World Shocks, Commodity Prices and Domestic Inflation

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Abstract

We evaluate the importance of world shocks for explaining domestic inflation fluctuations. To this end, we devise a structural vector autoregressive (SVAR) model, in which world shocks affect domestic economies through changes in commodity prices and the world interest rate. The model is applied to a set of 105 countries, for the period from 1970 to 2014. Our results indicate that world shocks can explain between twenty four and thirty eight percent of inflation fluctuations in the median country. Our results highlight the need for using multiple commodity price indices in assessing the effects of world shocks. Single-world-price SVAR models have been previously found to significantly underestimate the importance of world shocks for domestic business cycles. Similarly, we find that a fraction of the inflation variance explained by world shocks falls by more than half (below ten percent in the median country) when a single-world-price is included in the SVAR. Our results are robust to a range of alternative specifications. Finally, we evaluate the role of structural country-specific characteristics in the propagation of world shocks.

Key words: world shocks, commodity prices, domestic inflation
JEL classification: E31, E32, F44, F62

1 Introduction

The liberalization of trade and capital flows has arguably increased the importance of world shocks for both advanced and emerging economies. The origin of these shocks can often be found in commodity markets (Halka and Kotlowski, 2017). Since the energy crises of the mid-1970s, fluctuations in the prices of globally traded goods have caused some concerns for policymakers (Sapsford and Singer, 1998) and attracted attention of many economists. For example, the recent results of Fernández, Schmitt-Grohe and Uribe (2017) demonstrate that up to one-third of the output fluctuations be explained by commodity price shocks. Yet, the extent to which world shocks in general and commodity price shocks in particular can matter for domestic inflation remains debatable.

Many previous studies have focused on the role of individual commodities, most notably of the oil prices, on inflation (Mendoza, 1995; Kose, 2002; Broda, 2004). However, Fernández, Schmitt-Grohe and Uribe (2017) suggest that single measures of world prices may not provide sufficient information to explain the channels through which the world shocks are transmitted to domestic business cycles. As a result, the role of the world shocks in explaining domestic inflation may be underestimated.

In this paper, we re-visit the importance of the world shocks in explaining changes in domestic inflation. To this end, we adapt a structural vector-autoregressive (SVAR) model developed by Fernández, Schmitt-Grohe and Uribe (2017) to study inflation in the sample of 105 countries. Fernández, Schmitt-Grohe and Uribe (2017) build on the insight that the world shocks are transmitted to small open economies via changes in the world prices (commodity prices and the world interest rate). Since prices of internationally traded commodities, such as food, metal, and fuel, reflect changes in supply and demand conditions of the world markets, all these prices are informative about world shocks. Even though this approach does not identify the structural shocks driving the world prices directly, it provides means to assess the historical contribution of the world to inflation fluctuations. Our main statistics of interest is the fraction of the variance of inflation (for each country in the data sample) that can be attributed to the world shocks mediated by commodity prices.

We find that commodity prices can explain twenty-four percent of inflation fluctuations in the median country. This statistics implied an increased contribution of world shocks to changes in domestic inflation rates compared to previous studies. Furthermore, this statistics falls by more than half (below ten percent in the median country) when single-world-price is used in the estimation. In this respect, our results echo the conclusions of Rodriguez, Gonzalez and Fernández Martin (2016) and Fernández, Schmitt-Grohe and Uribe (2017) who demonstrate the importance of using multiple prices for output fluctuations. Our results also highlight the importance of the world interest rate as an additional transmission channel of world shocks to domestic inflation. When the world real interest rate in included in the SVAR, the fraction of inflation explained by world shocks increases to thirty eight percent.

We also find significant cross-country differences in the importance of world shocks for inflation. Motivated by previous theoretical studies, we identify several structural country-specific factors that may help explain the differences. For instance, we find that the inflation of countries with a higher share of export (import) in real GDP is positively (negatively) affected by how domestic inflation responds to international commodity price shocks.

Finally, theoretical papers discuss the channels through which commodity price shocks affect domestic prices. Sekine and Tsuruga (2018) state that commodity price shocks affect consumer prices through commodity prices alone—the first-round effect. Accordingly, commodity price shocks could also spill over into the price of goods and services other than commodities. This impact could be through the production cost and price setting in other industries—the second-round effect (Sekine and Tsuruga, 2018). The expansion of cross-border trade in intermediate goods and services is an important channel through which global economic slack influences domestic inflation (Kaldor, 1976; Kose, 2002; Neely and Rapach, 2011; Auer, Borio and Filardo, 2017; Gelos and Ustyugova, 2017). Since a typical firm in a small open economy is likely to use imported intermediate goods in production, the real cost of imported inputs increases. Commodity price shocks affect the economy through medium-term fiscal planning; during booms, there will be strong pressures to scale up spending independently of the capacity to manage it. This can lead to the need for large fiscal adjustments (Medas, Salins and Danforth, 2016).

The rest of the paper is organized as follows. Section 2 describes the data. Section 3 specifies our empirical model. Section 4 and 5 present the main results and their robustness. Section 6 explores possible explanations for heterogeneity among countries in response to world shocks. Section 7 concludes.

2 Data description

Our analysis relies on country-specific rates of inflation and real GDP growth, world interest rates, and commodity prices.

Country-specific macroeconomic variables Macroeconomic variables are from the World Development Indicators[1] (WDI) of the World Bank. The key variable of interest, inflation, is measured by the annual percentage change the consumer price index (CPI). The CPI reflects the cost to the average consumer of acquiring a basket of goods and services. The GDP data are in constant local currency units. We use the annual growth rate of output. The growth rates specifications are suggested by the conventional Augmented Dickey-Fuller tests applied to the level and the growth rate of output.

Our baseline sample contains 105 countries, for the period from 1970 to 2014. The annual sample is unbalanced. The longest sample contains 45 years (1970-2014) and the shortest sample contains 20 years (1994-2014). In the robustness section, we also work with quarterly sample of 40 countries, using the data from the OECD database. We require that a country has at least 100 consecutive quarterly observations to be included in the quarterly sample. Table A1 in the Appendix describes country-by-country information about its sample period and the data source.

Commodity prices Commodity prices are obtained from the World Bank's Pink Sheet.[2] This data source includes monthly series of 45 globally-traded commodities as well several commodity indices. The series are expressed in U.S. dollars. We use the monthly U.S. CPI to convert the nominal series into real.

Similar to Fernández, Schmitt-Grohe and Uribe (2017), our baseline model uses three commodity price indices: agricultural, fuel, and metal prices. These indices are the weighted averages of spot prices of commodities. The fuel index is included the prices of coal, crude oil, and natural gas. The agricultural index is a weighted average of prices of beverages (cocoa, coffee, and tea), food (fats and oils, grains, and other foods), and agricultural raw materials (timber and other raw materials). The metals and minerals index includes spot prices of aluminum, copper, iron, ore, lead, nickel, steel, tin, and zinc. We calculate the annual data by taking the monthly averages. In our estimation, we use the annual growth rates of commodity prices, as suggested by the stationary results of Augmented Dickey-Fuller tests.

[1]The WDI database is publicly available at http://data.worldbank.org.

[2]The data is publicly available at http://www.worldbank.org/en/research/commodity-markets.

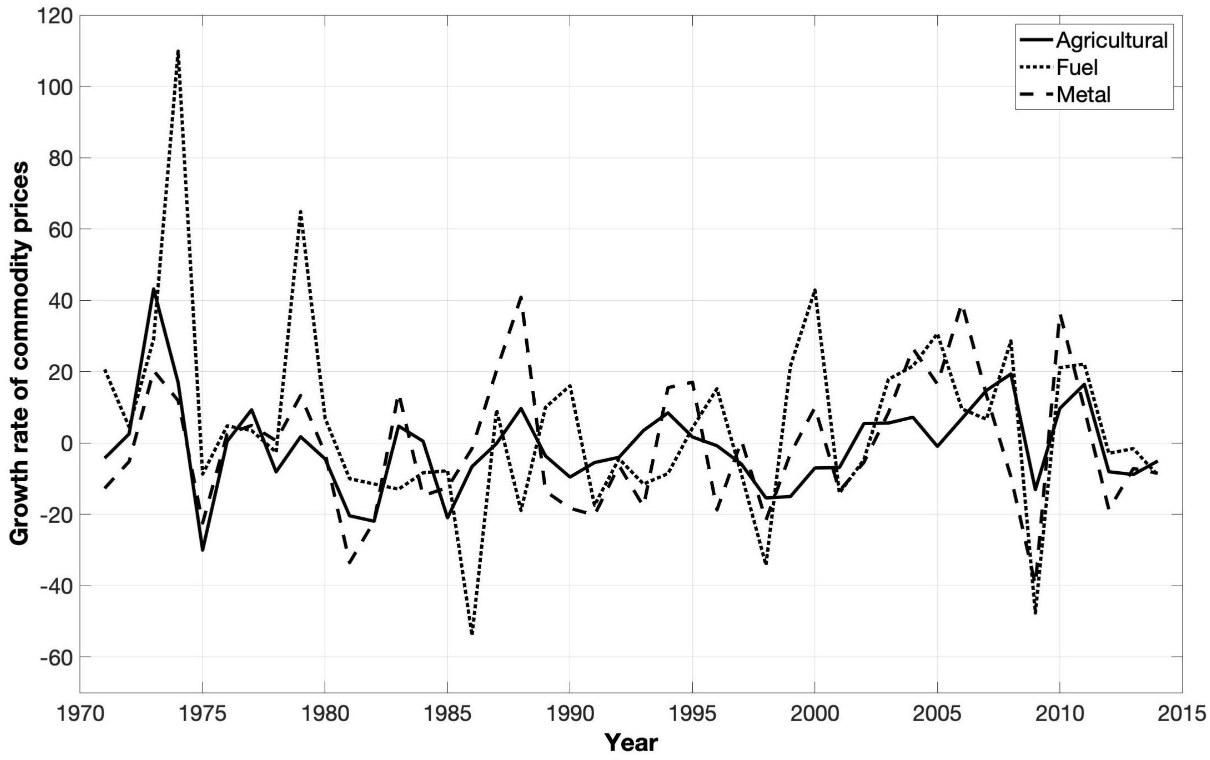

Fig. 1: The panel displays the growth rate of real commodity prices (agricultural, fuel, and metal), over the period 1970-2014.

Figure 1 displays the three commodity price indices. Two observations are worth pointing out. This, commodity prices are volatile. This volatility suggests that commodity price changes can be a potentially important source of inflation. Second, there is a relatively strong positive correlation between the indices. This suggests that the joint behaviour of commodity prices may be more informative about the possible effects of the world shocks. This comovement pattern has often been overlooked by other studies.

While our baseline results are based on three price indices, we evaluate the implications of using different single commodity price measures in section 4.3. We also explore the information content contained in all available commodity prices by estimating a factor model.

The world interest rate We take the real three-month U.S. Treasury bill rate as a proxy for the world interest rate. To obtain this measure, we subtract the monthly U.S. CPI inflation rate from the monthly Treasury bill rate, and then average the monthly data into the annual frequency.

3 SVAR model

Our empirical framework follows the approach developed by Fernández, Schmitt-Grohe and Uribe (2017). Specifically, we study the joint behaviour of the world price vector p_t and of the vector of domestic macroeconomic indicators for country i denoted by Y_t^i from a perspective of a small open economy. This behaviour is characterized by a block-recursive SVAR model.

The foreign bloc In our baseline specification, the world price vector consists of the growth rates of real prices of agricultural, fuel, and metal commodity price indices p_t^a, p_t^f, and p_t^m,

$$p_t = \begin{bmatrix} {p_t}^a \\ {p_t}^f \\ {p_t}^m \end{bmatrix}$$

We later augment this price vector to include the real interest rate r_t.

We assume that the world prices are independent of domestic macroeconomic variables for each individual country. Further, we assume that they follow the first-order vector autoregressive system.

$$p_t = Ap_{t-1} + \mu_t, \tag{3.1}$$

where A represents a matrix of coefficients, and μ_t is an i.i.d mean-zero random vector with the variance matrix Σ_μ. The vector μ_t captures the effects of unobservable structural world shocks. It is important to note that no assumptions are imposed to identified these shocks in the model. Instead, the focus here, as in Fernández, Schmitt-Grohe and Uribe (2017), is on the estimating the *joint contribution* of μ_t to domestic inflation in individual countries.

The domestic bloc The vector of domestic macroeconomic indicators Y_t^i includes the inflation rate and/or GDP growth. The domestic variables are influenced by country-specific shocks ε_t^i and world shocks μ_t. We assume that ε_t^i and μ_t are uncorrelated. Further, the world shocks can affect the small open economy only through changes in the contemporaneous or past world prices p_t. These assumptions give rise to the following model,

$$Y_t^i = B^i p_t + C^i\, Y_{t-1}^i + D^i\, p_{t-1} + \varepsilon_t^i. \tag{3.2}$$

The innovations vector ε_t have mean-zero and the variance matrix $\Sigma^i_{\varepsilon_t}$.

The SVAR model Combining 3.1 into equation 3.2, we obtain a first-order block-recursive structural vector autoregressive model in the form

$$\begin{bmatrix} p_t \\ Y^i_t \end{bmatrix} = \begin{bmatrix} A & 0 \\ B^i A + D^i & C \end{bmatrix} \begin{bmatrix} P_{t-1} \\ Y^i_{t-1} \end{bmatrix} + \begin{bmatrix} I & 0 \\ D^i & I \end{bmatrix} \begin{bmatrix} \mu_t \\ \varepsilon^i_t \end{bmatrix}, \tag{3.3}$$
$$E \begin{bmatrix} \mu_t \mu_t^{'} & \mu_t \varepsilon_t^{i'} \\ \varepsilon^i_t \mu_t^{'} & \varepsilon^i_t \varepsilon_t^{i'} \end{bmatrix} = \begin{bmatrix} \Sigma_\mu & 0 \\ 0 & \Sigma^i_\varepsilon \end{bmatrix}.$$

The coefficients of the foreign bloc A and Σ_μ are estimated by the ordinary least squares (OLS), equation by equation, using annual data from 1970 to 2014. The $R^2 = [0.38\ 0.32\ 0.33]$ for the three equations in the model suggests contemporaneous shocks explain almost two-thirds of movements in commodity prices.

We then estimate the domestic bloc, equation 3.2, by the OLS for every 105 countries in the sample. With the parameters of the SVAR at hand, we perform variance decomposition to estimate the joint contribution of world shocks μ_t to movements in domestic macroeconomic indicators in a specific country.

Implementation details To overcome problems with the relatively small number of observations, with follow two suggestions of Fernández, Schmitt-Grohe and Uribe (2017). First, we estimate the parameters of the domestic bloc in two ways. (i) The *Sequential estimation* includes only one domestic indicator (either the inflation rate or output growth) in Y_t and estimated the domestic bloc two times per country (once for each indicator). (ii) The *joint estimation* includes both indicators in the vector Y^i_t, which results in a maximum number on the degrees of freedom.

Another issue is the possibility of a small-sample upward bias in the estimation of the model. This small-sample upward bias might occur due to two reasons. First, any negative or positive correlation between the foreign bloc and the domestic bloc may result in a positive share of commodity price shocks in the variance matrix Σ^i_ε. Second, the estimates obtained from OLS regressions are known to be biased in a short sample. To overcome these issues, we follow the Monte Carlo procedure suggested by Fernández, Schmitt-Grohe and Uribe (2017) to create artificial data. We estimate the model to calculate the non-corrected estimates using the real data and subtract the small sample bias obtained from the Monte Carlo procedure to get the corrected estimates. In dicussing the results, we will focus on the estimates corrected for the small sample bias.

4 Results

This section starts with a discussion of the contribution of world shocks to explaining inflation and output fluctuations in the baseline model with three commodity prices. We then consider several variations of the model. Section 4.2 examines the role of including the world interest rate into the SVAR. Section 4.3 analyzes the impact of using a single proxy for the world prices.

4.1 Commodity price shocks and inflation fluctuations

Table 1 displays the cross-country median shares of the variances of output and inflation explained by commodity price shocks. These statistics are computed by estimating the SVAR model and computing the relevant variance decomposition for each of the 105 counties, and then computing the median values. Table A2 in the Appendix reports the results for each country (σ^y and σ^π) separately. Note that our sample is unbalanced, and the number of observations for the domestic bloc is different across countries (20 to 45 across 105 countries).

The noncorrected estimate shows that commodity price shocks explain on average 32% and 33% of the output and inflation fluctuations in the 105 countries. After correcting for small-sample bias, 20% of the output fluctuations and 24% of the inflation fluctuations in sequential estimates and 22% of the output fluctuations and 25% of the inflation fluctuations in joint estimates are explained by commodity price shocks. We treat the results obtained in the corrected estimates of sequential estimation for inflation fluctuations (24%) as the baseline result in our paper. Figures 2 and 3, as well as Table A2 in the Appendix display the variance shares of inflation and output, for each country, that can be explained by world shock mediated by commodity prices.

It is useful to put our estimates in the context of the literature. For example, Gelos and Ustyugova (2017) estimate the impact of one-world price shocks on inflation fluctuations on domestic inflation. They indicate that the median long-term pass-through of a 10 percentage-point food price shock to domestic inflation is 0.2 percentage-point for advanced economies and almost 0.8 percentage-point for emerging and developing

Table 1: Share of variances explained by world shocks and mediated by commodity prices

	Cross-country median of variance share	
	Output growth	Inflation
Sequential estimation		
Noncorrected estimate	0.32	0.33
Small-sample bias	0.11	0.09
Corrected estimate	0.20	0.24
MAD of corrected estimate	0.09	0.13
Joint estimation		
Noncorrected estimate	0.33	0.35
Small-sample bias	0.11	0.10
Corrected estimate	0.22	0.25
MAD of corrected estimate	0.09	0.11

Note: Variance decompositions are based on country-by-country estimates of the SVAR system (equation 3.3) over the period 1970-2014. In sequential estimation, vector Y_t of domestic variables contains only one of the domestic variables, and in the joint estimation, vector Y_t contains both two domestic indicators. The small-sample bias in the variance decomposition for the output and inflation is on average almost 10 percentage-point. MAD stands for the cross-country median absolute deviation which displays the interval of the estimated variance share. Statistics are computed across 105 advanced and emerging economies.

economies. Furthermore, Sekine and Tsuruga (2018) find that the effects of commodity price shocks on headline inflation, on average, are increased by 1.87 percentage-point in response to a 10 percentage-point increase in commodity prices. This result indicates an increased contribution of world shocks to changes in domestic inflation rates compared to previous studies.

4.2 Results with the world interest rate

Changes in world prices can be viewed as the key mechanism through which world shocks are transmitted to small open economies (Lubik and Teo, 2005). While real commodity prices represent the relative prices of goods in the same period, the real interest rate represents the relative price of goods dated in different periods. A possible link from the world interest rate into domestic inflation is its impact on the production costs and the availability of intermediate goods (Kaldor, 1976; Neely and Rapach, 2011; Auer, Borio and Filardo, 2017). Motivated by theoretical predictions that movements in the world interest rate should affect domestic production and domestic inflation, we augment the price vector p_t in the foreign block to include the world interest rate and re-estimate the

SVAR model for each country. Our results suggest that the world interest rate does act as an important transmitter of the world shocks.

$$p_t = \begin{bmatrix} {p_t}^a \\ {p_t}^f \\ {p_t}^m \\ r_t \end{bmatrix}$$

Results with annual data The resulting shares of the variances explained by worlds shocks, mediated by the three commodity price indices and the world interest rate, are reported in Table 2 for annual data. The statistics Table 2 point to the increased importance of the world shocks for explaining both inflation and output movements. Based on the corrected estimated, the shares of output and inflation fluctuations explained by world shocks now account for 35% of the variation in output and 38% of the variation of in inflation in the median country. These shares are about fifteen percentage points higher relative to the benchmark SVAR model with the commodity prices. The result is similar for the sequential and the joint estimation.

Table 2: World shocks mediated by world interest rates and commodity prices

	Cross-country median of variance share	
	Output growth	Inflation
Sequential estimation		
Noncorrected estimate	0.48	0.50
Small-sample bias	0.13	0.12
Corrected estimate	0.35	0.38
MAD of corrected estimate	0.09	0.10
Joint estimation		
Noncorrected estimate	0.50	0.51
Small-sample bias	0.13	0.13
Corrected estimate	0.37	0.39
MAD of corrected estimate	0.09	0.10

Note: Variance decompositions are based on country-by-country estimates of the SVAR system over the period 1970-2014. In sequential estimation, vector Y_t of domestic variables contains only one of the domestic variables, and in the joint estimation, vector Y_t contains both two domestic indicators. The small-sample bias in the variance decomposition for the output and inflation is on average almost 13 percentage-point. MAD stands for the cross-country median absolute deviation which displays the interval of the estimated variance share. Here, r_t is measured by the real Treasury bill rate.

Results with quarterly data We have re-estimated the SVAR models with the three commodity price indices and the real interest rate using quarterly data. Due to the data limitations, the number of countries in our sample decreased to forty. These countries and the available sample periods are listed in the last column of Table A1 in the appendix. Table 3 reports the results for inflation for a sequential estimation method. We find that 30% of the variance of inflation is explained by world shocks using quarterly data and 33% of the variance of inflation is explained by world shocks using annual data. The estimate using annual data for all 105 countries of the sample is 38%. These estimates indicate that the results are consistent using quarterly data compared to the baseline result.

Table 3: World shocks mediated by commodity prices and interest rate using quarterly data

	Cross-country median of variance share of inflation		
	Quarterly-40 countries	Annual-40 countries	Annual-105 countries
Noncorrected estimate	0.45	0.43	0.50
Small-sample bias	0.14	0.11	0.12
Corrected estimate	0.30	0.33	0.38
MAD of corrected estimate	0.15	0.14	0.10

Note: Variance decompositions are based on country-by-country estimates of the SVAR system over the period 1970-2014 using quarterly data and annual data. MAD stands for the cross-country median absolute deviation. Statistics are computed across 40 countries. The domestic bloc contains only one country-specific indicator, domestic inflation. The small-sample bias in the variance decomposition is almost 13 percentage-point. Here, r_t is measured by the real U.S. interest rate.

4.3 Single-world-price model specification

Many previous studies have focused on the impact of a single commodity price, such as the price of oil or the price of food, on domestic inflation. Schmitt-Grohé and Uribe (2016) and Fernández, Schmitt-Grohe and Uribe (2017) demonstrate that such approach underestimates the importance of world shocks in explaining output fluctuations. In this section, we analyze the implications of using single price indicators. To this end, we estimate a number of single-world-price SVAR models and compare the results of these models relative to the SVAR with the three commodity price indices and the world interest rate. Overall, our results emphasize the need for using multiple commodity price indices in assessing the effects of world shocks.

The comparative results are reported in Table 4. We examine six alternative single price models, similar to Fernández, Schmitt-Grohe and Uribe (2017). Our focus is on the share of the variances of inflation and output growth explained by the world shocks. We report the estimates for the sequential estimation that are corrected for the small-sample bias. For the ease of comparison, first row in Table 4 reproduces the results from the SVAR model with the commodity prices and the world interest rate from Table 2.

Table 4: Share of variances using one-price specifications

	Cross country median of variance share	
Model specification	Output growth	Inflation
Four world prices, p^a,p^f,p^m,r	0.35	0.38
1.One world price, p^a	0.06	0.07
2.One world price, p^f	0.10	0.07
3.One world price, p^m	0.08	0.03
4.One world price, r	0.07	0.05
5.First principal component of, p^a,p^f,p^m,r	0.08	0.04
6.Terms of trade, tot	0.01	0.03

Note: The reported variance shares are group-specific medians using annual data. The domestic bloc is estimated at sequentially. Statistics are medians across 105 countries, corrected for small-sample bias. The first row is reproduced from Table 2. Here, r_t is measured by the real Treasury bill rate.

We first estimate the SVAR models with one of the four world prices (agricultural, fuel, metal price indices, or the world interest rate) in the foreign bloc. The results for the specifications 1 to 4 indicate that when only one world price is included in the foreign bloc, world shocks explain on average less than 10% of the variances of output and inflation in the median country (across 105 countries).

We next examine the role of common price factor (specification 5) and the terms of trade (specification 6). The common price factor is equated with the first principal component estimated for four world prices (p^a, p^f, p^m, r). The principal component is intended to capture common movements in the four series. The terms of trade series is defined as the ratio of trade weighted export to import price indices. Schmitt-Grohé and Uribe (2016) indicate that the terms-of-trade shocks represent a major source of business cycles in emerging economies. Our results in Table 4 show that both series can explain only a small fraction of inflation and output fluctuations.

5 Robustness of the results

This section demonstrates that our results on the importance of world shocks for explaining inflation and output fluctuations are robust on different dimensions.

1. **Larger number of commodity prices.** Our results show that is important to go beyond single-world-price specifications in evaluating the importance of world shocks. Our baseline model uses three commodity price indices. A natural question to ask if it is necessary to extend the number of world prices even further. To evaluate this possibility, we consider all 45 commodity prices reported by the World Bank. We estimate the factor model for the growth rate of the prices by the principal component analysis. We use Bai and Ng (2002)'s test to determine the number of factors. The AIC(3) and BIC(3) tests suggest that three leading principal components are sufficient to explain the variability of commodity prices.[3] Panel A of Table 5 shows that there is virtually no difference between the results using commodity price indices (the baseline estimation) or three leading components of the commodity series to capture the impact of the world shocks on inflation fluctuations. Table A3 display the estimation result using four components of commodity price series. World shocks using four components of commodity series explain 36% of the variation of domestic inflation fluctuations. This result indicates using more components (more variables) in the foreign bloc has more explanatory power for domestic inflation fluctuations.

2. **Excluding large commodity exporters.** There is a possibility of market power among countries that might violate our identification assumption of exogeneity of commodity prices to each country. To address this concern, we exclude large commodity exporters from the sample. We identify the top 20% largest exporters for each of the three commodity groups using the annual averages of exports of fuel, agricultural, and metal commodities from the WDI database (1970-2014). This exercise excludes 31 countries as large commodity exporters. The panel B in Table 5 reports the results for the remaining 74 countries. World shocks appear to explain 25% and 27% of the variation of output and inflation in this modified sample. These

[3] AIC(3) and BIC(3) take into account the panel structure of the data which indicates that three components should be considered in this analysis. AIC(3) performs consistently across configurations of the data while BIC(3) performs better on large N data sets.

Table 5: Heterogeneity among countries in response to world shocks

Model specification	Share of variance explained by world shocks		
	Number of countries	Output	Inflation
Baseline estimation	105	0.20	0.24
A. Larger number of commodity prices			
Using three components	105	0.24	0.25
B. Excluding large commodity exporters	74	0.25	0.27
C. Oil			
Exporters	21	0.14	0.17
Importers	82	0.21	0.29
D. Net commodity traders			
Exporters	39	0.11	0.15
Importers	64	0.25	0.28
E. Level of development			
High income	63	0.24	0.27
Low income	42	0.14	0.18
F. Data detrending			
HP filter (HP=100)	105	0.35	0.18

Note: The reported variance shares are group-specific medians using annual data. The foreign bloc consists of three commodity price indices (agriculture, fuels, and metals) except for Panel F which contains three leading components of PCA. The domestic bloc is estimated sequentially and variance shares are corrected for small sample bias.

statistics are similar to the baseline results. We conclude that the market power in commodity production does not impact the economy's susceptibility to world shocks.

3. **Oil exporters and oil importers.** We compute the country-specific median of net exports of fuels since 1970, using the annual information on exports and imports of fuel commodities from the WDI database. A country is defined as an oil exporter (importer) if the median net fuel export share in GDP is positive (negative). Based on this specification, there are 21 oil exporters and 82 oil importers in the analysis (see the panel C of Table 5). The effects of commodity price shocks on output and inflation fluctuations in oil-importing countries (21% and 29% respectively) are much stronger than in oil-exporting countries (14% and 17% respectively). This result indicates that higher oil prices may induce increases in the industry costs and

hence in the inflation rates in oil-importing countries. This result is in line with the discussion in Barsky and Kilian (2004): world shocks appear to be more important for explaining business cycles in oil importer countries than in oil exporter countries.

4. **Net commodity traders.** World shocks appear to be more important for explaining macroeconomic indicators fluctuations in countries that are net commodity importers than in countries that are net commodity exporters (Barsky and Kilian, 2004; Fernández, Schmitt-Grohe and Uribe, 2017). In our analysis, we consider a country as a commodity exporter (importer) if there is a positive (negative) trade balance on average in the group of three commodities (agricultural, fuel, and metals) since 1970. We use annual data on agricultural, fuel, and metals commodities to calculate the net trade-in for each category. This classification yields 39 commodity exporters and 64 commodity importers. The panel D of Table 5 indicates that commodity importers experience more fluctuations in response to world shocks compared to commodity exporters which is consistent with the existing literature.

5. **Level of development.** Some papers discuss how the level of development affects the importance of world shocks as drivers of domestic business cycles. Developed countries, especially small economies, tend to be more integrated to the rest of the world. This tighter links could imply a larger exposure to world shocks (Fernández, Schmitt-Grohe and Uribe, 2017). We divide countries into two categories: the high income (63 countries) and the low income (42 countries). The categorization is based on the data of per capita gross national incomes in the World Development Indicator in 2015.[4] Panel E of Table 5 shows the result of this estimation. The share of variance of output and inflation explained by world shocks in the high-income group is ten percentage points higher compared to the low-income group. This result shows that there is some positive relationship between the level of development and the share of variance accounted for by world shocks.

6. **Estimation using HP-filtered data.** Fernández, Schmitt-Grohe and Uribe (2017) work with the HP-filtered data. This filter has been criticized on different grounds. Nonetheless, we re-estimate our model with the cyclical components of the series obtained with the HP-filter with the smoothing parameter $\lambda = 100$. Panel F of Table 5 implied that data filtering increase the importance of world shocks for output by

[4] The results are robust to basing the categorization on income levels in 1990.

six percentage points, but decreases that for inflation by seven percentage points, relative to the baseline results in Table 1.

6 Structural country-specific characteristics and heterogeneity among responses

Our main results report the median contributions of world shocks. Yet, the importance of world shocks varies between the countries, as shown in Table A2. In this section, we evaluate the role of structural country-specific characteristics in the propagation of world shocks. To do so, we rely on theoretical studies to identify possible structural factors that can explain the cross-country differences. We apply an OLS estimation to explain the heterogeneity among responses using country-specific indicators. To be precise, we use the estimated fractions of the variances of inflation that are explained by world shocks and regress that on the identified factors. The number of observations in these regressions depend on the data availability.

Table 6: Structural country-specific indicators to explain heterogeneity

σ^{π}	Coefficient	Standard error	Observation	R^2	P-value
A. Export share	18.997	7.489	89	0.013	0.010
B. Import share	-16.739	6.075	89	0.041	0.007
C. Fuel intensity	0.235	0.067	83	0.109	0.001
D. CBI	-21.270	16.360	98	0.020	0.200
E. PEG (EX)	16.252	13.070	30	0.560	0.220
F. PEG (IM)	-5.470	7.600	71	0.007	0.474

Note: The results of the OLS estimation to explain the heterogeneity among responses using country-specific indicators. The number of countries are different due to availability of data for each indicator.

1. **Net food/oil exporters/importer.** Some theoretical papers discuss when the commodity price increases, a net food/oil exporter experiences positive terms of trade shock (see, for instance, Gelos and Ustyugova (2017)). This shock prompts an increase in demand and puts an upward pressure on prices. Thus, we expect

to obtains positive variations in domestic inflation (the opposite is true for a net importer). To investigate this phenomenon, we use the shares of export and imports from the Penn World Tables. Panel A (B) in Table 6 shows the share of export (import) in real GDP has a positive (negative) impact on how strongly domestic inflation responds to world shocks. The results are significant at 1% level.

2. **Fuel intensity of an economy.** An increase in oil prices is likely to increase the general price level. We expect that this impact will increase with the fuel intensity of an economy (Gelos and Ustyugova, 2017). To investigate how the fuel intensity of an economy impacts inflation fluctuations in response to world shocks, we use the growth rate of fossil fuel energy consumption, averaged over the 1970-2014 period. Panel C in Table 6 indicates that inflation in countries with a high rate of fuel intensity fluctuates 23% higher compared to other countries in the sample.

3. **The central bank independence.** A greater central bank independence (CBI), which refers to the operational and policy freedom of monetary policymakers, may affect macroeconomic performances positively. To be more specific, higher CBI is associated with higher credibility of monetary policy, which results in price stability in the presence of shocks (Cukierman, 2008; Gelos and Ustyugova, 2017). In this analysis, we use the weighted CBI index from Garriga (2016) as a proxy for central bank autonomy. The dataset covers a diverse set of countries, extending the index proposed by Cukierman (1992). Panel D in Table 6 displays the significant cross-country differences in the importance of world shocks for inflation using CBI indicator. This result shows that there is a negative relationship between higher CBI index and inflation fluctuations in response to world shocks which is consistent with previous studies.

4. **The exchange rate regime.** For net commodity exporters, a rise in commodity prices implies an equilibrium appreciation of the real exchange rate. If the nominal exchange rate is not allowed to appreciate, pressures on domestic prices are going to be higher. For net importers, a fixed nominal exchange rate will make the required depreciation more difficult but also dampen the inflationary impact (Gelos and Ustyugova, 2017). To capture a fixed nominal exchange rate regime, we use the classification of countries suggested by Shambaugh (2004). A country is classified as a "peg", as opposed to a "nonpeg", if its exchange rate stays within 2% bands

against the base currency or if it displayed zero volatility in all months except for a one-off devaluation. Countries must be pegged for two consecutive years to be counted as a peg, to avoid spuriously classifying observations as pegs due to random lack of volatility.[5] Panel E (F) in Table 6 shows that if a country is a commodity exporter (importer), there is a positive (negative) relation between following the fixed exchange rate regime and inflation fluctuations in response to shocks. The result is less precisely estimated but consistent with theoretical studies.

7 Conclusion

Our research evaluates the historical importance of world shocks for explaining changes in domestic inflation. We demonstrate that world shocks are more important than was thought previously. This result sheds light on the origin of inflation fluctuations in advanced and emerging economies. The key innovation of our paper is the use of multiple commodity price indicators. Previous studies typically rely on a single commodity price, which underestimates the importance of world shocks for domestic inflation. The findings show that twenty four percent of the fluctuations of inflation can be explained by world shocks mediated through commodity prices. We find an increased contribution of world shocks to changes in domestic inflation rates relative to the previous studies.

We identify some structural factors that may explain the estimated differences in the importance of world shocks across the countries. The knowledge of the drivers of domestic inflation is critical for determining optimal policy in controlling inflation. Most modern central banks aim to achieve low, stable, and predictable inflation, creating favorable economic conditions for economic decisions. Yet, central banks may not be always successful in mitigating the effects of world shocks. This information can also be used to find better institutional arrangements to shelter domestic inflation from world shocks.

One limitation of our analysis is the absence of explicit identification of structural world shocks. For example, these shocks can be driven by productivity shocks, shock to monetary or fiscal policy, or shocks to global uncertainty. Our method is unable to differentiate the origin of the world shocks. Further analysis in this regards would be useful.

[5]See Shambaugh (2004) for more details.

Appendices

Table A1: List of countries

	Annual data set				Quarterly data set	
Country name	Real GDP	Inflation	Data source	Balanced sample	Time period	Data source
Albania	1970-2014	1992-2014	WDI	1992-2014		
Algeria	1970-2014	1981-2014	WDI	1981-2014		
Angola	1980-2014	1991-2014	WDI	1991-2014		
Australia	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Austria	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Bahamas, The	1970-2014	1989-2014	WDI	1989-2014		
Bahrain	1970-2014	1988-2014	WDI	1988-2014		
Bangladesh	1970-2014	1987-2014	WDI	1987-2014		
Barbados	1970-2014	1986-2014	WDI	1986-2014		
Belgium	1970-2014	1977-2014	WDI	1977-2014	1970Q1-2015Q4	OECD
Benin	1970-2014	1993-2014	WDI	1993-2014		
Bolivia	1970-2014	1980-2014	WDI	1980-2014		
Botswana	1970-2014	1980-2014	WDI	1980-2014		
Bulgaria	1970-2014	1986-2014	WDI	1986-2014		
Burkina Faso	1970-2014	1980-2014	WDI	1980-2014		
Burundi	1970-2014	1980-2014	WDI	1980-2014		
Cabo Verde	1970-2014	1984-2014	WDI	1984-2014		
Cameroon	1970-2014	1980-2014	WDI	1980-2014		
Canada	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Central African Republic	1970-2014	1981-2014	WDI	1981-2014		
Chad	1970-2014	1984-2014	WDI	1984-2014		
Chile	1970-2014	1971-2014	WDI	1971-2014	1980Q1-2015Q4	OECD
China	1970-2014	1987-2014	WDI	1987-2014		
Congo, Rep.	1970-2014	1986-2014	WDI	1986-2014		
Cote dIvoire	1970-2014	1980-2014	WDI	1980-2014		
Croatia	1970-2014	1986-2014	WDI	1986-2014		
Cyprus	1970-2014	1977-2014	WDI	1977-2014		
Czech Republic	1970-2014	1992-2014	WDI	1992-2014		
Denmark	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Dominican Republic	1970-2014	1978-2014	WDI	1978-2014		
Egypt, Arab Rep.	1970-2014	1974-2014	WDI	1974-2014		
El Salvador	1970-2014	1979-2014	WDI	1979-2014		
Equatorial Guinea	1980-2014	1986-2014	WDI	1986-2014		
Eswatini	1970-2014	1981-2014	WDI	1981-2014		
Ethiopia	1970-2014	1981-2014	WDI	1981-2014		
Finland	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
France	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Gambia, The	1970-2014	1970-2014	WDI	1970-2014		
Germany	1978-2014	1978-2014	WDI	1978-2014	1970Q1-2015Q4	OECD
Greece	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD

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Table A1: List of Countries (cont.).

	Annual data set				Quarterly data set	
Country name	Real GDP	Inflation	Data source	Balanced sample	Time period	Data source
Guatemala	1970-2014	1970-2014	WDI	1970-2014		
Guinea-Bissau	1970-2014	1988-2014	WDI	1988-2014		
Haiti	1970-2014	1974-2014	WDI	1974-2014		
Honduras	1970-2014	1979-2014	WDI	1979-2014		
Hong Kong SAR, China	1970-2014	1982-2014	WDI	1982-2014		
Iceland	1970-2014	1977-2014	WDI	1977-2014	1970Q1-2015Q4	OECD
India	1970-2014	1976-2014	WDI	1976-2014		
Indonesia	1970-2014	1979-2014	WDI	1979-2014	1970Q1-2015Q4	OECD
Iran, Islamic Rep.	1970-2014	1980-2014	WDI	1980-2014		
Ireland	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Italy	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Japan	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Jordan	1975-2014	1974-2014	WDI	1974-2014		
Kenya	1970-2014	1979-2014	WDI	1979-2014		
Korea, Rep.	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Kuwait	1970-2014	1979-2014	WDI	1979-2014		
Lesotho	1970-2014	1980-2014	WDI	1980-2014		
Libya	1970-2014	1990-2014	WDI	1990-2014		
Luxembourg	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Madagascar	1970-2014	1978-2014	WDI	1978-2014		
Malawi	1970-2014	1980-2014	WDI	1980-2014		
Malaysia	1970-2014	1970-2014	WDI	1970-2014		
Mali	1970-2014	1989-2014	WDI	1989-2014		
Malta	1970-2014	1983-2014	WDI	1983-2014		
Mauritania	1970-2014	1986-2014	WDI	1986-2014		
Mauritius	1970-2014	1978-2014	WDI	1978-2014		
Mexico	1970-2014	1980-2014	WDI	1980-2014	1970Q1-2015Q4	OECD
Mongolia	1970-2014	1993-2014	WDI	1993-2014		
Myanmar	1970-2014	1982-2014	WDI	1982-2014		
Netherlands	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
New Zealand	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Niger	1970-2014	1980-2014	WDI	1980-2014		
Nigeria	1970-2014	1980-2014	WDI	1980-2014		
Norway	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Pakistan	1970-2014	1980-2014	WDI	1980-2014		
Panama	1970-2014	1980-2014	WDI	1980-2014		
Papua New Guinea	1970-2014	1983-2014	WDI	1983-2014		
Poland	1970-2014	1984-2014	WDI	1984-2014		
Romania	1970-2014	1991-2014	WDI	1991-2014		
Russian Federation	1970-2014	1993-2014	WDI	1993-2014		
Rwanda	1970-2014	1980-2014	WDI	1980-2014		
Saudi Arabia	1970-2014	1981-2014	WDI	1981-2014		
Senegal	1970-2014	1980-2014	WDI	1980-2014		

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Table A1: List of Countries (cont.).

	Annual data set				Quarterly data set	
Country name	Real GDP	Inflation	Data source	Balanced sample	Time period	Data source
Seychelles	1970-2014	1983-2014	WDI	1983-2014		
Singapore	1970-2014	1978-2014	WDI	1978-2014		
Slovak Republic	1970-2014	1978-2014	WDI	1978-2014		
Slovenia	1970-2014	1980-2014	WDI	1980-2014		
Solomon Islands	1970-2014	1980-2014	WDI	1980-2014		
South Africa	1970-2014	1980-2014	WDI	1980-2014	1970Q1-2015Q4	OECD
Spain	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Sri Lanka	1970-2014	1980-2014	WDI	1980-2014		
Sudan	1970-2014	1976-2014	WDI	1976-2014		
Sweden	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Switzerland	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Tanzania	1970-2014	1980-2014	WDI	1980-2014		
Thailand	1975-2014	1970-2014	WDI	1970-2014		
Togo	1970-2014	1980-2014	WDI	1980-2014		
Trinidad and Tobago	1970-2014	1980-2014	WDI	1980-2014		
Tunisia	1970-2014	1983-2014	WDI	1983-2014		
Turkey	1970-2014	1977-2014	WDI	1977-2014	1970Q1-2015Q4	OECD
Uganda	1982-2014	1994-2014	WDI	1994-2014		
United Kingdom	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
United States	1970-2014	1970-2014	WDI	1970-2014	1970Q1-2015Q4	OECD
Yemen, Rep.	1970-2014	1990-2014	WDI	1990-2014		
Zambia	1970-2014	1986-2014	WDI	1986-2014		

Table A2: Share of variances explained by world shocks and mediated by commodity prices

Country	σ^y	σ^π	Country	σ^y	σ^π	Country	σ^y	σ^π
Albania	0.26	0.10	Finland	0.38	0.62	New Zealand	0.05	0.11
Algeria	0.04	0.10	France	0.41	0.68	Niger	0.04	0.10
Angola	0.37	0.22	Gambia, The	0.07	0.06	Nigeria	0.61	0.28
Australia	0.11	0.23	Germany	0.37	0.38	Norway	0.10	0.07
Austria	0.42	0.47	Greece	0.15	0.34	Pakistan	0.14	0.73
Bahamas, The	0.55	0.11	Guatemala	0.17	0.04	Panama	0.25	0.60
Bahrain	0.08	0.37	Guinea-Bissau	0.28	0.04	Papua New Guinea	0.27	0.07
Bangladesh	0.08	0.25	Haiti	0.20	0.42	Poland	0.17	0.07
Barbados	0.20	0.42	Honduras	0.28	0.11	Romania	0.40	0.48
Belgium	0.38	0.35	Hong Kong SAR, China	0.35	0.55	Russian Federation	0.44	0.51
Benin	0.38	0.10	Iceland	0.16	0.02	Rwanda	0.08	0.46
Bolivia	0.47	0.14	India	0.22	0.07	Saudi Arabia	0.39	0.59
Botswana	0.35	0.01	Indonesia	0.15	0.16	Senegal	0.32	0.05
Bulgaria	0.24	0.08	Iran, Islamic Rep.	0.24	0.16	Seychelles	0.10	0.44
Burkina Faso	0.08	0.09	Ireland	0.21	0.57	Singapore	0.32	0.62
Burundi	0.10	0.40	Italy	0.42	0.67	Slovak Republic	0.68	0.08
Cabo Verde	0.09	0.10	Japan	0.13	0.56	Slovenia	0.16	0.34
Cameroon	0.03	0.02	Jordan	0.14	0.17	Solomon Islands	0.46	0.09
Canada	0.15	0.19	Kenya	0.38	0.23	South Africa	0.58	0.03
Central African Republic	0.07	0.04	Korea, Rep.	0.11	0.46	Spain	0.26	0.25
Chad	0.10	0.27	Kuwait	0.07	0.20	Sri Lanka	0.04	0.34
Chile	0.21	0.60	Lesotho	0.07	0.38	Sudan	0.09	0.05
China	0.06	0.53	Libya	0.12	0.58	Sweden	0.36	0.27
Congo, Rep.	0.08	0.01	Luxembourg	0.27	0.52	Switzerland	0.35	0.14
Cote dIvoire	0.03	0.13	Madagascar	0.17	0.07	Tanzania	0.05	0.20
Croatia	0.15	0.18	Malawi	0.09	0.12	Thailand	0.00	0.43
Cyprus	0.26	0.51	Malaysia	0.26	0.41	Togo	0.35	0.14
Czech Republic	0.79	0.06	Mali	0.01	0.02	Trinidad and Tobago	0.10	0.08
Denmark	0.33	0.46	Malta	0.43	0.31	Tunisia	0.29	0.11
Dominican Republic	0.10	0.09	Mauritania	0.08	0.18	Turkey	0.03	0.21
Egypt, Arab Rep.	0.03	0.08	Mauritius	0.00	0.19	Uganda	0.41	0.77
El Salvador	0.13	0.09	Mexico	0.20	0.30	United Kingdom	0.48	0.55
Equatorial Guinea	0.09	0.11	Mongolia	0.47	0.48	United States	0.24	0.63
Eswatini	0.38	0.05	Myanmar	0.02	0.26	Yemen, Rep.	0.06	0.31
Ethiopia	0.07	0.47	Netherlands	0.39	0.59	Zambia	0.01	0.18

Note: The panel displays the GDP and inflation responses of each country to commodity prices (agricultural, fuel, and metal) shocks, over the period 1970-2014.

Table A3: Share of variances explained by world shocks (larger number of commodity prices)

	Cross-country median of variance share	
	Output growth	Inflation
Sequential estimation		
Noncorrected Estimate	0.45	0.48
Small-Sample Bias	0.12	0.11
Corrected Estimate	0.33	0.36
MAD of Corrected Estimate	0.11	0.12
Joint estimation		
Noncorrected Estimate	0.65	0.51
Small-Sample Bias	0.08	0.13
Corrected Estimate	0.56	0.38
MAD of Corrected Estimate	0.07	0.10

Note: In this analysis, we use four leading components of commodity price series which explain 36% of domestic inflation fluctuations. This result indicates using more components (more variables) in the foreign bloc have more explanatory power for domestic inflation fluctuations.

Table A4: List of commodity price series

Aluminum	Lead	Sawn wood Malaysian
Banana	Logs	Shrimps Mexican
Barley	Maize	Silver
Beef	Meat chicken	Sorghum
Coal Index	MUV Index	Soy bean meal
Cocoa	Natural gas index	Soy bean oil
Coconut oil	Nickel	Soy beans
Coffee	Orange	Sugar world
Copper	Ground nut oil	Tea avg 3 auctions
Copra	Palm oil	Tin
Cotton Index	Phosphate rock	Tobacco US import u.v.
Crude oil average	Platinum	TSP
DAP	Potassium chloride	Urea
Gold	Rice	Wheat
Iron ore cfr spot	Rubber	Zinc

Data: annual prices available in real terms, 2010 US dollars, 1970 to present. Source: World Bank Commodity Price Data (The Pink Sheet)

Table A5: List of countries—Excluding large commodity exporters

Large commodity exporters		Little commodity exporters		
Algeria	Sweden	Albania	France	Panama
Australia	Switzerland	Angola	Germany	Papua New Guinea
Austria	Thailand	Bahamas, The	Greece	Poland
Belgium	United Kingdom	Bahrain	Guatemala	Russian Federation
Canada	United States	Bangladesh	Guinea-Bissau	Rwanda
Chile		Barbados	Haiti	Saudi Arabia
China		Benin	Hong Kong SAR, China	Senegal
Denmark		Bolivia	Iceland	Seychelles
Ethiopia		Botswana	Iran, Islamic Rep.	Singapore
Finland		Bulgaria	Ireland	Slovak Republic
Gambia, The		Burkina Faso	Japan	Slovenia
Honduras		Burundi	Jordan	Spain
India		Cabo Verde	Kuwait	Sri Lanka
Indonesia		Cameroon	Lesotho	Sudan
Italy		Central African Republic	Libya	Tanzania
Kenya		Chad	Luxembourg	Togo
Korea, Rep.		Congo, Rep.	Madagascar	Trinidad and Tobago
Malawi		Cote dIvoire	Malaysia	Tunisia
Mauritius		Croatia	Mali	Turkey
Netherlands		Cyprus	Malta	Uganda
Niger		Czech Republic	Mauritania	Yemen, Rep.
Nigeria		Dominican Republic	Mexico	Zambia
Norway		Egypt, Arab Rep.	Mongolia	
Romania		El Salvador	Myanmar	
Solomon Islands		Equatorial Guinea	New Zealand	
South Africa		Eswatini	Pakistan	

We exclude large commodity exporters from the sample. We identify the top 20% largest exporters for each of the three commodity groups; then we exclude the union of these large exporters from the panel. This yields the exclusion of 31 countries from the sample which results in 74 countries used in the estimation.

Table A6: List of countries—Oil exporters vs oil importers

Oil exporters	Oil importers		
Algeria	Albania	Dominican Republic	Saudi Arabia
Australia	Austria	El Salvador	Senegal
Bolivia	Bahamas, The	Equatorial Guinea	Seychelles
Cameroon	Bahrain	Eswatini	Singapore
Canada	Bangladesh	Ethiopia	Slovak Republic
Congo, Rep.	Barbados	Finland	Slovenia
Egypt, Arab Rep.	Belgium	Gambia, The	Solomon Islands
France	Benin	Germany	South Africa
India	Botswana	Greece	Spain
Indonesia	Bulgaria	Guatemala	Sri Lanka
Korea, Rep.	Burkina Faso	Haiti	Sudan
Lesotho	Burundi	Honduras	Sweden
Malawi	Cabo Verde	Hong Kong SAR, China	Switzerland
Mauritius	Central African Republic	Iceland	Tanzania
Niger	Chad	Iran, Islamic Rep.	Thailand
Nigeria	Chile	Ireland	Togo
Norway	China	Italy	Turkey
Romania	Cote dIvoire	Japan	Uganda
Trinidad and Tobago	Croatia	Jordan	United Kingdom
Tunisia	Cyprus	Kenya	United States
Yemen, Rep.	Czech Republic	Russian Federation	Zambia
	Denmark	Rwanda	

We compute the net trade in fuel oil for each country. We compute the country-specific median of net exports of fuels since 1970, using annual information on exports and imports of fuel commodities from World Development Indicator. A country is an oil exporter (importer) if the median net fuel export share in GDP is positive (negative).

Table A7: List of countries— Net commodity traders

Net commodity exporters		Net commodity importers		
Algeria	Nigeria	Albania	Ireland	Switzerland
Australia	Norway	Austria	Italy	Tanzania
Bahrain	Panama	Bahamas, The	Japan	Thailand
Benin	Romania	Bangladesh	Jordan	Tunisia
Bolivia	Seychelles	Barbados	Kenya	Turkey
Burkina Faso	Solomon Islands	Belgium	Kuwait	Uganda
Cameroon	Sri Lanka	Botswana	Libya	United Kingdom
Canada	Togo	Bulgaria	Luxembourg	United States
Central African Republic	Trinidad and Tobago	Burundi	Madagascar	
Chad	Yemen, Rep.	Cabo Verde	Malaysia	
Chile	Zambia	China	Mali	
Congo, Rep.		Croatia	Mauritania	
Cote dIvoire		Cyprus	Mongolia	
Egypt, Arab Rep.		Czech Republic	New Zealand	
Equatorial Guinea		Denmark	Pakistan	
France		Dominican Republic	Papua New Guinea	
Guatemala		El Salvador	Poland	
India		Eswatini	Russian Federation	
Indonesia		Ethiopia	Rwanda	
Korea, Rep.		Finland	Saudi Arabia	
Lesotho		Gambia, The	Senegal	
Malawi		Germany	Singapore	
Malta		Greece	Slovak Republic	
Mauritius		Haiti	Slovenia	
Mexico		Honduras	South Africa	
Myanmar		Hong Kong SAR, China	Spain	
Netherlands		Iceland	Sudan	
Niger		Iran, Islamic Rep.	Sweden	

We consider a country as a commodity exporter (importer) if there is a positive (negative) trade balance on average in the group of three commodities (agricultural, fuel, and metals) since 1970. To do so, we use annual data on agricultural, fuel, and metals commodities from World Development indicator. Then, we calculate the net trade in each category. This classification yields 39 commodity exporters and 64 commodity importers.

Table A8: List of countries—Level of development

High income		Low income	
Albania	Korea, Rep.	Bangladesh	Slovenia
Algeria	Kuwait	Benin	Spain
Angola	Lesotho	Bolivia	Sri Lanka
Australia	Libya	Burkina Faso	Sudan
Austria	Malawi	Burundi	Tanzania
Bahamas, The	Malaysia	Cabo Verde	Togo
Bahrain	Mali	Cameroon	Uganda
Barbados	Mauritania	Central African Republic	Yemen, Rep.
Belgium	Mauritius	Chad	Zambia
Botswana	Mexico	Congo, Rep.	
Bulgaria	Myanmar	Cote dIvoire	
Canada	Netherlands	Egypt, Arab Rep.	
Chile	Nigeria	El Salvador	
China	Norway	Eswatini	
Croatia	Pakistan	Germany	
Cyprus	Papua New Guinea	Greece	
Czech Republic	Poland	Guatemala	
Denmark	Romania	Guinea-Bissau	
Dominican Republic	Senegal	Haiti	
Equatorial Guinea	Singapore	Iceland	
Ethiopia	Slovak Republic	India	
Finland	Solomon Islands	Jordan	
France	South Africa	Luxembourg	
Gambia, The	Sweden	Madagascar	
Honduras	Switzerland	Malta	
Hong Kong SAR, China	Thailand	Mongolia	
Indonesia	Trinidad and Tobago	New Zealand	
Iran, Islamic Rep.	Tunisia	Niger	
Ireland	Turkey	Panama	
Italy	United Kingdom	Russian Federation	
Japan	United States	Rwanda	
Kenya		Saudi Arabia	

We divide countries into two categories: The high income (63 countries) and the low income (42 countries). The categorization is based on the world Development Indicator and is based on the per capita gross national incomes in 2015. The results are robust to basing the categorization on income levels in 1990.

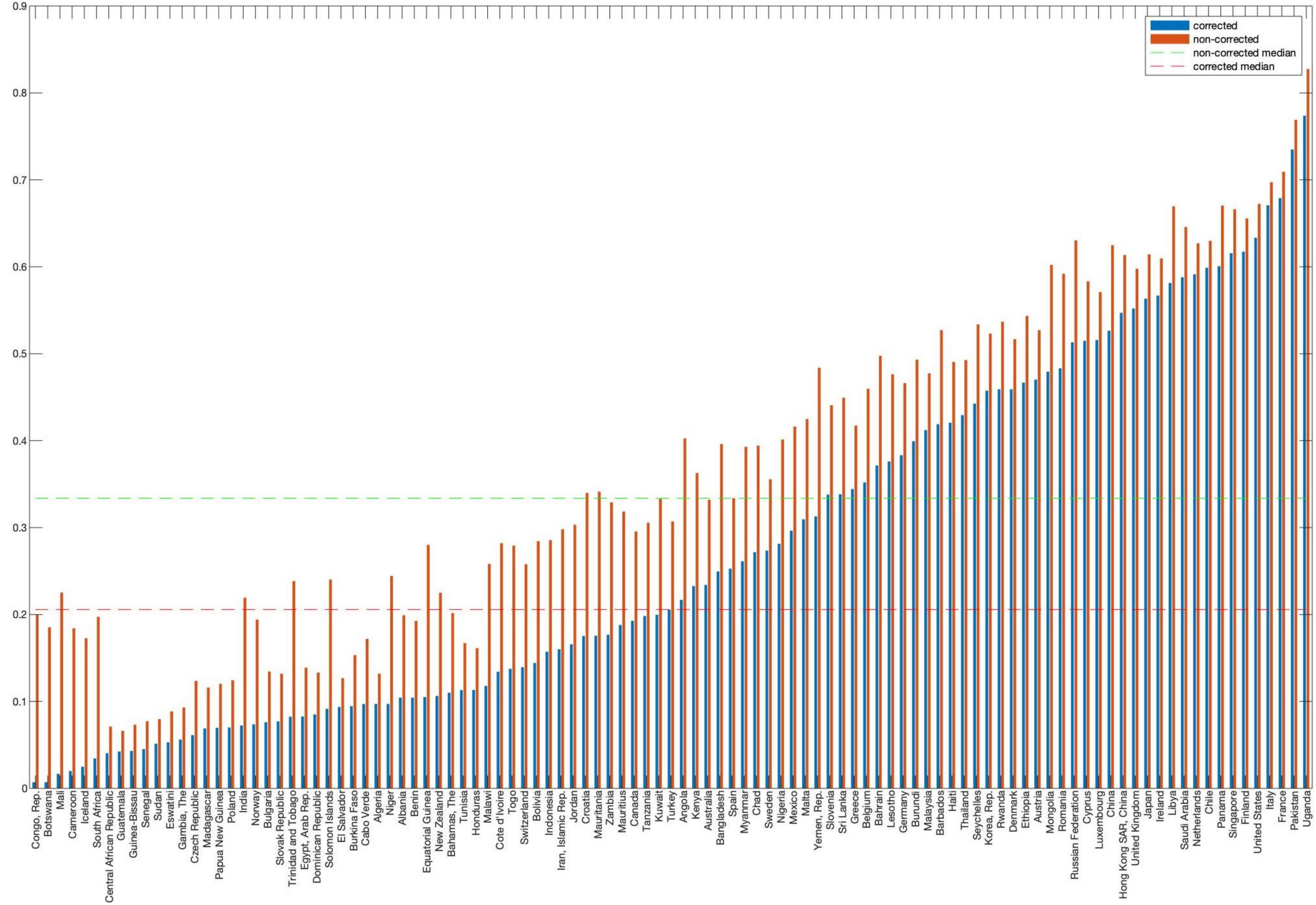

Fig. 2: The panel displays the inflation responses of each country to commodity prices (agricultural, fuel, and metal) shocks, over the period 1970-2014.

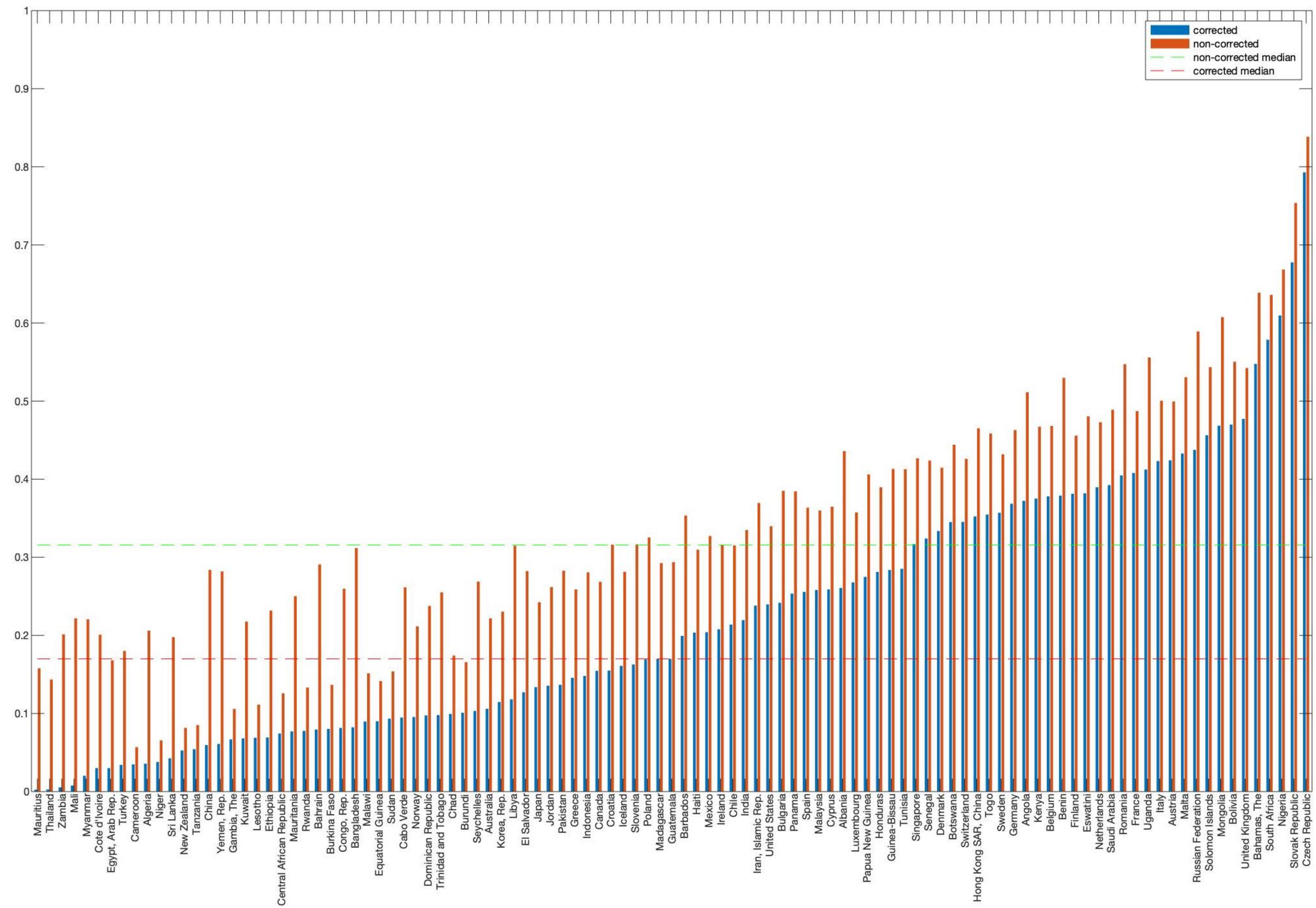

Fig. 3: The panel displays the GDP responses of each country to commodity prices (agricultural, fuel, and metal) shocks, over the period 1970-2014.

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