key area of production had the capacity to significantly affect total production and prices. Our data depict a sharp increase in soybean prices in 1988, going from 215.75 per tonne in 1987 to 303.50 in 1988.

Newspaper Articles. A newspaper article from Los Angeles Times supports the analysis. The key point is detailed below.

Commodities: Grain Prices Skyrocket in Response to Drought Report, Los Angeles Times (July 14, 1988):[27]

"Grain and soybean futures prices blasted out of their recent slump Wednesday in response to the government's report of severe drought damage to crops and forecasts for more hot, dry weather in the Farm Belt."

vii. Sugar

Year of Event: 1984.
Type of Event: Negative price shock.

According to a FAO report, sugar prices declined in 1984 to their lowest level in 13 years, reflecting a situation of oversupply.[28] Our data show that prices declined by 40 percent in 1984. Interestingly, in 1984 Pepsico Inc. and Coca-Cola Company decided to stop using sugar in favor or a corn based sweetener for their drinks, which was associated with a fall in current and future consumption of sugar.

Newspaper Articles. Some articles are informative to illustrate the importance of the change in sweetener for the two giants of the soft-drink industry for the sugar market. We include an example below.

Coke, Pepsi to use more corn syrup, New York Times (November 7, 1984):[29]

[26] http://documents.worldbank.org/curated/en/443751468739336774/Summary-energy-matals-and-minerals.

[27] Article available at: http://articles.latimes.com/1988-07-14/business/fi-8706_1_grain-prices.

[28] http://www.fao.org/3/a-ap664e.pdf.

[29] Article available at: https://www.nytimes.com/1984/11/07/business/coke-pepsi-to-use-more-corn-syrup.html.

"For the sugar industry, the announcements mark the end of its involvement with soft drinks (...)"

E.2 Agriculture: Raw Materials

i. Cotton

Year of Event: 1994.
Type of Event: Positive price shock.

A report from the U.S. International Trade Commission describes that the 1994 cotton price increase was driven by a decline in production in key production areas such as China, and India.[30] The decline in production in China is explained by bad weather and a bollworm infestation.

A study from the National Cotton Council of America explains that the price increase is also partly due to a recovery in world cotton consumption following the stagnation that resulted from the dissolution of the Soviet Union in the early 1990s.[31]

Our data indicate that cotton prices declined from 1.28 dollars per kilo in 1993 to 1.76 dollars per kilo in 1994.

Year of Event: 2003.
Type of Event: Positive price shock.

MacDonald and Meyer (2018) analyze the challenges faced when forecasting cotton prices in the long run. The article highlights that in 2003 there was a severe weather damage to cotton crops in China which resulted in a surge in cotton prices. In addition, an article from the National Cotton Council of America highlights that in the 2003 season, "(...) USDA's forecast put world sticks at their lowest level since 1994/95, raising the specter of a world cotton shortage for the first time in nearly a decade."[32]

Our data show that cotton prices increased from 1.02 dollars per kilo in 2002 to 1.40 dollars per kilo in 2003.

Year of Event: 2010.
Type of Event: Positive price shock.

Janzen, Smith and Carter (2018) analyze the extent to which cotton price movements can be attributed to comovement with other commodities vis-à-vis cotton specific developments. They point at the fact that in 2010-2011 cotton was scarce as a consequence of a negative supply shock generated by lower than average planted crops and negative weather shocks in the USA and Pakistan. This led to an increase in the price of cotton. The authors explain that this boom-bust appears to be cotton-specific, unlike other cases in which a set of macroeconomic factors drive the price of a broad range of commodities.

Our data confirm the findings of the paper. In fact, cotton prices increased from 1.38 dollars per kilo in 2009 to 2.28 dollars per kilo in 2010.

[30] Article available at: https://books.google.com/books?id=OZFDf6qLEosC&pg=SA3-PA5&lpg=SA3-PA5&dq=cotton+prices+1994&source=bl&ots=vi6JuOeGer&sig=DX9iSSIDP__dPIGTNKEfB03FkSA&hl=en&sa=X&ved=2ahUKEwiJkOOWztneAhVkneAKHWFOCWs4ChDoATADegQIBRAB#v=onepage&q=cotton\%20prices\%201994&f=false.

[31] Article available at: https://www.cotton.org/issues/2005/upload/WorldCottonMarket.pdf.

[32] Article available at: https://www.cotton.org/issues/2005/upload/WorldCottonMarket.pdf.

ii. Timber

Year of Event: 1993.
Type of Event: Positive price shock. Sohngen and Haynes (1994) explain that the 1993 price spike was driven by the environmentally friendly policies that President Clinton issued to protect forests which limited the timber harvests.[33] The application of such policies is confirmed in the list of environmental actions taken by President Clinton and Vice President Al Gore and is documented in the White House Archives.[34] Our data reveal that the timber price index increased from 72.41 in 1992 to 100.58 in 1993.

Newspaper Articles. A newspaper article from the Washington Post documents this episode and describes how the environmental policy was viewed as a threat to the woods product industry.

Clinton to Slash Logging (July 2, 1993):[35]

"To protect the region's wildlife and old-growth forests, the administration plan will allow for average timber harvests over the next decade of 1.2 billion board feet per year. That is about half the level of the last two years, and only a third of the average rate between 1980 and 1992, when annual harvests swelled as high as 5.2 billion board feet."

iii. Tobacco

Year of Event: 1989.
Type of Event: Positive price shock.

In a report from the FAO, it is explained that in 1989 tobacco prices in Malawi remained buoyant due to a worldwide shortage of this type of tobacco.[36] Our data show a 31 percent increase in the price of tobacco between 1988 and 1989.

Year of Event: 1993.
Type of Event: Negative price shock.

A report from the FAO highlights that the worldwide increase in competition for exports in 1993 led to a substantial fall in tobacco prices.[37] Our data reveal that tobacco prices declined 22 percent between 1992 and 1993.

E.3 Energy Commodities

i. Combined Energy Commodities

Year of Event: 2015.
Type of Event: Negative price shock.

[33] Article available at: https://www.fs.fed.us/pnw/pubs/pnw_rp476.pdf.
[34] Available here https://clintonwhitehouse4.archives.gov/CEQ/earthday/ch13.html.
[35] https://www.washingtonpost.com/archive/politics/1993/07/02/clinton-to-slash-logging/f2266e63-f45f-4f88-bd1f-5f1a1edd820f/
[36] Commodity Review and Outlook 1993-1994, Food and Agriculture Organization of the United Nations, page 135. Available at https://books.google.co.uk/books?id=xwNp0dpOsiEC&pg=PA154&lpg=PA154&dq=world+commodity+tobacco+prices+1993&source=bl&ots=Hm48B0nax6&sig=frnhLU3FFikaxD1d-Ngq_GfC6Uc&hl=en&sa=X&ved=2ahUKEwip09mhu6TeAhVM2qQKHU4CBM84ChDoATAGegQIAhAB#v=onepage&q=world\%20commodity\%20tobacco\%20prices\%201993&f=false.
[37] Commodity Review and Outlook 1993-1994, Food and Agriculture Organization of the United Nations, page 156.

The booming U.S. shale oil production played a significant role in the oil price plummet in 2015. However, this event has affected the prices of the main fossil fuels commodities. Our data shows that crude oil prices declined 47 percent, while coal and natural gas prices contracted 16 and 26 percent, respectively, between 2015 and 2015.

Year of Event: 2019.
Type of Event: Negative price shock.

This is the first time that the United States became a net energy exporter following the development of shale technology (EIA, 2020). Therefore, this event can be understood as an event affecting crude oil, natural gas, and coal prices. However, it is not visible in crude oil price because there were attacks to Saudi Arabia oil facilities which disrupted oil exports (World Bank, 2021). This effect partially offset the price reduction from shale technology in the United States.

In our dataset we observe that natural gas prices declined 25 percent in 2019 while coal declined 15 percent.

Newspaper Articles. A newspaper article explains the dimension of the oil price plunge.

How the U.S. and OPEC Drive Oil Prices, New York Times (October 5, 2015)[38]

"The global price of a barrel of oil remains near its lowest point since the depths of the 2009 recession — a result of a supply glut and battle for market share between the OPEC oil cartel and the United States, which has shifted toward the role of global swing producer."

ii. Crude Oil

Year of Event: 1986.
Type of Event: Negative price shock.

The period of oil price decline which finalized in a large drop in 1986 is referred to in Hamilton (2013) as "the great price collapse." In particular, in 1986 Saudi Arabia abandoned the effort to keep oil prices high by reducing oil production which originated a very large oil supply shock. With Saudi Arabia increasing oil production, the price of oil declined from $27 a barrel in 1985 to $12 a barrel in 1986.

Year of Event: 1990.
Type of Event: Positive price shock.

As explained in Hamilton (2013), this is the period marked by the first Persian Gulf War. Oil production in Iraq collapsed when the country invaded Kuwait in August 1990. The reduction in oil production together with the uncertainty that the conflict may spill over into Saudi Arabia led to the oil price almost doubling within a few months.

Year of Event: 1998.
Type of Event: Negative price shock.

Känzig (2021) highlights the role played by oil supply expectations in driving the plunge in oil prices in 1998.

Our dataset indicate that oil prices declined 32 percent in 1998.

[38] `https://www.nytimes.com/interactive/2015/09/30/business/how-the-us-and-opec-drive-oil-prices.html?searchResultPosition=28`.

iii. Natural Gas

Year of Event: 2000.
Type of Event: Positive price shock.

The Energy Information Administration (EIA) documents the California energy crisis of 2000-2001.[39] In terms of natural gas, a report from the Task Force on Natural Gas Market Stability finds that "the 2000-2001 California natural gas crisis resulted in major part from a perfect storm of sudden demand increase, impaired physical capacity, natural gas diversion, and inadequate storage fill. The quick summary is as follows: Low hydroelectric availability in 2000, coupled with a modest increase in overall power needs resulted in a substantial increase in gas-fired generation usage, with little preparation."[40] A study from the Federal Reserve Bank of San Francisco documents the natural gas price increase in 2000.[41] Our data show that the natural gas price index jumped from 39.78 in 1999 to 73.85 in 2000.

Year of Event: 2005.
Type of Event: Positive price shock.

An article from the "Oil and Gas Journal" highlights that the effects of Hurricanes Katrina and Rita were the main source of the price increase. Some details of the article are quoted below.[42]

"The combined effects of the 2004 and 2005 hurricane seasons had an impact across all sectors of the US gas industry. Hurricane Ivan, which made landfall in September 2004, caused more long-term gas production interruptions than any previous hurricane, but its impacts were dwarfed by Hurricanes Katrina (landfall Aug. 29, 2005) and Rita (Sept. 24, 2005). The combined effects of Hurricanes Katrina and Rita were by far the most damaging in the history of the US petroleum industry."

A report from the Federal Energy Regulatory Commission highlights the following:[43]

"The pump was primed for significant energy price effects well before Hurricanes Katrina and Rita hit the Gulf Coast production areas in September. The Gulf storms exacerbated already tight supply and demand conditions, increasing prices for fuels in the United States further after steady upward pressure on prices throughout the summer of 2005. Most of this was due to increased electric generation demand for natural gas caused by years of investment in gas-fired generation and a significantly warmer-than-average summer. Supply showed some weakness despite increasing numbers of active drilling rigs. The result was broadly higher energy prices."

Our natural gas index data shows a clear spike in 2005, going up from 95.39 in 2004 to 142.40 in 2005.

Newspaper Articles. The increase in natural gas prices in the aftermath of the hurricanes received media attention. An example from NBC News is included in what follows.[44]

[39] https://www.eia.gov/electricity/policies/legislation/california/subsequentevents.html.
[40] http://bipartisanpolicy.org/wp-content/uploads/sites/default/files/Introduction\%20to\%20North\%20American\%20Natural\%20Gas\%20Markets_0.pdf.
[41] https://www.frbsf.org/economic-research/publications/economic-letter/2001/february/economic-impact-of-rising-natural-gas-prices/#subhead3.
[42] https://www.ogj.com/articles/print/volume-104/issue-36/general-interest/us-gas-market-responds-to-hurricane-disruptions.html.
[43] https://www.ferc.gov/EventCalendar/Files/20051020121515-Gaspricereport.pdf.
[44] http://www.nbcnews.com/id/9146363/ns/business-local_business/t/pump-prices-

"Gas prices in cities across the United States soared by as much as 40 cents a gallon from Tuesday to Wednesday, a surge blamed on disruptions by Hurricane Katrina in Gulf of Mexico oil production."

E.4 Fertilizers

Year of Event: 1984.
Type of Event: Positive price shock.

According to a report from the FAO, the demand for fertilizers rebounded in 1984, leading to a price increase.[45] This observation is supported by the "Proceedings of the 34th Annual Meeting of the Fertilizer Industry Round Table 1984."[46] Our data reveal a considerable increase in fertilizer prices in 1984. Specifically, the index went from 29.47 in 1983 to 36.62 in 1984.

E.5 Metals and Mineral Commodities

i. Aluminum

Year of Event: 1994.
Type of Event: Positive price shock.

According to the "Commodity Markets and Developing Countries" report from the World Bank, aluminum prices increased in 1994 due to a reduction in stocks, attributed primarily to the cutbacks in production by major producers.[47]

Our data reveal that aluminum prices went up 30 percent in 1994.

Newspaper Articles. A newspaper article illustrates the cuts in supply.

A Loose Plan On Output of Aluminum, New York Times (January 31, 1994):[48]

"Six leading aluminum producers have agreed on ways to reduce a serious oversupply that has depressed prices on world markets."

ii. Copper

Year of Event: 1981.
Type of Event: Negative price shock.

A report from the US Department of the Interior titled "Metal Prices in the United States through 1998" highlights that in 1981 copper prices were low due to a large growth in US and world production combined with rising inventories. Our data feature this price decline. In fact, our data show that copper prices went down from 1774.91 per tonne in 1980 to 1262.73 in 1981.

jump-across-us-after-katrina/#.W3NQbehKiUk.

[45] http://www.fao.org/3/a-ap664e.pdf.

[46] http://www.firt.org/sites/default/files/pdf/FIRT1984.pdf.

[47] http://https://thedocs.worldbank.org/en/doc/475131464184948121-0050022016/original/CMO1994November.pdf.

[48] Article available at: https://www.nytimes.com/1994/01/31/business/a-loose-plan-on-output-of-aluminum.html?.

iii. Iron ore

Year of Event: 1982.
Type of Event: Positive price shock

According to "Metal Prices in the United States through 1998" iron ore production in the U.S. fell from 73.4 million tons in 1981 to 36.0 million tons in 1982. This decline in production was accompanied by a price increase, which we observe in our data. In fact, prices went up from 28.09 per dry metric ton in 1981 to 32.50 per dry metric ton in 1982.

E.6 El Niño / La Niña Events

El Niño is a local warming of surface waters that takes place in the entire equatorial zone of the central and eastern Pacific Ocean of the Peruvian coast and which affects the atmospheric circulation worldwide (Kiladis and Diaz, 1989). La Niña is the cold equivalent of El Niño. These weather events take place approximately every two to seven years.

The Southern Oscillation is an East-West balancing movement of air masses between the Pacific and Indo-Australian areas, characterized by typical wind patterns and measured by the Southern Oscillation Index (SOI). While El Niño refers to the oceanic component of this phenomenon, the Southern Oscillation pertains to its atmospheric counterpart. The combination of these two components gives rise to the term ENSO (El Niño Southern Oscillation), which can have significant climatic impacts such as flash floods or intense hurricanes that may affect crop seasons and disrupt agricultural activities, resulting in crop damage. What sets these weather events apart is their global reach, which tends to impact regions worldwide.

The literature suggests that the Niño episodes of 1982-1983 and 1997-1998 were particularly severe (Brenner, 2002). Therefore, we investigate how were commodity prices affected in light of these eventsand how we can use them for narrative restrictions. Since we already have a narrative restriction for 1997 we concentrate on the 1982-1983 episode. One challenge that we face in the presence weather events which have worldwide implications is that when we impose the narrative restrictions that are driven due to weather conditions or political events of a specific country, we exclude such event for that country. In selecting the dates for export and import price shocks we are very careful to avoid events which have the characteristic of being both an export or import price shock and a capital or productivity shock at the same time.[49] This means that if crops of a certain commodity were affected by a weather phenomena in all the exporting countries we cannot use that as part of the narrative since it would mimic a negative productivity shock. Therefore, we searched in the literature for Niño weather events which originated in one region of the world so that we can use the narrative for the regions not directly affected by drastic weather conditions.

After searching for the origin and impacts of El Niño/La Niña events, we found two potential narratives which we could use: (i) a positive price shock for soybeans in 1983 and (ii) a positive price shock for cocoa also in 1983. For soybeans, Brenner (2002) suggests that the price increase was driven by draughts in Australia and New Zealand. Therefore, this event in the pacific can be used for soybean exporting countries in the Atlantic such as Brazil and Argentina. For Cocoa, Brenner (2002) documents that the price increase was caused by droughts in South East Asia and floods in South America. Therefore, we cannot use these events for

[49]For instance, when the increase in the price of a particular agricultural commodity is associated with a drought in a given country, the country is effectively facing a combination of shocks: (a) the fall in production (akin to a negative productivity shock in the agricultural sector) and (b) a positive windfall from the (worldwide) increase in the price of the commodity.

South America or Asia but we could for Africa. In fact, Ghana and Cote d'Ivoire were cocoa exporters during this period. Drilling deeper, we found evidence that these countries were actually fueling the cocoa price increase due to country-specific political events unrelated to the El Niño.[50] In particular, Cote d'Ivoire was facing fires and Ghana political unrest which were driving the price of coca upwards. For these reasons, we do not use this Niño event for cocoa.

To sum up, as a result of El Niño events, we added a narrative restriction for a positive price shock to soybeans in 1983. Our data depict a sharp increase of 15 percent in soybean prices in 1983. This is a positive export price restriction for Argentina and Brazil where overall soybean exports accounted for 10 percent and 13.3 percent of overall exports in 1983, respectively.

E.7 Country-Specific Assumptions

In order to implement the narrative restrictions, a number of adjustments were necessary. In what follows we list the country-specific assumptions and clarify some events characteristics.

- To determine whether an event constitutes an export or import price shock, we follow a rule based on whether the country is an exporter or importer of the affected commodity. In some cases, this rule results in both a positive export price shock originating from one commodity and a negative export price shock stemming from another commodity for the same year. One such example is observed in Cameroon and Congo in 1986, where a positive export price shock arose from coffee while a negative export price shock originated from crude oil. To assign a sign to the export price shock in such cases, we attribute it according to the commodity with the larger weight in the export share. Since oil exports represented a higher share than coffee exports for both Cameroon and Congo in 1986, the oil price shock dominates the coffee price shock, and the latter is eliminated from the narrative.

- We exclude events from specific countries when they are due to weather conditions or political events unique to that country. The following cases are excluded from the narrative restrictions:
  - The 1986 coffee price shock caused by droughts in Brazil. We did not include this shock as part of the narrative restrictions for Brazil.
  - The 2002 cocoa price shock driven by an attempted coup in Cote d'Ivoire. As the country was already suffering the consequences of a civil war with rising tensions, we did not use the 2002 date for the narrative restrictions in this country.

- Some countries are exporters and importers of certain commodities in the same year. When this happens an event would serve both as an export price and import price shock. In these cases, we attributed the narrative to an export or import price shock depending on the trade share. If the export (import) share is larger, then it is linked to an export (import) price shock.[51] For instance, in our sample these happens in these cases:

[50] `https://www.nytimes.com/1983/06/13/business/commodities-cocoa-prices-on-the-rise.html`.

[51] An exception to this rule is present for the case of Türkiye. The positive oil price shock in 1990 serves as a positive export price shock and a positive import price shock for Türkiye. While the export share is higher, it is the only narrative for import prices so we kept the narrative for both export and import price shocks. For

– The negative oil price shock in 1986 implies a negative export price shock and a negative import price shock for Indonesia and Nigeria. In both cases the export share of oil is higher and therefore these events are attributed to an export price shock.

– All the cereal events imply a export and import price shock for Senegal. Since the export share for cereal is higher than the import share, we linked these events to export price shocks.

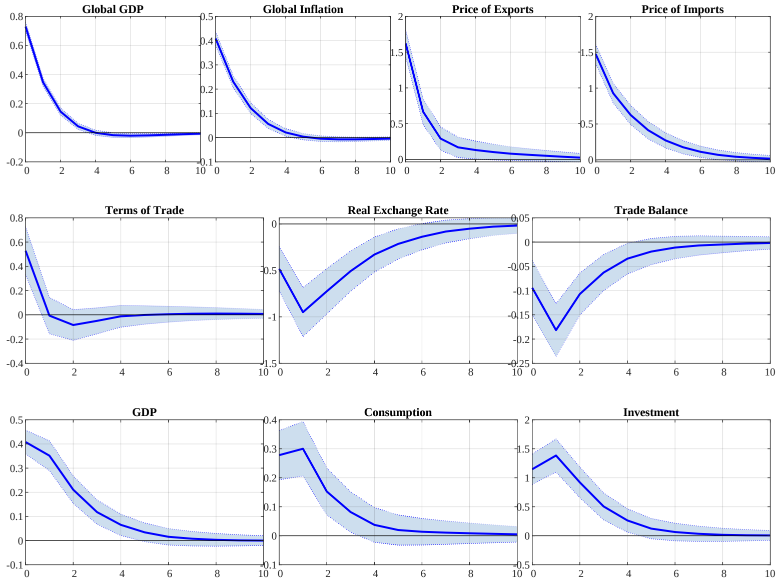
– The negative oil price shock in 1998 could be used as a negative export price shock and a negative import price shock for Cameroon, Congo, and Cote d'Ivoire. Since the oil export share is larger than the import share for Cameroon and Congo, for these two countries we used this event as as narrative for an export price shock. By contrast, in Cote d'Ivoire the oil import share is larger than the export share, and therefore this event was used as a narrative for an import price shock.

– The negative energy price shock in 2015 implies negative export and import price shocks both for Cameroon and Cote d'Ivoire. We use this narrative as a negative export shock for the former and a negative import price shock for the latter, as dictated by the export and import shares.

Indonesia in 1998 and 2015 and Peru in 1998, the export and import shares are very similar. We therefore used the narrative both for export and import price shocks.

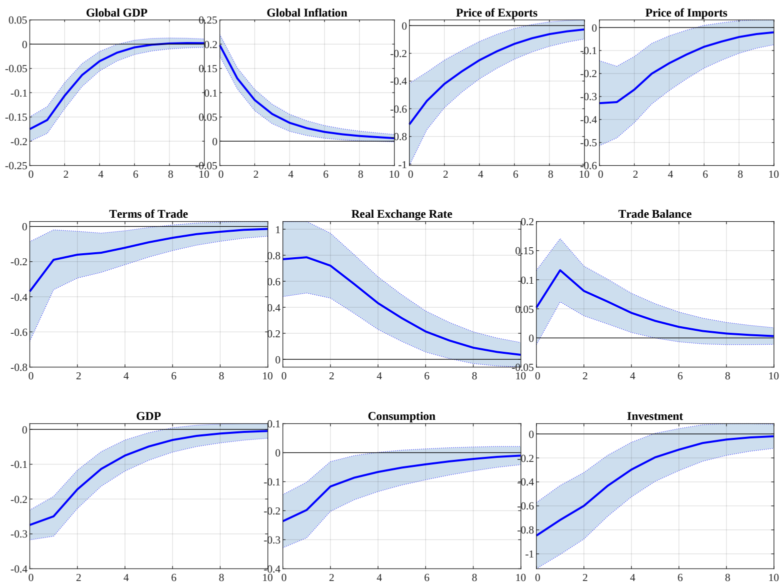
Appendix F Evidence on Global Demand and Supply Shocks

Figure F.1: Impulse Responses to a Global Demand Shock: All Countries



Notes: This Figure shows the impulse responses to a g^d shock for all countries using a VAR with sign and narrative restrictions. The blue solid lines denote the mean responses weighted using inverse variance weights and the dashed lines represent the 16^{th} and 84^{th} percentile error bands.

Figure F.2: Impulse Responses to a Global Supply Shock: All Countries



Notes: This Figure shows the impulse responses to a g^s shock for all countries using a VAR with sign and narrative restrictions. The blue solid lines denote the mean responses weighted using inverse variance weights and the dashed lines represent the 16^{th} and 84^{th} percentile error bands.

Table F.1: Forecast Error Variance Decomposition: Global Demand and Supply Shocks

	Export Prices		Import Prices		Terms of Trade		Real Exchange Rate	
	g^d	g^s	g^d	g^s	g^d	g^s	g^d	g^s
0	20.98	18.80	23.15	14.17	15.58	22.84	5.05	7.09
1	20.52	19.69	23.04	15.55	16.75	22.86	9.96	9.60
4	20.57	21.33	22.67	17.95	18.16	23.36	13.56	13.00
10	20.55	22.01	22.36	19.06	18.32	23.66	14.39	14.37
	Trade Balance		Output		Consumption		Investment	
	g^d	g^s	g^d	g^s	g^d	g^s	g^d	g^s
0	6.93	5.70	8.56	6.69	6.68	6.51	7.89	6.09
1	9.88	7.82	11.76	9.41	9.68	8.80	11.72	8.74
4	12.07	10.34	14.37	13.02	11.62	11.47	14.10	11.70
10	12.69	11.35	15.19	14.50	12.52	12.79	14.66	12.80

Notes: This Table shows the forecast error variance decomposition of all the variables in the VAR in response to global demand and supply shocks on impact, at a 1-year, 4-year and 10-year horizons. Reported are mean values weighted using inverse variance weights.

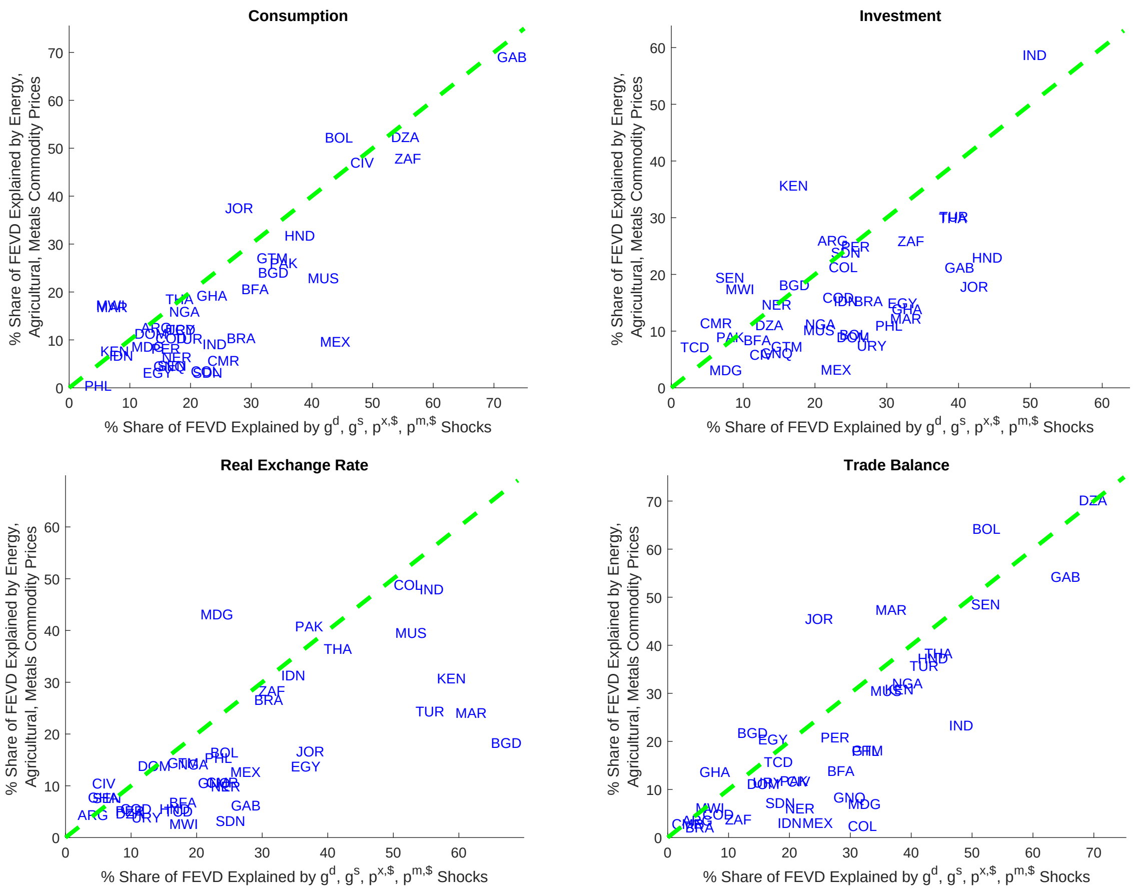
Appendix G Additional Results

This section presents additional results. First, we focus on commodity price shocks as world shocks. Next, we study the role of cross-country heterogeneity. Finally, we show an analysis by export and import groups.

G.1 Commodity Price Shocks as World Shocks

Figure G.1 compares the forecast error variance decomposition of consumption, investment, the real exchange rate, and the trade balance in our paper with the combined contribution of shocks from the three major commodity indices as identified by Fernández et al. (2017) for each country.

Figure G.1: Comparison Forecast Error Variance Decomposition: Our Model vs. World Shocks



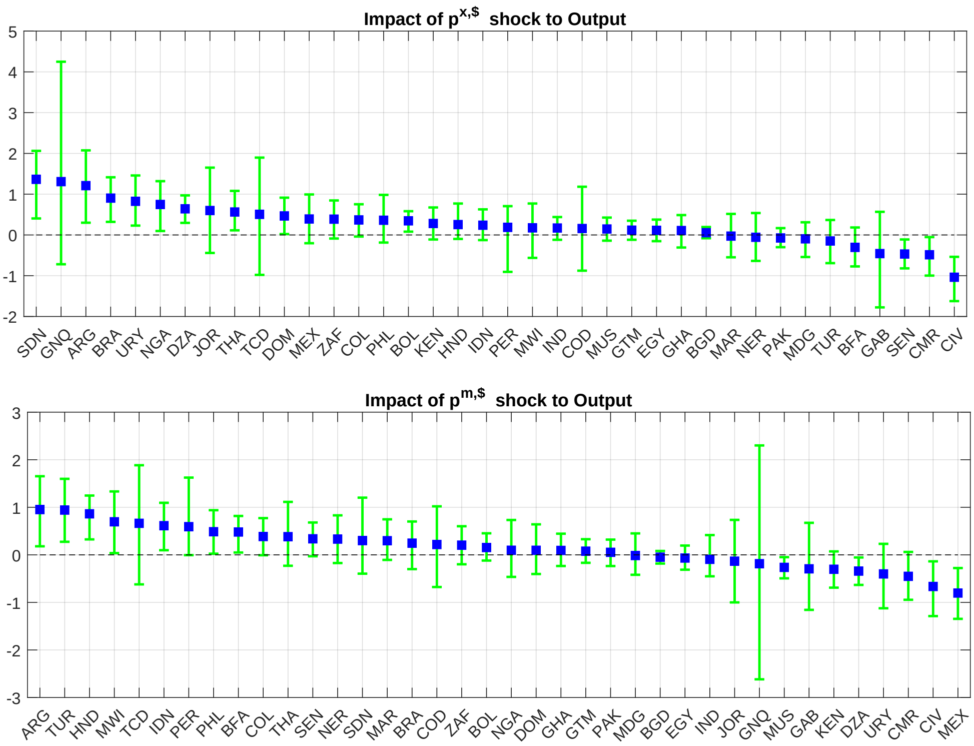
Notes: This Figure shows a comparison of the forecast error variance decomposition of main economic variables, for each country, in our model (x-axis) *vis-à-vis* using three main commodity price indices as in Fernández et al. (2017) (y-axis). Details on the computation are provided in the text.

For each country we report the share of the variance of the one-step prediction error associated with global shocks. We construct the one-step prediction errors for GDP conditioning on the lagged value of GDP as well as the lagged values of the foreign variables. Specifically, as outlined in Section 4, we assume that the dynamics of output, for each country k, $y_{k,t}$, can be written as a $y_{k,t} = \rho_{0k} + \rho_{1k} y_{k,t-1} + \gamma_{0k}\mathbf{z}_{k,t} + \gamma_{1k}\mathbf{z}_{k,t-1} + \varepsilon_{k,t}$, where $\varepsilon_{k,t} \sim N\left(0, \sigma_k^2\right)$, and the dynamics of the foreign bloc of variables, $\mathbf{z}_{k,t}$, is captured by a VAR(1): $\mathbf{z}_{k,t} = \mathbf{a}_k + \mathbf{A}_{1k}\mathbf{z}_{k,t-1} + \mathbf{A}_{0k}^{-1}\mathbf{u}_{k,t}$, where $\mathbf{u}_{k,t}$ denote the structural shocks with normalized unit variance. Therefore, the share of the one-step ahead forecast variance that is attributed to the foreign shocks can be calculated as $b_k / \left(b_k + \sigma_k^2\right)$ where $b_k = \gamma_{0k} \mathbf{A}_{0k}^{-1} \left(\mathbf{A}_{0k}^{-1}\right)' \gamma_{0k}$. In the main text, we present two sets of results. The first set of results (Figure 1, panel a) compares the case where the foreign bloc of variables includes ToT only (x-axis) with the three major commodity price indices (as in Fernández et al., 2017) (y-axis). In the second set of results (Figure 1, panel b), we compare the foreign bloc of variables given by the three major commodity price indices (as in Fernández et al., 2017) (y-axis) with our model that identifies export price ($p^{x,\$}$), import price ($p^{m,\$}$), global demand and supply shocks (g^d and g^s) (x-axis). Figure G.1 further extends the latter case.

G.2 Cross-Country Heterogeneity: Export and Import Price Shocks

Figure G.2 shows the impact impulse response (blue square) of output, for each country, to a one standard deviation shock in $p^{x,\$}$ and $p^{m,\$}$. In Table G.1 we analyze the determinants of the impact impulse responses for output, the trade balance and the terms of trade in response to export and import price shocks. The results of this subsection are summarized in Section 6 of the main text.

Figure G.2: Heterogeneous Effects of Export and Import Price shocks on Output



Notes: This Figure shows the impact impulse response (blue square) on output (in %) for each country in the sample to a one standard deviation shock in export and import prices. The green lines represent 16th and 84th percentile error bands.

G.3 Cross-Country Heterogeneity: Global Demand and Supply Shocks

Figures G.3 and G.4 depict the impact impulse response (blue square) of export prices, import prices, and output to a one standard deviation shock in g^d and g^s, respectively. We observe that the effects on export prices tend to be higher than on import prices. Interestingly, the countries with the largest increase in export prices following a global demand shock do not

Table G.1: Determinants of the Impulse Responses to Export and Import Price Shocks

	IRF $\widetilde{y}$ to $p^{x,\$}$			IRF $\widetilde{Tb}$ to $p^{x,\$}$			IRF $\widetilde{ToT}$ to $p^{x,\$}$		
GDP Per Capita (PPP)	0.137	0.153***	0.146**	0.038	0.140*	0.126*	0.085	-0.058	-0.069
	(0.081)	(0.051)	(0.059)	(0.072)	(0.071)	(0.069)	(0.531)	(0.185)	(0.196)
Commodity Export Share	0.274	0.916**	0.796*	0.553	-1.117**	-1.174***	5.127***	6.421***	6.508***
	(0.364)	(0.409)	(0.452)	(0.493)	(0.421)	(0.359)	(0.991)	(0.814)	(1.020)
H Index Exports (commodities)			0.132			-0.407			-0.373
			(0.281)			(0.466)			(1.504)
Comm. Groups Dummies		✓	✓		✓	✓		✓	✓
	IRF $\widetilde{y}$ to $p^{m,\$}$			IRF $\widetilde{Tb}$ to $p^{m,\$}$			IRF $\widetilde{ToT}$ to $p^{m,\$}$		
GDP Per Capita (PPP)	-0.199**	-0.193***	-0.280***	-0.0772	-0.00931	-0.0214	0.222*	-0.0267	-0.0725
	(0.083)	(0.045)	(0.0999)	(0.125)	(0.082)	(0.082)	(0.123)	(0.317)	(0.119)
Commodity Import Share	-1.356*	1.128	1.585	-0.593	-3.063	-2.766	-5.572***	-3.979	-1.446
	(0.712)	(1.037)	(0.936)	(1.371)	(1.924)	(1.770)	(1.293)	(2.755)	(1.843)
H Index Imports (commodities)			5.382			1.581			-9.315**
			(3.645)			(2.191)			(4.198)
Comm. Groups Dummies		✓	✓		✓	✓		✓	✓

Notes: The commodity export and import shares are the same as the ones reported in Table C.1; the H index is the Herfindahl index of concentration which can take values from 0 to 1 and it is calculated for all commodities; Comm. Group Dummies denote that the regression includes dummy variables which are equal to 1 if the country is an agriculture, energy, and metal exporter or importer. In all columns the total number of observations is 38 and the regression is robust to outliers. Standard errors are reported in parenthesis. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table G.2: Determinants of the Impulse Responses to Global Demand and Supply Shocks

	IRF $\widetilde{p}^{x,\$}$ to g^d	IRF $\widetilde{p}^{m,\$}$ to g^d	IRF $\widetilde{ToT}$ to GD	IRF $\widetilde{y}$ to g^d	IRF $\widetilde{Tb}$ to g^d
GDP Per Capita (PPP)	0.191	-0.0843	0.162	0.118	-0.191***
	(0.184)	(0.101)	(0.189)	(0.106)	(0.0328)
Commodity Export Share	4.668***	-0.552	4.841***	0.069	0.259
	(0.797)	(0.711)	(0.763)	(0.273)	(0.238)
Commodity Import Share	0.939	0.684	-0.563	-1.402	-1.213*
	IRF $\widetilde{p}^{x,\$}$ to g^s	IRF $\widetilde{p}^{m,\$}$ to g^s	IRF $\widetilde{ToT}$ to g^s	IRF $\widetilde{y}$ to g^s	IRF $\widetilde{Tb}$ to g^s
GDP Per Capita (PPP)	-1.040***	-0.155***	-1.199***	-0.0157	-0.0409
	(0.343)	(0.048)	(0.216)	(0.047)	(0.090)
Commodity Export Share	-1.049	0.424	-2.523**	0.135	0.0935
	(1.571)	(0.970)	(1.114)	(0.264)	(0.329)
Commodity Import Share	-12.55*	-5.522	-4.400*	0.697**	-0.677
	(7.343)	(3.814)	(2.388)	(0.339)	(1.345)

Notes: The commodity export and import shares are the same as the ones reported in Table 1 of the main text. In all columns the total number of observations is 38 and the regression is robust to outliers. Standard errors are reported in parenthesis. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

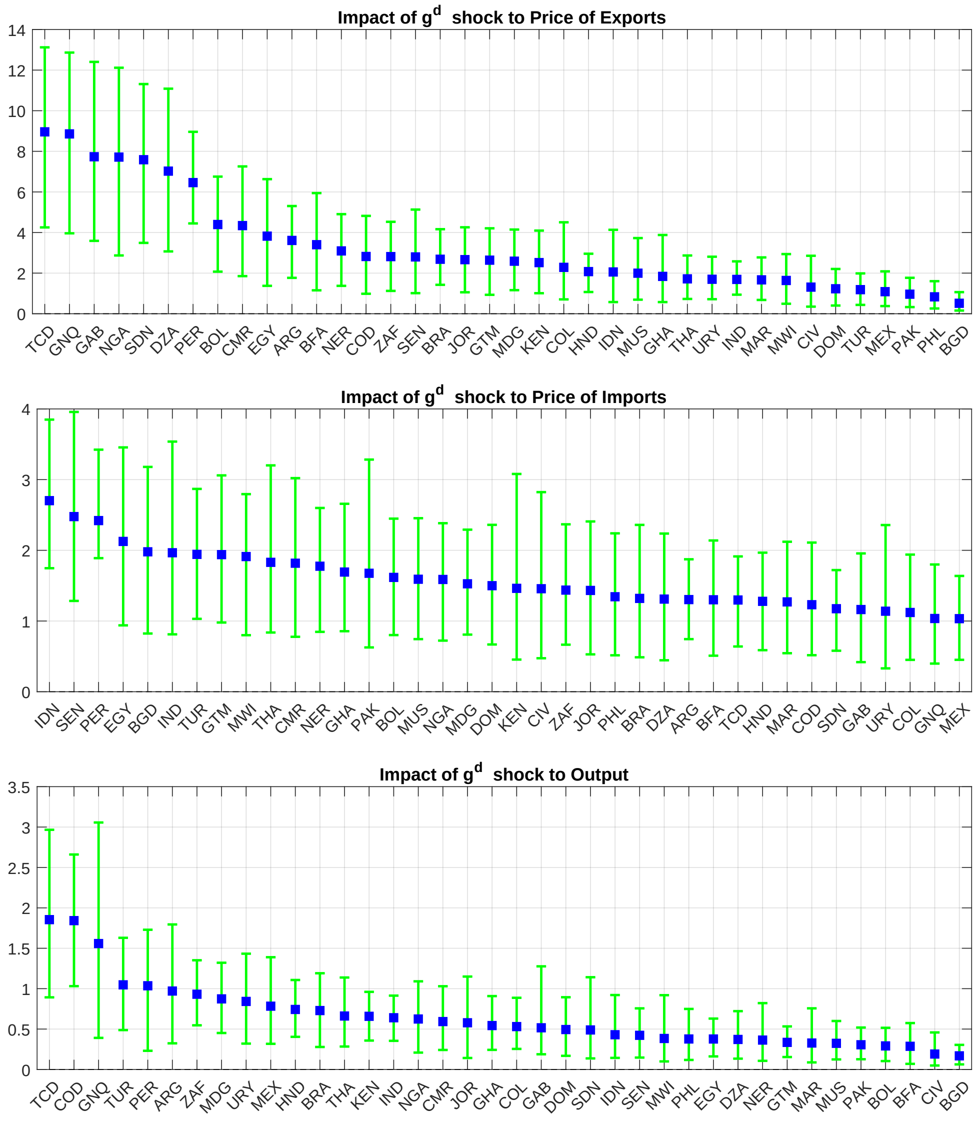
coincide with those showing the largest increase in import prices. The impact on output is heterogeneous across countries but large.

Table G.2 shows the estimates of the determinants of the impact impulse responses of export prices, import prices, the terms of trade, output and the trade balance to a demand activity shock and a global supply shock for the cross-section of countries.[52] Since in this case we are looking at the impact of one shock we use as regressors the GDP per capita (PPP), the commodity export share and the commodity import share.[53] We find that countries which have a higher commodity export share exhibit, on average, a larger response of export prices

[52] As before, the impact impulse response is defined as a 1 standard deviation shock in g^d and g^s multiplied by 100 and we perform robust to outliers regressions.

[53] We also run separate specifications in which we have export and import characteristics in separate regressions and the results remain robust. We do not include them here to preserve space but are available upon request.

Figure G.3: Heterogeneous Effects of Demand Shocks



Notes: This Figure shows the impact impulse response (blue square) on export prices, import prices and output (in %) for each country in the sample to a one standard deviation shock in g^d. The green lines represent 16th and 84th percentile error bands.

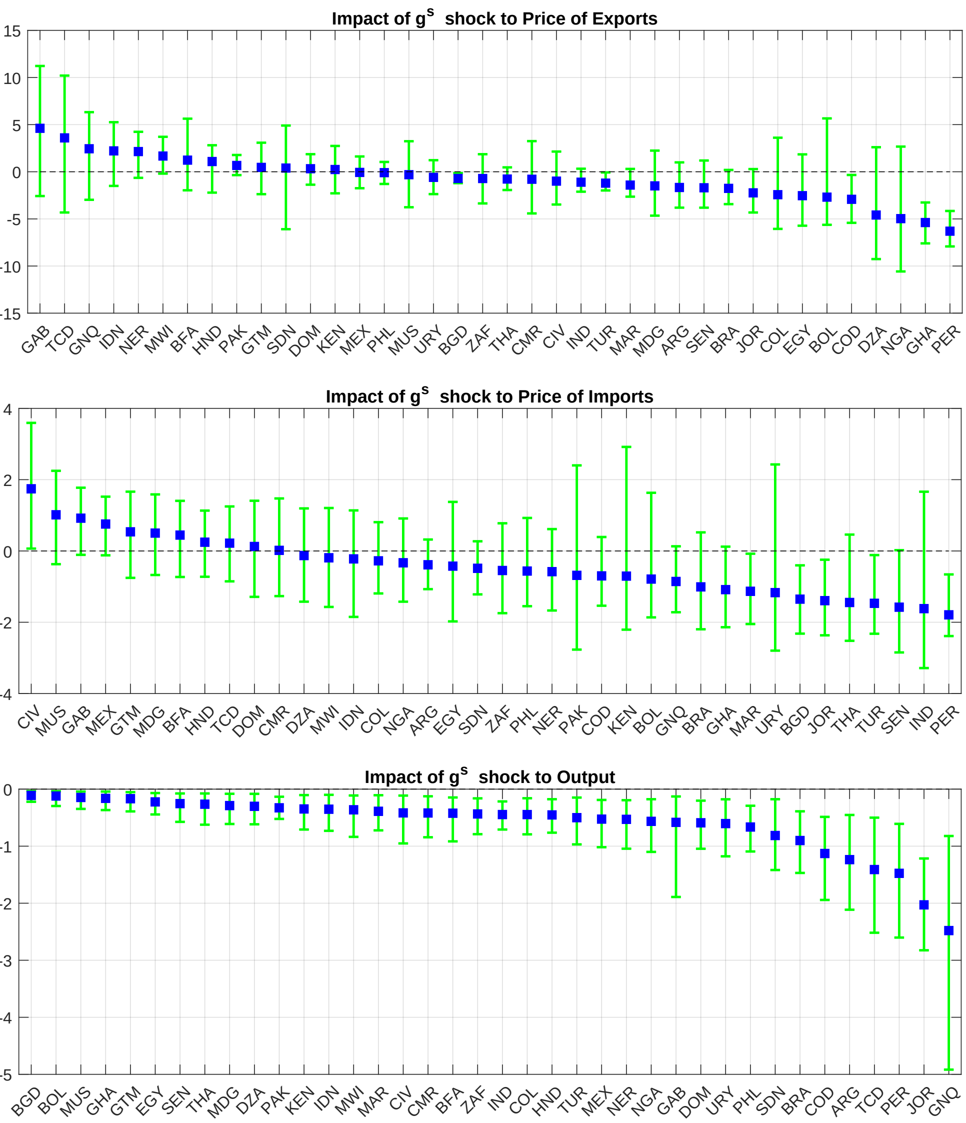
and the terms of trade after a global demand shock. By contrast, the results suggest that countries which have a higher commodity import share display a larger response of import prices and export prices after a global demand shock.

G.4 Analysis by Export and Import Group

We analyze the effects of export price, import price, global demand shocks, and global supply shocks by grouping the countries according to whether they are exporters or importers of main commodity groups. For exporters, we split the countries into agriculture (food and beverages), energy, manufacturing, metal and minerals (including precious metals) and agriculture raw materials (plus fertilizers).[54] A country is classified as an exporter for a given

[54]We bundled precious metals into the metal category as otherwise we would have no countries in the precious metal exporters category. This happens because precious metal exports do not represent a large enough share of

Figure G.4: Heterogeneous Effects of Global Supply Shocks



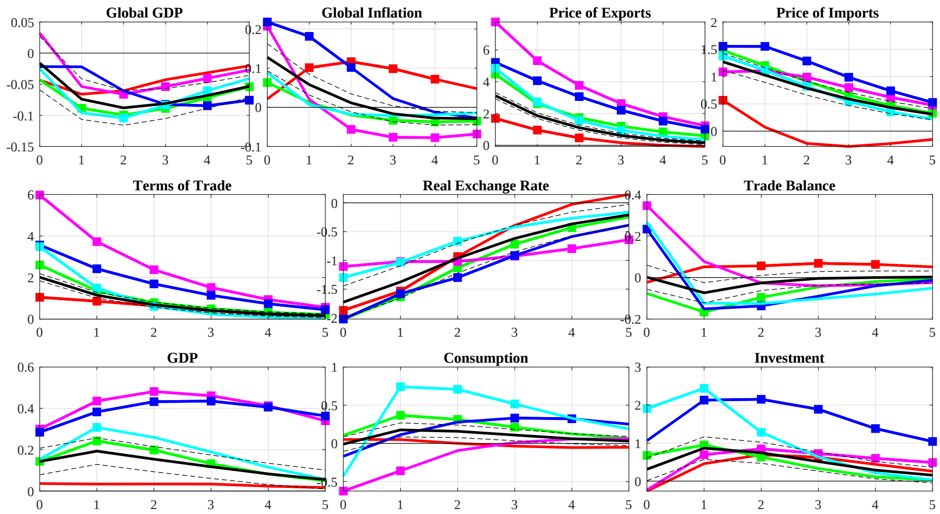
Notes: This Figure shows the impact impulse response (blue square) on export prices, import prices and output (in %) for each country in the sample to a one standard deviation shock in g^d. The green lines represent 16th and 84th percentile error bands.

commodity if more than 25 percent of its commodity export share is within a particular commodity class. A country falls into the manufacturing exporter category if less than 30 percent of its exports are commodities.[55] For importers, we divide the countries into agriculture (food and beverages), energy, and manufacturing importers. A country is included in the category of importer of a given commodity if more than 15 percent of its commodity import share is

exports. Therefore, we can think of this group as related to mining activity and including both industrial and precious metals. In addition, we included fertilizers into the agriculture raw materials group because otherwise we were left with a very small group on its own.

[55]The following countries are agriculture (food and beverages) exporters: Argentina, Brazil, Colombia, Cote d'Ivoire, Ghana, Guatemala, Honduras, Kenya, Madagascar, Malawi, Mauritius, Senegal, Sudan, and Uruguay. Energy exporters are Algeria, Bolivia, Cameroon, Chad, Colombia, Egypt, Equatorial Guinea, Gabon, Indonesia, Nigeria, and Sudan. The following countries are metal exporters: Bolivia, Congo, Peru, and South Africa. Manufacturing exporters are Bangladesh, Niger, Pakistan and Philippines. Finally, agriculture raw materials (plus fertilizers) exporters are Burkina Faso, Chad, Jordan, Malawi, and Sudan.

Figure G.5: Impulse Responses to an Export Price Shock by Export Group



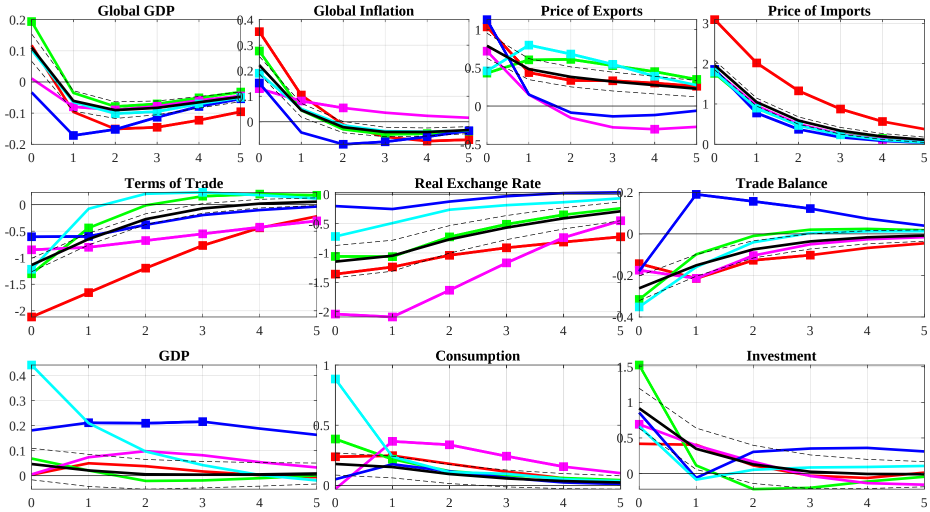
Notes: This Figure shows the impulse responses to an export price shock for countries in each commodity group using a VAR with sign and narrative restrictions. Each color represents a different export group: agriculture (food and beverages) exporters are in green, energy exporters in magenta, manufacturing exporters in red, metal exporters in blue and agriculture raw material (plus fertilizers) exporters in turquoise. Reported are mean responses weighted using inverse variance weights. The squares denote that zero is not within the 68 percent confidence band. For comparison, the impulse responses for all countries are shown in black with the corresponding 16^{th} and 84^{th} percentile error bands.

within a particular commodity class. A country is classified as a manufacturing importer if less than 30 percent of its imports are commodities. The difference in the threshold for the classification of exporters and importers in each commodity group reflects the lower average share of commodities in imports and exports.[56]

The impulse responses for each export group are summarized in Figures G.5, G.6, G.7, and G.8 while for each import group they are included in Figures G.9, G.10, G.11, and G.12. Each color denotes a sector: agriculture (food and beverages) is in green, energy in magenta, manufacturing in red, metals in blue, agriculture raw materials (plus fertilizers) in turquoise, and for comparison purposes the results for all countries are in black (with the corresponding dashed confidence bounds). In all cases shocks have been normalized to a 1 percent increase in $p^{x,\$}$, $p^{m,\$}$, g^d, and g^s, respectively. The solid lines denote the mean response weighted by the country's size proxied by their GDP. The squares denote that zero is not within the 68 percent confidence band. The sectoral split for the FEVD is presented in Tables G.3 and G.4.

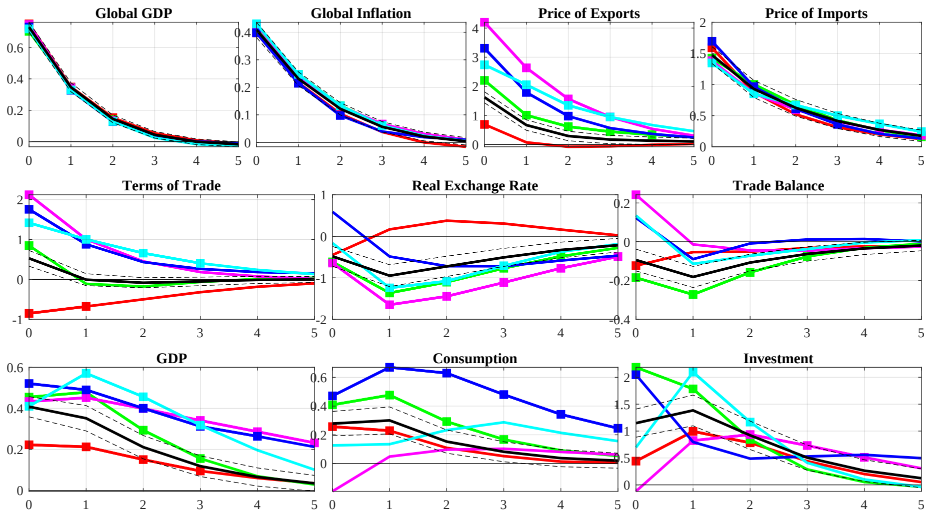
[56]The country split is as follows. Manufacturing importers is composed of Argentina, Bolivia, Burkina Faso, Chad, Colombia, Congo, Dominican Republic, Gabon, Ghana, Guatemala, Honduras, Kenya, Madagascar, Malawi, Mauritius, Mexico, Niger, Nigeria, Philippines, South Africa and Sudan. The group of agriculture (food and beverages) importers includes Algeria, Bangladesh, Burkina Faso, Congo, Cote d'Ivoire, Egypt, Equatorial Guinea, Jordan, Madagascar, Mauritius, Niger, Senegal and Sudan. Energy importers are Brazil, Cote d' Ivoire, India, and Pakistan.

Figure G.6: Impulse Responses to an Import Price Shock by Export Group



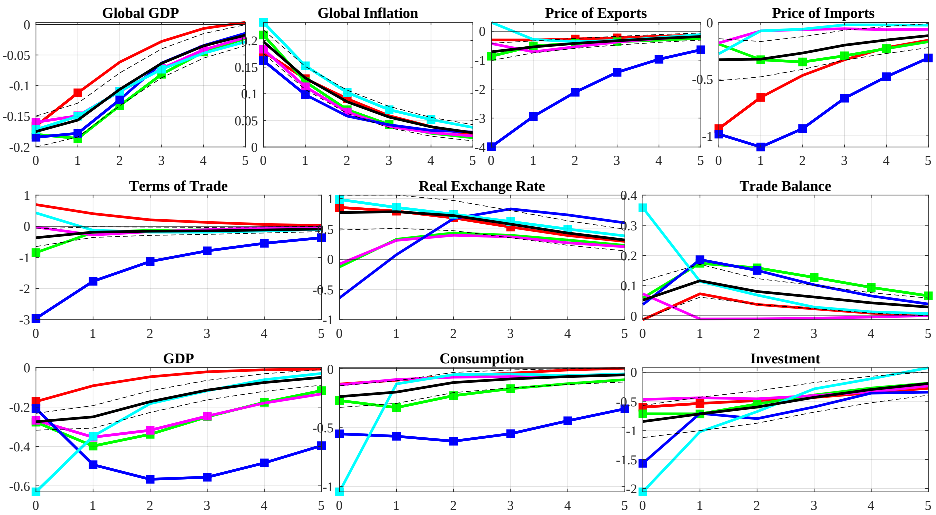
Notes: This Figure shows the impulse responses to an import price shock for countries in each commodity group using a VAR with sign and narrative restrictions. Each color represents a different export group: agriculture (food and beverages) exporters are in green, energy exporters in magenta, manufacturing exporters in red, metal exporters in blue and agriculture raw material (plus fertilizers) exporters in turquoise. Reported are mean responses weighted using inverse variance weights. The squares denote that zero is not within the 68 percent confidence band. For comparison, the impulse responses for all countries are shown in black with the corresponding 16^{th} and 84^{th} percentile error bands.

Figure G.7: Impulse Responses to a Global Demand Shock by Export Group



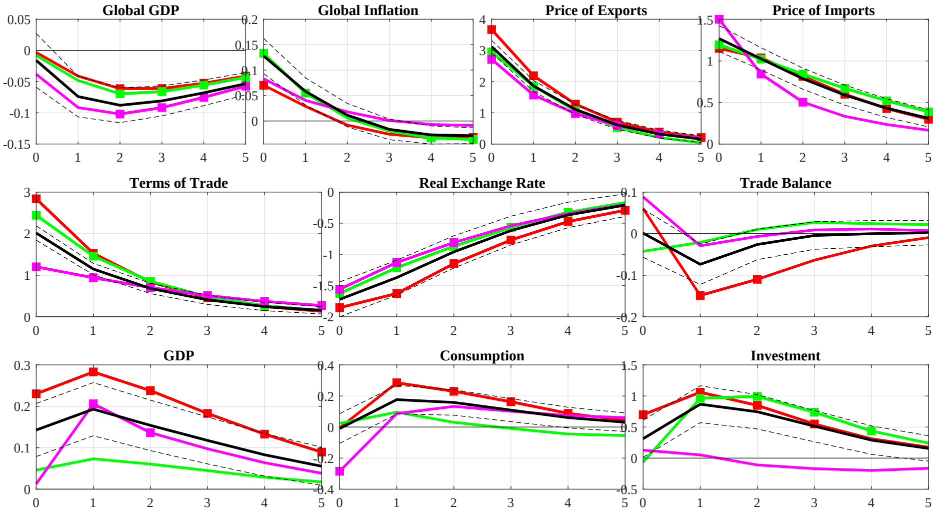
Notes: This Figure shows the impulse responses to a global demand shock for countries in each commodity group using a VAR with sign and narrative restrictions. Each color represents a different export group: agriculture (food and beverages) exporters are in green, energy exporters in magenta, manufacturing exporters in red, metal exporters in blue and agriculture raw material (plus fertilizers) exporters in turquoise. Reported are mean responses weighted using inverse variance weights. The squares denote that zero is not within the 68 percent confidence band. For comparison, the impulse responses for all countries are shown in black with the corresponding 16^{th} and 84^{th} percentile error bands.

Figure G.8: Impulse Responses to a Global Supply Shock by Export Group



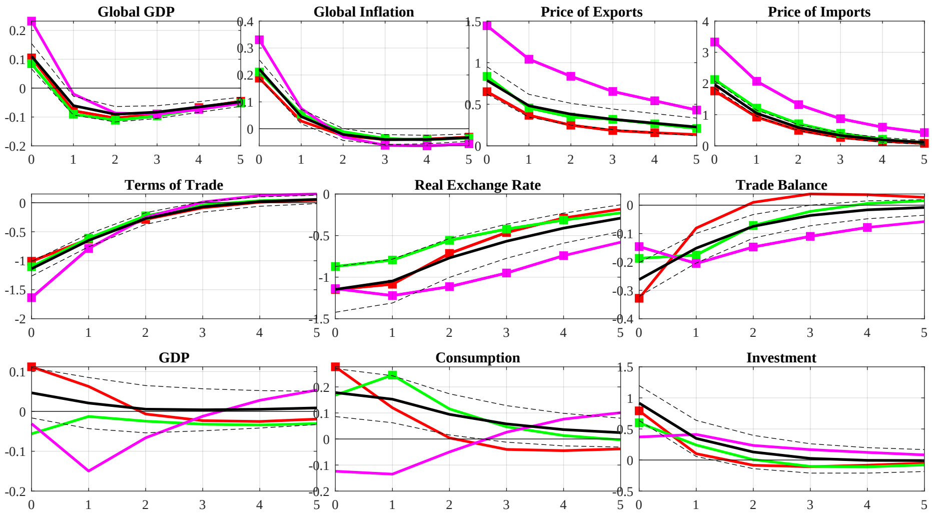
Notes: This Figure shows the impulse responses to a global supply shock for countries in each commodity group using a VAR with sign and narrative restrictions. Each color represents a different export group: agriculture (food and beverages) exporters are in green, energy exporters in magenta, manufacturing exporters in red, metal exporters in blue and agriculture raw material (plus fertilizers) exporters in turquoise. Reported are mean responses weighted using inverse variance weights. The squares denote that zero is not within the 68 percent confidence band. For comparison, the impulse responses for all countries are shown in black with the corresponding 16^{th} and 84^{th} percentile error bands.

Figure G.9: Impulse Responses to an Export Price Shock by Import Group



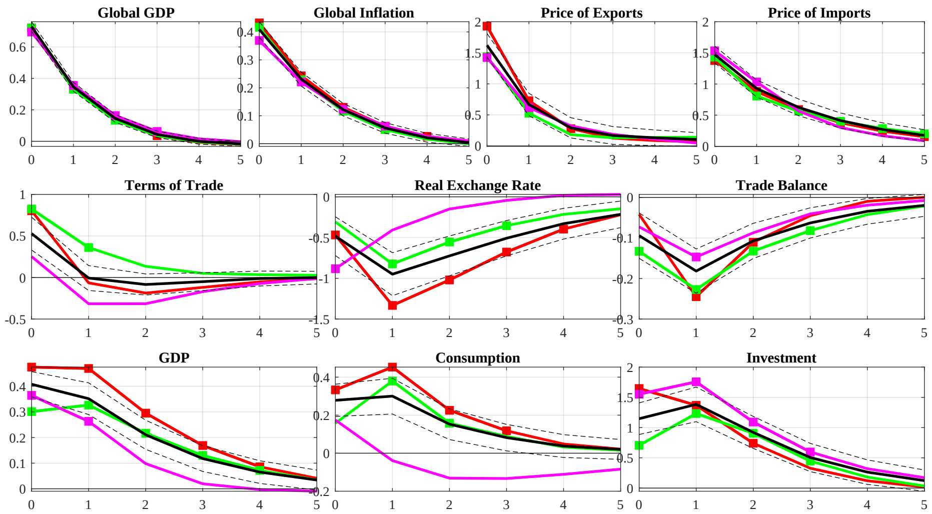
Notes: This Figure shows the impulse responses to an export price shock for countries in each commodity group using a VAR with sign and narrative restrictions. Each color represents a different import group: agriculture (food and beverages) importers are in green, energy importers in magenta, and manufacturing importers in red. Reported are mean responses weighted using inverse variance weights. The squares denote that zero is not within the 68 percent confidence band. For comparison, the impulse responses for all countries are shown in black with the corresponding 16^{th} and 84^{th} percentile error bands.

Figure G.10: Impulse Responses to an Import Price Shock by Import Group



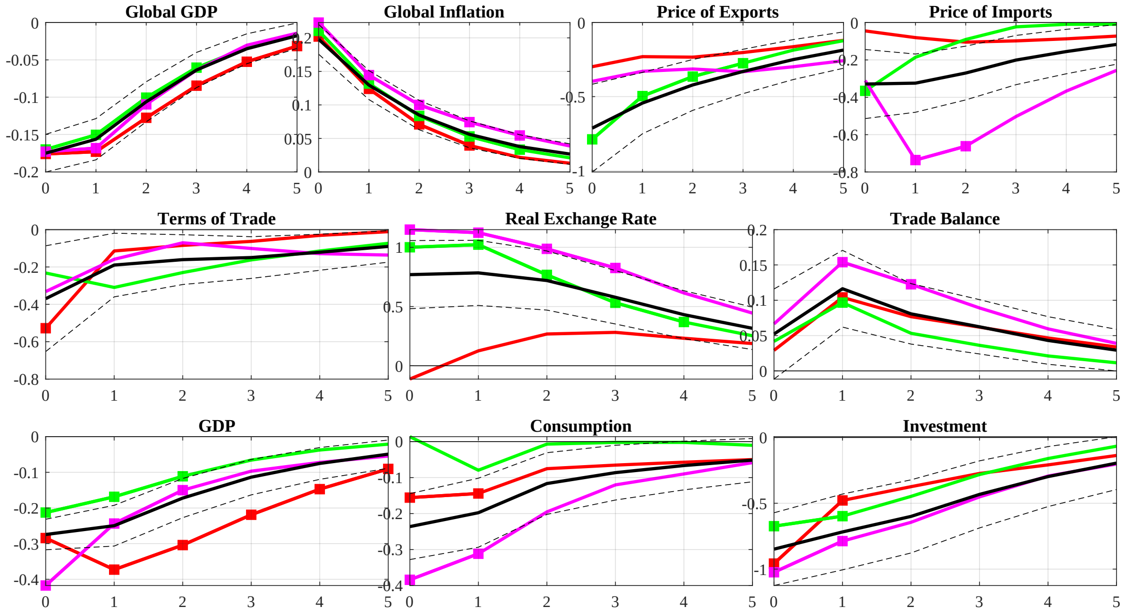
Notes: This Figure shows the impulse responses to an import price shock for countries in each commodity group using a VAR with sign and narrative restrictions. Each color represents a different import group: agriculture (food and beverages) importers are in green, energy importers in magenta, and manufacturing importers in red. Reported are mean responses weighted using inverse variance weights. The squares denote that zero is not within the 68 percent confidence band. For comparison, the impulse responses for all countries are shown in black with the corresponding 16^{th} and 84^{th} percentile error bands.

Figure G.11: Impulse Responses to a Global Demand Shock by Import Group



Notes: This Figure shows the impulse responses to a global demand shock for countries in each commodity group using a VAR with sign and narrative restrictions. Each color represents a different import group: agriculture (food and beverages) importers are in green, energy importers in magenta, and manufacturing importers in red. Reported are mean responses weighted using inverse variance weights. The squares denote that zero is not within the 68 percent confidence band. For comparison, the impulse responses for all countries are shown in black with the corresponding 16^{th} and 84^{th} percentile error bands.

Figure G.12: Impulse Responses to a Global Supply Shock by Import Group



Notes: This Figure shows the impulse responses to a global supply shock for countries in each commodity group using a VAR with sign and narrative restrictions. Each color represents a different import group: agriculture (food and beverages) importers are in green, energy importers in magenta, and manufacturing importers in red. Reported are mean responses weighted using inverse variance weights. The squares denote that zero is not within the 68 percent confidence band. For comparison, the impulse responses for all countries are shown in black with the corresponding 16th and 84th percentile error bands.

Table G.3: FEVD by Commodity Groups: International Prices

	Export Prices				Import Prices				Terms of Trade				RER			
	g^d	g^s	$p^{x,\$}$	$p^{m,\$}$	g^d	g^s	$p^{x,\$}$	$p^{m,\$}$	g^d	g^s	$p^{x,\$}$	$p^{m,\$}$	g^d	g^s	$p^{x,\$}$	$p^{m,\$}$
									Agriculture (Food and Beverages) Exporters							
0	18.62	19.64	55.63	6.11	22.20	13.16	25.40	39.24	11.86	25.36	44.98	17.79	4.61	5.41	7.86	5.41
10	19.67	22.90	45.32	12.11	22.71	19.03	28.97	29.28	15.94	25.23	39.98	18.85	13.08	13.51	17.16	12.02
									Energy Exporters							
0	24.96	18.74	53.91	2.39	25.20	13.90	20.11	40.79	20.81	20.85	55.38	2.96	5.12	8.44	8.22	10.70
10	24.09	22.04	49.87	4.00	23.25	18.96	30.86	26.92	22.35	22.86	48.81	5.98	16.71	13.38	17.47	16.58
									Manufacturing Exporters							
0	13.03	15.10	49.46	22.40	20.88	14.79	6.25	58.08	16.35	18.55	19.78	45.32	4.94	7.93	15.74	12.38
10	15.02	17.48	40.57	26.93	20.77	17.83	10.21	51.19	20.42	18.67	19.97	40.95	11.42	16.27	23.48	24.03
									Metal Exporters							
0	25.25	28.50	43.05	3.20	28.68	16.79	22.54	31.98	18.89	30.89	46.69	3.53	5.90	5.93	8.63	5.33
10	22.07	28.38	44.68	4.88	24.33	23.30	33.47	18.90	19.37	29.90	44.10	6.62	13.36	13.09	15.31	11.81
									Agriculture Raw Matrials (plus Fertilizers) Exporters							
0	24.93	19.25	50.99	4.84	22.38	12.21	24.21	41.20	21.44	20.35	49.04	9.17	3.89	9.07	9.92	5.85
10	27.52	21.72	40.02	10.75	24.35	17.73	27.93	30.00	25.36	22.14	42.17	10.32	17.34	13.12	14.43	10.24
									Agriculture Importers							
0	20.81	18.01	54.98	6.20	21.87	13.75	20.44	43.94	17.27	21.11	50.25	11.37	4.84	7.65	8.50	6.27
10	21.14	21.21	46.64	11.01	21.64	18.08	28.73	31.54	19.25	22.90	44.02	13.84	15.14	14.52	17.32	12.81
									Energy Importers							
0	16.14	14.54	53.17	16.15	15.64	17.60	15.85	50.91	12.45	22.88	26.14	38.53	5.41	7.29	8.72	7.35
10	15.85	19.43	42.15	22.57	16.58	21.57	17.78	44.06	14.46	23.07	30.09	32.37	12.72	19.55	15.07	17.12
									Manufacturing Importers							
0	20.93	20.48	52.78	5.82	24.05	13.16	21.49	41.30	14.46	24.39	48.82	12.33	5.16	6.26	8.99	7.29
10	20.97	23.13	45.67	10.23	23.57	18.88	27.89	29.67	17.85	24.93	41.59	15.63	14.38	12.39	17.14	13.05

Table G.4: FEVD by Commodity Groups: Business Cycle Variables

	Trade Balance				Output				Consumption				Investment			
	g^d	g^s	$p^{x,\$}$	$p^{m,\$}$	g^d	g^s	$p^{x,\$}$	$p^{m,\$}$	g^d	g^s	$p^{x,\$}$	$p^{m,\$}$	g^d	g^s	$p^{x,\$}$	$p^{m,\$}$
Agriculture (Food and Beverages) Exporters																
0	6.02	5.08	6.11	7.30	9.86	5.85	8.18	7.06	6.42	6.08	6.59	7.21	7.81	5.83	6.07	6.43
10	12.13	11.33	12.48	11.79	15.83	15.42	19.28	13.51	13.30	13.78	15.90	13.85	14.39	12.70	13.07	11.88
Energy Exporters																
0	7.82	6.00	8.16	4.80	6.60	5.67	7.31	5.04	6.38	7.23	9.19	6.46	6.49	4.89	5.20	6.42
10	12.96	10.61	16.77	8.95	14.77	14.82	20.47	13.03	10.85	12.67	17.31	11.91	13.20	12.62	16.45	12.94
Manufacturing Exporters																
0	9.12	4.75	5.52	6.48	8.09	7.88	5.01	5.26	6.18	4.63	9.84	6.82	5.86	5.34	5.69	5.09
10	14.96	10.38	11.21	17.26	14.29	11.84	13.43	14.15	12.43	10.88	18.21	16.72	13.47	11.61	18.84	15.42
Metals Exporters																
0	5.15	5.71	6.12	5.42	12.86	6.27	6.62	4.67	11.30	6.34	8.43	4.98	9.40	13.02	7.59	5.72
10	9.16	10.92	12.14	9.40	16.39	19.93	19.21	11.07	18.38	16.45	17.53	9.93	13.44	17.66	15.63	9.29
Agriculture Raw Materials (plus Fertilizers) Exporters																
0	8.78	5.85	5.58	5.33	5.01	8.05	6.67	6.26	4.94	7.22	5.58	5.82	4.14	5.36	5.37	6.00
10	12.26	9.70	11.27	8.54	13.57	13.42	13.54	12.50	11.79	12.35	12.09	10.52	12.00	11.95	13.21	10.48
Agriculture Importers																
0	8.64	6.48	8.75	6.13	7.31	6.67	6.95	5.03	7.43	7.66	9.32	6.59	7.97	5.32	5.25	5.30
10	14.12	11.52	15.07	10.83	15.28	12.98	15.38	11.74	14.37	13.08	16.97	13.28	14.48	11.37	13.43	10.67
Energy Importers																
0	4.05	5.84	7.01	7.01	9.87	10.11	8.90	6.39	4.36	9.74	12.18	11.16	6.93	6.29	5.37	4.43
10	10.28	15.09	12.78	15.01	15.62	16.35	17.89	14.70	10.15	16.45	20.54	19.85	14.62	14.37	11.56	12.03
Manufacturing Importers																
0	7.23	5.85	6.45	6.98	9.45	6.41	6.95	6.37	7.24	6.38	6.62	6.79	8.32	5.95	6.61	6.07
10	12.74	11.13	13.28	10.93	15.92	14.78	15.95	12.72	13.54	12.94	14.33	12.26	14.29	12.26	14.25	10.93

Appendix H Robustness

The baseline VAR presented in Section 5 assumes that a country's export and import prices are exogenous to their own, country-specific shocks. One concern with this assumption is that country-specific shocks could lead to changes in equilibrium prices of specific commodities while likely having an independent effect on domestic GDP. This would invalidate the SOE-exogeneity assumption and would represent an inconsistency in the identification approach. In order to address this, we estimate two alternative specifications. First, we exclude from the VAR the countries that produce a substantial percentage of the global production of a specific commodity. Second, we estimate the VAR using the common component of export and import prices.

H.1 Excluding Main Commodity Producers

In order to identify countries whose commodity production represents a large share of world production we proceeded in two steps. First, we focused on the main commodities each country's exports over the period analyzed (as listed in Tables C.1-C.5). Second, we compiled commodity-specific information on global and country-specific production of those main commodities and computed the average share of each country production in world production for the period 1980-2019.[57] Finally, for the robustness exercise, we dropped the countries whose average production of a given commodity represents more than 10 percent of world production. These countries are: Argentina, Brazil, Colombia Cote de Ivoire, and Ghana. Table H.1 lists the share of commodity production in world production in large producers in our sample for the key commodities identified. Impulse responses to an export and import price shock are reported in Figure H.1 and they remain robust.

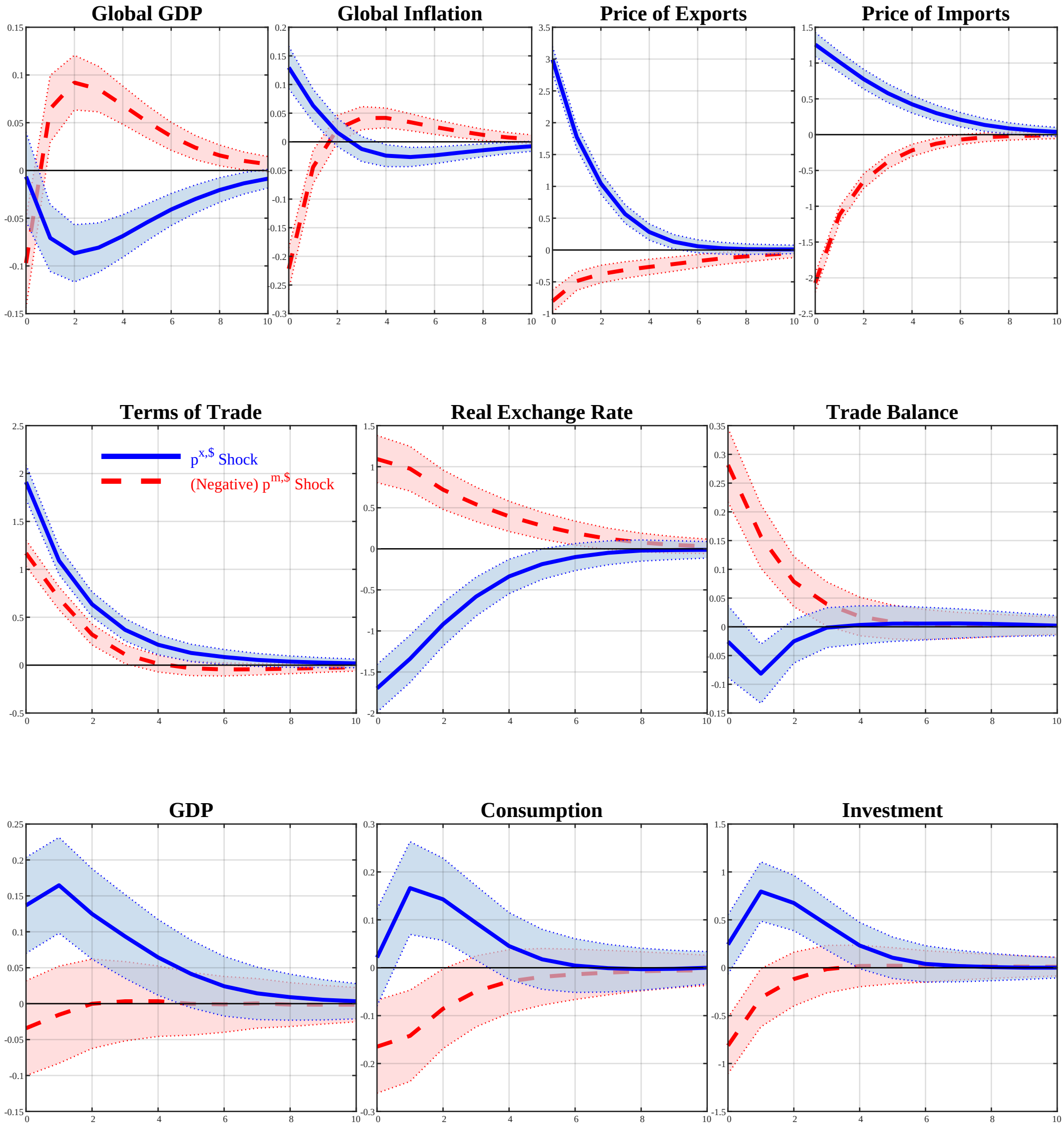
Table H.1: Commodity Production: Large Producers

Country	Commodity	Production (as percent of world production)
Argentina	Soybean	13
Brazil	Coffee	28
	Soybean	22
	Iron ore	16
Colombia	Coffee	11
Cote d'Ivoire	Cocoa	33
Ghana	Cocoa	14

Notes: This Table shows the percentage of production in world production for given commodities. Only commodities each country exports and that represent over 10 percent of world production are listed.

[57] For energy commodities production information was obtained from the British Petroleum Statistical Review of World Energy and Joint Organizations Data Initiative (JODI) oil and gas database. Production information for metals was obtained from the United States Geological Survey. Finally, production information for agriculture commodities and fertilizers was sourced from FAO.

Figure H.1: IRFs Excluding Large Commodity Producers



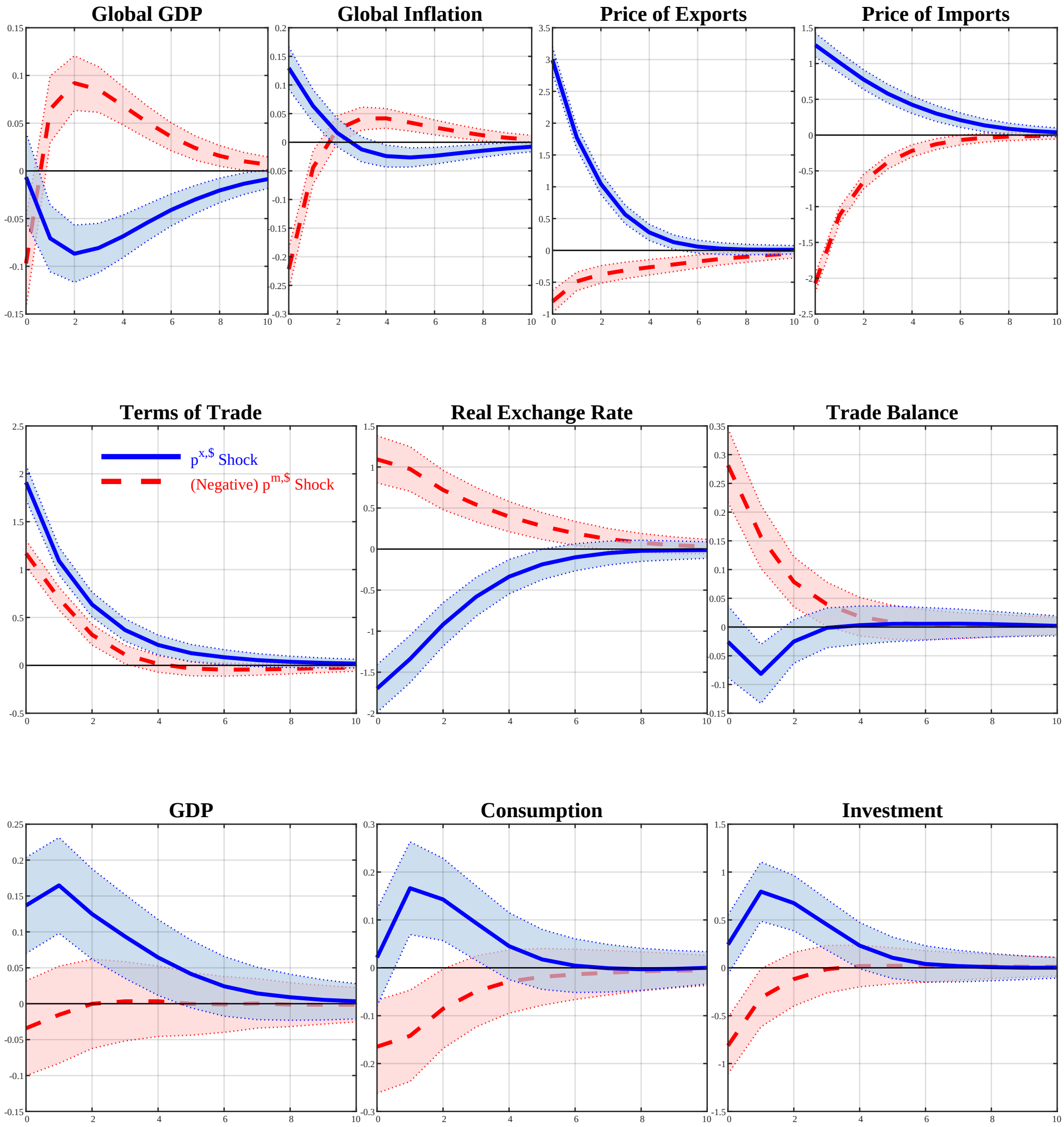
Notes: This Figure shows the impulse responses to a positive one standard deviation export price shock (solid blue) and negative one standard deviation import price shock (dashed red) for all countries excluding those listed in Table H.1 using a VAR with sign and narrative restrictions. The solid and dashed lines denote the mean responses weighted using inverse variance weights and the shaded areas represent the 16$^{\text{th}}$ and 84$^{\text{th}}$ percentile error bands.

Table H.2: Forecast Error Variance Decomposition: Excluding Large Commodity Producers

	Export Prices		Import Prices		Terms of Trade		Real Exchange Rate	
	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$
0	52.00	7.76	19.99	42.46	43.11	18.76	9.98	8.03
1	50.49	8.93	22.55	38.87	41.70	18.86	13.12	11.04
4	46.46	11.49	25.55	34.04	39.04	19.51	16.52	13.60
10	44.51	12.88	26.47	32.32	38.14	19.98	18.06	14.41
	Trade Balance		**Output**		**Consumption**		**Investment**	
	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$
0	7.12	7.48	6.35	5.98	7.53	6.50	5.73	6.45
1	10.67	9.65	9.24	8.91	10.97	9.50	9.33	8.83
4	13.24	11.66	13.69	12.40	14.21	12.13	13.36	11.55
10	14.33	12.24	15.65	13.70	15.57	12.97	14.85	12.54

Notes: The Table shows the forecast error variance decomposition of all the variables in the VAR in response to export price and import price shocks on impact, at a 1-year, 4-year and 10-year horizons. Reported are mean responses weighted using inverse variance weights. $p^{x,\$}$ and $p^{m,\$}$ denote export and import price shocks, respectively.

Figure H.2: IRFs Common Component



Notes: This Figure shows the impulse responses to a positive one standard deviation export price shock (solid blue) and negative one standard deviation import price shock (dashed red) for all countries using a VAR with sign and narrative restrictions. The common component as opposed to export and import prices data were used. The solid and dashed lines denote the mean responses weighted using inverse variance weights and the shaded areas represent the 16th and 84th percentile error bands.

H.2 Common Component of Export and Import Prices

We estimate the VAR using the common component of export and import prices, as opposed to the country-specific series. In particular, we estimate the first four Principal Components from the panel of the price of exports and imports for each country in our sample. We then replaced the price of export and import for each country with the fitted value from what is explained by the principal components. The common component is by definition orthogonal to the country specific idiosyncratic part of the series and, as such, could be interpreted as being "less endogenous" to the country-specific shocks. The impulse responses are presented in Figure H.2. The baseline results remain robust.

Table H.3: Forecast Error Variance Decomposition: Common Component

	Export Prices		Import Prices		Terms of Trade		Real Exchange Rate	
	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$
0	50.36	8.54	22.69	36.87	42.84	16.67	8.96	8.04
1	50.21	8.89	24.89	33.94	42.23	17.02	12.34	10.11
4	46.80	10.71	27.54	29.76	40.16	17.81	16.05	12.56
10	44.56	12.15	28.67	28.07	38.88	18.62	17.82	13.50
	Trade Balance		Output		Consumption		Investment	
	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$	$p^{x,\$}$	$p^{m,\$}$
0	6.73	7.48	7.13	6.10	7.32	6.66	6.86	7.01
1	10.04	9.96	9.95	9.16	10.84	9.94	10.11	9.11
4	12.89	12.29	14.19	12.78	14.01	12.49	14.07	11.65
10	14.23	12.94	16.25	14.07	15.38	13.36	15.57	12.59

Notes: The Table shows the forecast error variance decomposition of all the variables in the VAR for export price and import price shocks on impact, at a 1-year, 4-year and 10-year horizons. Reported are mean responses weighted using inverse variance weights. $p^{x,\$}$ and $p^{m,\$}$ denote export and import price shocks, respectively.

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