Policy Research Working Paper 8939

Estimating and Calibrating MFMod

A Panel Data Approach to Identifying the Parameters of Data Poor Countries in the World Bank's Structural Macro Model

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WORLD BANK GROUP
Macroeconomics, Trade and Investment Global Practice
July 2019

Abstract

This paper summarizes the World Bank's approach to identifying parameters for key equations in its macro structural model for countries where short sample sizes or major structural changes render traditional time-series approaches infeasible or yield unstable estimates. To identify parameters that could be used in such cases, a cointegrating panel approach is followed that yields a common long-run estimate of parameters for key equations (to test the theoretical restrictions imposed in the model) and short-run disequilibrium estimates that vary by country. This approach is preferred to pure calibration or Bayesian estimation, because the functional forms imposed in the panel are consistent with those used in the macro structural model.

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Estimating and Calibrating MFMod: A Panel Data Approach to Identifying the Parameters of Data Poor Countries in the World Bank's Structural Macro Model

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JEL: C11, C33
Keywords: Structural equations, Cointegrated panels,

[1] The views in this paper are those of the authors and do not necessarily reflect the views of the World Bank. The authors thank Doerte Doemeland, David Stephan and Benoit Campagne for helpful comments and suggestions. Corresponding author: cjooste@worldbank.org.

1. Introduction

The World Bank's Macro Structural Model (MFMod) is the main forecasting and analysis tool for World Bank staff (WBG, 2019). The model is deployed for 184 countries utilizing data from a wide range of sources. Individual country models have a similar structure and economic variables are made as consistent as possible to enhance cross-country comparability. Theory underpins the long-run solution of the model, while short-run dynamics are primarily driven by the data and reflect the historical behavior of the economy.

A significant constraint in the modeling exercise is the availability of data over sufficiently long samples to estimate key parameters. As a general principle, most of the parameters should be time and policy invariant. With short sample sizes, econometrically estimated coefficients may be biased, have large standard errors and may therefore take the wrong size or sign, all of which renders analysis problematic. MFMod is an annual model. Across the 184 countries included in MFMod, time series for some countries can be as short as only five observations, partly because some countries have been publishing independent data for only a brief period. In other cases, data definitions have been significantly revised or upgraded. Combining the low-frequency nature of the data over short time horizons makes econometric identification of parameters close to impossible in some cases.

This paper describes the methodology used by the World Bank to estimate or calibrate the parameters for countries that suffer from short data samples. The paper's objectives are to match the functional forms of MFMod and produce, as best possible, country estimates.

There are generally three approaches in dealing with these kinds of data constraints. One is to calibrate parameters using a meta-data approach based on the literature or from micro data (see Kydland and Prescott (1982) for calibration of general equilibrium models; Hansen and Heckman (1996) on a synthesis of calibration and simulation to identify parameters). Another is a Bayesian approach where a prior is imposed (see Smets and Wouters (2003) as an example). The last approach is a panel methodology – the approach used by the World Bank to identify some of the parameters.

The following section describes the various approaches to estimating parameters and juxtaposes it with the methodology employed in this paper. This is followed by a description of the econometric methodology used. The fourth section presents the key equations with references to the technical MFMod equations with the results. A final section concludes.

2. Methodological choice

Most estimation and calibration techniques have their pros and cons. It is inevitable that some assumption will be made to estimate/calibrate parameters for countries that have short sample sizes. As an example, one cannot adequately identify parameters for a country with say only five observations. Fixing that parameter to a certain value ignores all the country-characteristics (which

is unknowable, and at best approximated by studying countries that have a similar economy). This section describes some approaches to deal with this problem and finally motivates the use of a panel cointegrated method. Each approach is evaluated in terms of how it fits within the structure of MFMod. We do not claim that we adequately identify the parameters for data poor countries, but only approximate them in as much as we have evidence for how other countries (with more observations) behave.

Calibration techniques to identify parameters are complicated by the need to find studies that share similar functional forms for each of the equations in MFMod or finding a micro-data set from which to estimate the parameters. While a common approach, calibrating equations in either of these ways may be too restrictive, particularly as concerns accounting for country specific effects such as the speed of adjustment, and short-term sensitivities to external shocks – features that are critical to the out-of-equilibrium behavior of MFMod. A useful way to use calibration in cases where significant parameter uncertainty exists is to construct counterfactuals by varying the parameter. In single structural equations this might be permissible, however, for cases where equations are estimated jointly (i.e. reduced form systems) this will render problems.

Bayesian approaches marry the analyst's specific view (informed or uninformed) of the world (prior) with what can be measured using data (likelihood function). A prior can be chosen based on some assumption on the distribution of parameters where the prior mean equals a value from the literature or from some available estimate. With large sample sizes, the prior weight is reduced to zero and coefficients resemble classical estimation – i.e. the posterior is determined by the data. With little data or short sample sizes, the likelihood function weight approaches zero while the prior gets a larger weight. Because a good prior is informed by the literature or a reasonable estimate, a large weight on the prior effectively reduces the problem to the calibration approach discussed above, while a low weight on the prior reduces to classical estimation. A classical example in the VAR literature requires assumptions about the distribution of the parameter, hyper parameters for the prior mean (i.e. the analyst's view regarding a unit root assumption of the dependent variable), and the importance of own lags relative to the influence of the explanatory variable's lags. It is important to note that this approach makes the analyst's assumptions transparent – which in our view is a good thing. If the analyst acknowledges parameter uncertainty, then the precision of the posterior is low – this would entail that the estimate has wide variance.[2] A benefit with a Bayesian approach is that the prior gets updated with more available data – which represents learning and thus the parameter estimate gets closer the real parameter over time.

There exists yet a third approach, one that the World Bank employs: **estimation of dynamic panels**. Using a cointegrating panel, small sample bias becomes less of a problem. Grouped data greatly increases the degrees of freedom for estimating parameters, while still allowing for a differentiation of countries via fixed effects. The approach makes some assumptions; countries that form part of the panel are differentiated only is as much as their intercepts and error terms vary, while all sharing a common long-run slope (i.e. no long-run slope heterogeneity).

[2] See for example Koop and Korobilis (2010) on the Minnesota prior where the unknown variance-covariance is replaced by an estimate, which does not necessarily reflect the degree of uncertainty in predictive densities.

The methodology, however, lends itself naturally to the one used in MFMod and allows for the estimation of parameters using the exact functional forms. Furthermore, the long-run (equilibrium) elasticities of different equations can be estimated (and the theoretical restrictions imposed on the long-run component of the ECMs in MFMod can be tested). The approach retains cross country heterogeneity in the estimation of short-run coefficients, including the speed of adjustment parameter in the ECM. Country-specific estimates of parameters can be used to calibrate parameters for countries where data constraints prevent more traditional time-series estimation, while the distribution of parameter estimates can be used to constrain outliers.

3. Econometric methodology

Most of the equations in MFMod[3] are written using a dynamic error-correction formulation (see Wickens and Breusch, 1988; Engel and Granger, 1987 and Johansen, 1991). This formulation lends itself naturally to test the theoretical restrictions of MFMod where the long-run conditions in the ECM are typically driven by theory. The standard ECM estimation methods used in MFMod allows a separate modeling of the short-run and long-run relationships between variables (for example allowing for short-run rigidities and larger long-run elasticities).

The methodology essentially separates two aspects of each equation; the equilibrium path of the dependent variable from the speed of adjustment of the model when it is away from equilibrium. In equation (1) below, the long run conditions are summarized by $y_t = \omega x_t + \epsilon_t$ where y_t is a dependent variable or a vector of country dependent variables and x_t resembles the explanatory variables. The long run expected value of the error term ϵ_t is zero, the expression between the square brackets in $[y_{t-1} + \omega x_{t-1}]$ reflects the deviation of the model from equilibrium. When the model is in equilibrium, i.e. $y_t = \omega x_t$, the square bracketed component falls out. In the short run, the path of the dependent variable will reflect short-term influences $\sum_{j=1}^{p-1} \gamma_j \, \Delta y_{t-j} + \sum_{j=0}^{q-1} \delta_j \Delta x_{t-j}$. The adjustment to equilibrium is determined by the speed of adjustment parameter θ and the distance from equilibrium in the previous period $[y_{t-1} - \omega x_{t-1}]$.

$$\Delta y_t = \rho + \theta[y_{t-1} + \omega x_{t-1}] + \sum_{j=1}^{p-1} \gamma_j \, \Delta y_{t-j} + \sum_{j=0}^{q-1} \delta_j \Delta x_{t-j} + \varepsilon_t \qquad (1)$$

At a more technical level, (1) assumes that we have two nonstationary I(1) time series variables; the dependent variable is Y_t and the explanatory variable is X_t for every period t in history. Note that $\Delta = (1 - L)$ is the difference operator and small case letters are the variables expressed in natural logs. The formulation in equation (1) exploits the equilibrium mechanism between Y_t and X_t, and summarizes the dynamic interplay. There exists a common stochastic trend if $-1 < \theta < 0$ and statistically significant. We interpret ω as the long-run elasticity of X_t on Y_t, while γ_j and δ_j are the short-run elasticities. $\varepsilon_t \sim iid$ and is the structural error term of equation (1).

[3] World Bank (2019) provides an in-depth discussion of the model's structure and functional forms employed.

Following Pesaran et al. (1999), Equation (1) above can written as a panel regression as:

$$\Delta y_{i,t} = \theta_i y_{i,t-1} + x_{i,t}\beta + \sum_{j=1}^{p-1} \gamma_{i,j}\, \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{i,j} \Delta x_{i,t-j} + d_t \rho_i + \varepsilon_{i,t} \qquad (2)$$

This specification models each annual observation, $t = 1, \dots, T$, over a number of countries, $i = 1,2, \dots, N$ for specific dependent variables (y) and a vector of explanatory variables (x) using different lags (p, q) for the dependent and explanatory variables respectively. Note that lower case represents logs of the variables.

The parameters in equation (2) have the following interpretation when compared to (1): θ_i is the error correction parameter for each country and summarizes the time path to equilibrium for country i and should fall in the interval $(-1,0)$. $\frac{\beta}{\theta_i}$ is the long-run coefficient of $x_{i,t}$ (which in the MFMod setup equals ω). Thus, the long-run relationship is simply $y_{i,t} = \left(\frac{\beta}{|\theta_i|}\right) x_{i,t} + \epsilon_{i,t}$. Note that in this panel estimation ω is the same across all countries (common slope). The equation can therefore be written as (1):

$$y_{i,t} = \theta_i [y_{i,t-1} - x_{i,t}\omega] + \sum_{j=1}^{p-1} \gamma_{i,j}\, \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \Delta x_{i,t-j}\, \delta_{i,j} + d_t \rho_i + \varepsilon_{i,t}$$

Where d_t is a vector of fixed regressors.

Lastly, it is assumed that $\varepsilon_{i,t} \sim iid$ across i and t, with zero mean and fixed variances. With common slopes the time effects, $d_t \rho_i$, vanish by demeaning (essentially employing fixed effects). Finally, p and q (parameters that determine the number of lags in the equation) are assumed to equal 1, significantly reducing the number of parameters to be estimated.

The methodology then allows us to extract the following coefficients for each country: $\{\delta_i, \theta_i, \gamma_i\}$ as well as the common parameters (mainly ω, and an average of the error-correction parameter $\bar{\theta} = \frac{1}{N}\sum_{i=1}^{N} \theta_i$).

4. Key modeling equations

The theoretical basis for the key equations in MFMod is laid out in World Bank (2019). This section focuses on deriving panel estimates for the key parameters of the main equations in MFMod to be used in cases where country-specific time-series are too short to identify the parameters at a country-level. Where enough observations exist standard econometric techniques as laid out in World Bank (2019) are employed.

The methodology is used (1) to test the theoretical model employed using data and (2) to help calibrate country parameters for countries with short time series data.

The key model equations where panel estimates are derived include: the real household consumption behavior, real investment, exports volumes and imports volumes, and prices (producer, consumer, imports and exports). Around 180 countries are included in the estimation strategy (not all countries in the MFMod system have precisely the same functional form so that the number of countries in the panel varies with the concept being estimated).

Household consumption

When expressed as a panel regression, the real household consumption equation in MFMod takes the following form:[4]

$$\triangle c_{i,t} = \alpha_i + \theta_i\left[c_{i,t-1} - \beta_1 ln\left(\frac{WN_{i,t-1} - T_{i,t-1}^{DIRECT}}{P_{i,t-1}^{C}}\right)\right] + \lambda_i \triangle ln\left(\frac{WN_{i,t} - T_{i,t}^{DIRECT}}{P_{i,t}^{C}}\right) - \beta_{i,2}(r_t - \pi_t) + \varepsilon_{i,t}^{c} \quad (3)$$

where $c_{i,t}$: private consumption of country in period t; $WN_{i,t}$: nominal wage bill in the economy (the sum of the government and private wage bills); T_t^{DIRECT}: general government revenue from direct taxation; $P_{i,t}^{C}$: the consumption deflator. The term $\left[c_{i,t-1} - \beta ln\left(\frac{WN_{i,t-1} - T_{i,t-1}^{DIRECT}}{P_{i,t-1}^{C}}\right)\right]$ represents the long-run cointegrating vector, which reports the one period lag deviation from equilibrium. The econometrically estimated $\theta_i \in (-1,0)$ measures the speed with which consumption tends to its steady state. In line with the permanent income hypothesis, equation (3) indicates that in equilibrium household consumption is determined by real disposable income. Prices act to reduce household consumption when the economy overheats through a Phillips-curve mechanism (modeled separately). The econometrically estimated parameter ($\lambda_i \in 0,1$) indicates the extent to which observed consumption behavior displays myopia vs consumption smoothing: larger values for λ_i imply less consumption smoothing and more myopia. Finally, $\beta_{i,2}$ captures the influence of credit markets and is expected to have negative sign, as higher real interest rates incite increased savings and reduced consumption today.

Table 1 summarizes the panel's estimated values of the main parameters of the household consumption equation. The error correction term is negative and statistically significant, suggesting that there is a cointegrating relationship between incomes and consumption. It takes roughly four years for any disequilibrium to be corrected. The common long-run elasticity of

[4] In MFMod the long-run component of the consumption function also includes a wealth variable, for those countries where data are available. It is omitted here to maximize the number of countries over which the panel equation can be estimated.

income to consumption is slightly smaller than 1. Thus, for a 1% increase in permanent income, household consumption increases by 0.93%. The short-run elasticity of consumption to disposable income is 0.34 (implying that about 2/3 of consumption is subject to income smoothing). Interestingly the real interest rate is not statistically significant, perhaps a reflection of the lack of financial intermediation in many of the countries in the sample.

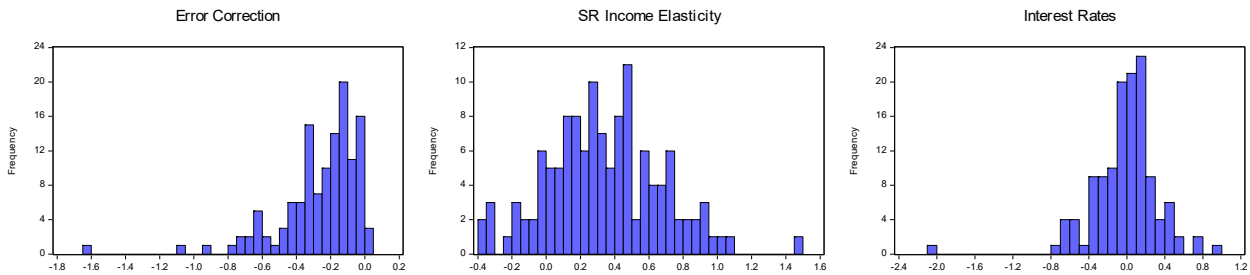
Table 1: Real household consumption coefficients

Long-run	
$ln\left(\frac{WN_{i,t-1} - T_{i,t-1}^{DIRECT}}{P_{i,t-1}^{C}}\right)$	0.93***
$\overline{\theta_i}$	-0.26***
Short-run (average over country list)	
$\triangle ln\left(\frac{WN_{i,t} - T_{i,t}^{DIRECT}}{P_{i,t}^{C}}\right)$	0.34***
$(r_t - \pi_t)$	-0.01
$\overline{\alpha_i}$	0.28***
$n * t$	2794

Notes: *,**,*** signify statistical significance at 10%, 5% and 1%, respectively.

Figure 1 displays the distribution of the error-correction terms and short-run parameters for all the countries. Most countries have an ECM term that falls within the expected range indicating that the theory and data match well. The short-run income elasticity is positive for most countries and in one case much larger than one. The outputs of the long and short-run elasticities are used as calibration inputs in countries where data are scarce. As an example, one may compute sample averages for country groups (e.g. based on some economic criteria or regional grouping) and use those estimates to calibrate parameters in countries where insufficient data exist to independently estimate parameters using standard single-country time-series techniques, and for countries that are not included in the sample. These estimates can also be used to calibrate the coefficients of outliers (Figure 1). In MFMod parameter estimates that lie outside the 80 and 20 percentile bounds are constrained to the closest boundary (in the case of positive interest rates, the parameter value is set equal to 0). Appendix B summarizes the short-run and ECM parameters for the countries in the sample.

Figure 1: Real household consumption elasticities



Investment (real)

The equation for private investment is written as:

$$\Delta\left(i_{i,t}^{P}\right) = \alpha_i - \theta_i \left[i_{i,t-1}^{P} - \beta_1 \ln\left(\left(\Delta y_{i,t-1}^{*} + \delta_{i,t-1}\right)(1-\alpha)\left(\frac{P_{i,t-1}^{fcst} Y_{i,t-1}^{*}}{R_{i,t-1}}\right)\right)\right] + \beta_{i,2}\Delta\ln\left(\left(\Delta y_{i,t}^{*} + \delta_{i,t}\right)(1-\alpha)\left(\frac{P_{i,t} Y_{i,t}}{R_{i,t}}\right)\right) + \beta_{i,3}\Delta YGAP_{i,t} + \varepsilon_{i,t}^{i} \quad (4)$$

As explained in World Bank (2019), the demand for capital is standard and is given by the term $(1-\alpha)\left(\frac{P_{i,t-1}^{fcst} Y_{i,t-1}^{*}}{K_{i,t-1}}\right)$ where $(1-\alpha)$ is the capital share in output and $K_{i,t-1}$ is the stock of capital for each country. In steady state, investment grows by potential GDP and the rate of capital depreciation $\left(\Delta y_{i,t}^{*} + \delta_{i,t}\right)$.

Investment in the long-run will grow at the rate of potential GDP multiplied by the inverse optimal condition for capital demand. In this formulation, an increase in profits $((1-\alpha) * P_{i,t}^{fcst} Y_{i,t}^{*}))$ will lead to an increase in investment. By the same token, an increase in the cost of capital $(R_{i,t})$ will decrease investment.

In the short-term, deviations in investment are driven by movements in the real rental-rate of capital and short-run accelerator effects due to changes in demand, which are proxied by the change in the percent deviation of actual GDP from the level of potential output, or the output gap $(\Delta YGAP_{i,t})$.

Table 2**Error! Reference source not found.** reports results from the panel regression. It indicates that the long-run is empirically identified – the ECM parameter is statistically significant. The long-run elasticity of income to investment is close to the theoretical homogeneity constraint imposed in MFMod ($\beta_1 = 0.95$). The short-run accelerator elasticity is larger than 2, which is generally consistent with the observed variation of investment relative to output.

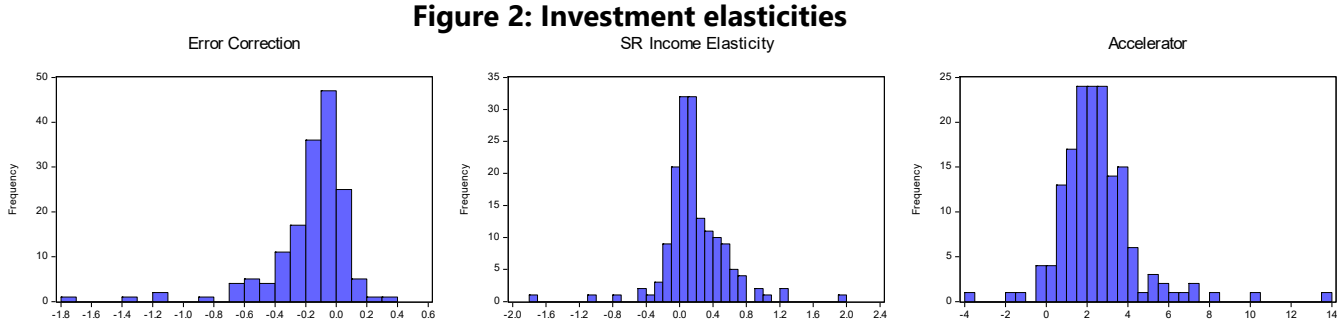
Countries whose parameters fall outside the 80 and 20 percentile bounds, will be calibrated in MFMod to the closest bound. Appendix A summarizes the short-run and ECM parameters for the countries that hit the bounds in the sample.

Table 2: Investment elasticities

Long-run	
$\left(\Delta y_{i,t}^{*} + \delta_{i,t}\right)(1-\alpha)\left(\frac{P_{i,t}Y_{i,t}}{R_{i,t}}\right)$	0.95***
$\overline{\theta_{\iota}}$	-0.16***
Short-run (average over country list)	
$\Delta ln\left(\Delta y_{i,t}^{*} + \delta_{i,t}\right)(1-\alpha)\left(\frac{P_{i,t}Y_{i,t}}{R_{i,t}}\right)$	0.17***
$\Delta YGAP_{i,t}$	2.51***
$\overline{\alpha_{\iota}}$	0.13***
$n * t$	3840

Notes:*,**,*** signify statistical significance at 10%, 5% and 1%, respectively.

Figure 2: Investment elasticities



Export volumes[5]

The export demand equation in MFMod has two variants. The first variant is used in cases where the econometric evidence suggests that a country is a price taker (i.e. where its own production is small enough and or generic enough) that change in its own output has no effect on world prices. The second variant is used in cases where the econometric evidence suggests the country is at least to some extent a price maker (changes in its own cost-structure or production affect output). See Box 1 for a more detailed discussion of the two variants.

Equation 5 below reports the price-taker variant of the model.

$$\Delta x_{i,t} = \alpha_i + \theta_i^x \left[x_{i,t-1} - \omega xmkt_{i,t-1} - \varepsilon_x ln\left(\frac{P_{i,t-1}^X}{P_{i,t-1}^C}\right)\right] + \beta_{i,2}\Delta\left(xmkt_{i,t}\right) + \varepsilon_{i,x2}\Delta ln\left(\frac{P_{i,t}^X}{P_{i,t}^C}\right) + \varepsilon_{i,t}^x \quad (5)$$

Real exports of goods and services ($x_{i,t}$) are determined by foreign demand ($xmkt_{i,t}$) in local currency. Because of the price takers' assumption, the domestic export deflator grows in line with world prices. The decision thus to sell abroad for a domestic producer will depend on the relative price of exports and domestic prices $\left(\frac{P_{i,t}^X}{P_{i,t}^C}\right)$. The term in square brackets is the error correction term, which serves to move exports back towards steady-state levels over time. A priori, it is expected that in the very long run the income elasticity of export demand is one ($\omega = 1$) to ensure that in the long run, if relative prices are constant, that domestic exports grow in line with world demand. In the panel setup the restriction on ω is relaxed and it is estimated freely.

Equation 6 shows the price-maker variant of the real-export equation. The signs in front of the relative price equations are now reversed – an increase in export prices relative to world price, a priori, induces a fall in export volumes.

$$\Delta x_{i,t} = \alpha_i + \theta_i^x \left[x_{i,t-1} - \omega xmkt_{i,t-1} + \varepsilon_x ln\left(\frac{P_{i,t-1}^X}{E_{i,t-i}P_{USA,t-1}^C}\right)\right] + \beta_{i,2}\Delta\left(xmkt_{i,t}\right) - \varepsilon_{i,x2}\Delta ln\left(\frac{P_{i,t}^X}{E_{i,t}P_{USA,t}^C}\right) + \varepsilon_{i,t}^x \quad (6)$$

[5] The functional forms for the import and export equations can be modified to explain additional variation in the data. Theory predicts that other factors could be included in the specification above, such as costs due to distance are lower with new technologies (e.g. faster and more efficient container ships), access to credit markets (Manova, 2018), knowledge of foreign languages (Melitz, 2008).

Table 3 reports regression results for the two specifications, with the samples restricted to countries where price-taking behavior dominates (the second column) and countries where the price-making behavior dominates (column 3).

In the second column of Table ***3***3 the relative price has the wrong expected sign in the long-run – i.e. an increase in export prices relative to domestic consumer prices leads to a *reduction* in exports. The third column, however, shows that the relative price has the expected sign, but is not statistically significant at 1% - an increase in the export price relative to the world priced *reduces* exports. Running separate country regressions confirms the ambiguity with the export equation specification as many of the signs and statistical significance depends on which relative price measure is used. Interestingly, the ECM coefficient suggests that it takes approximately 10 years $\left(\frac{1}{|\bar{\theta}_i|}\right)$ for exports to equilibrate. The short-run elasticity is much smaller than the long-run elasticity which is close to 1.

Table 3: Export volume coefficients

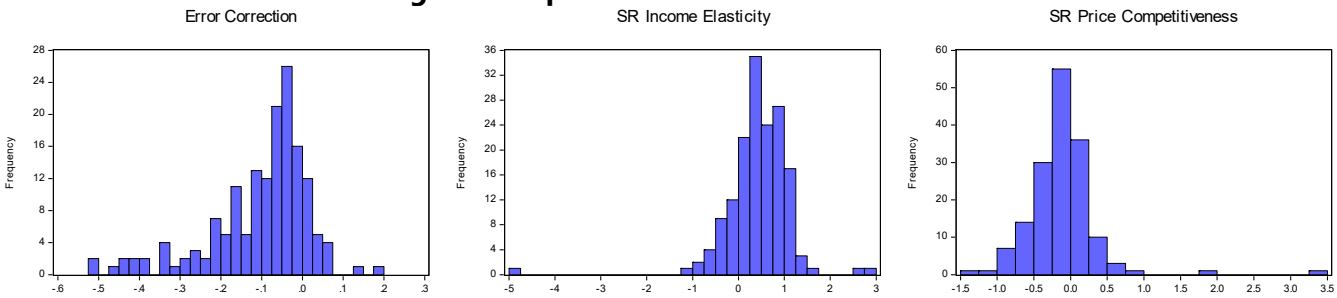
Long-run	$ln\left(\frac{P^X_{i,t-1}}{P^C_{i,t-1}}\right)$	$ln\left(\frac{P^X_{i,t-1}}{E_{i,t-1}P^*_{i,t-1}}\right)$
$xmkt_{i,t-1}$	0.87***	0.92***
Long-run relative price	-0.12***	-0.06
$\bar{\theta}_i$	-0.12***	-0.11***
Short-run (average over country list)		
$\Delta(xmkt_{i,t})$	0.03	0.03
Short-run relative price	0.20**	-0.30***
$\bar{\alpha}_i$	0.24***	0.13***
$n * t$	2224	2215

Notes:*,**,*** signify statistical significance at 10%, 5% and 1%, respectively.

Most of the short-run elasticities fall within the expected ranges for the estimates in column 3. The slow equilibrating process is highlighted by the center of mass in

Figure **3**4 with the smallest ECM at around-0.5 (i.e. it takes two years to equilibrate). It is maintained that the price taking assumption holds for most of the developing countries in MFMod. In the case of MFMod, outliers from Figure 4 are restricted to the 80 and 20 percentile bounds and in the case of positive relative prices we set the parameter value equal to 0. Appendix B summarizes the short-run and ECM parameters for the countries that hit the bounds in the sample.

Figure 3: Export volume elasticities



Box 1: Export price elasticities: Price takers vs price makers

The expected sign of the relative price variable in equation 5 or 6 depends on whether exporters in a country are price takers or price makers.

- A price-taker is sufficiently small enough that a producer cannot affect the world price with production decisions. The empirical correlation between export price changes and a price-taker's export volume will be positive. Higher prices induce more output, lower prices induce less output (with the elasticity being dictated by the exporter's supply curve).
- A price maker is either a sufficiently large producer on the global scale or produces a sufficiently differentiated product, that the producer can charge more or less as her costs rise or fall. For such producers the price elasticity of export volumes is expected to be negative: when prices rise, global demand falls; when prices fall, demand rises.

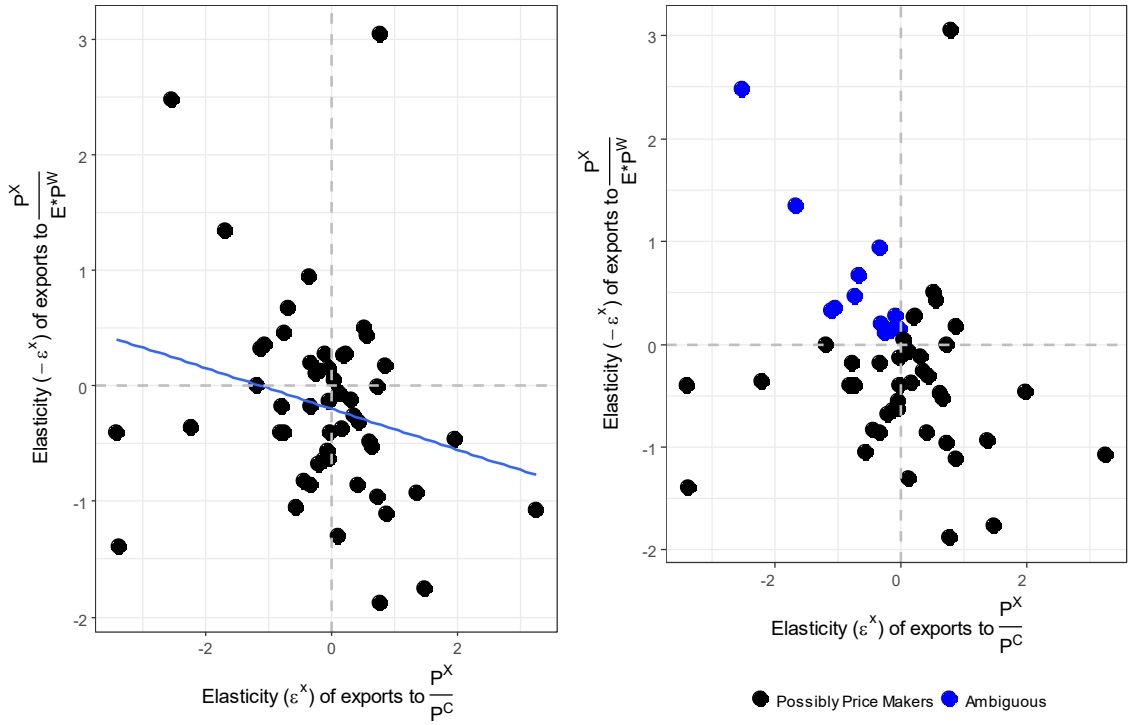
The exporters in any given country will be a mixture of price-takers and price-makers. As a result, the expected sign of the relative price variable in equations 5 and 6 is uncertain. Indeed empirically, about 30 of the countries have a positive price elasticity and 32 a negative – independent of the specification used, with many having coefficients close to zero (suggesting a mixture of price takers and price makers) and an overlap of 10 countries that have the correct sign in both specifications.

In MFMod when the price elasticity of exports is positive, the price-taker formulation is used, when the elasticity is negative the price taker formulation is used.

The two formulations used differ in the denominator of the relative price component of the equation. In the price-taker formulation the domestic price deflator is used as a proxy for local costs and competing domestic markets for export goods. As domestic costs / prices rise,

domestic producers are unwilling to sell as much abroad because the cost of producing it has increased (movement along the supply curve). In the price-maker formulation, the relevant price is the price of competing products produced by other exporters –proxied here by the consumption deflator in the United States.

Figure B1.1: Country sensitivity to relative prices



Import volumes

The panel version of the standard MFMod import volumes equation is:

$$\Delta m_{i,t} = \alpha_i + \theta_i^m \left[m_{i,t-1} - \beta_{i,1} y_{i,t-1}^{gde} + \varepsilon_{i,m} ln\left(\frac{P_{i,t-1}^m}{P_{i,t-1}^C}\right)\right] + \beta_{i,2}\Delta\left(y_{i,t-1}^{gde}\right) - \varepsilon_{i,m2}\Delta ln\left(\frac{P_{i,t}^m}{P_{i,t}^C}\right) + \varepsilon_{i,t}^m \quad (7)$$

The term in square brackets again represents the error correction term (the difference between last period's imports and the equilibrium levels), with the second term in the brackets proxying domestic demand ($y_{i,t}^{gde}$) and the third term $ln\left(\frac{P_{t-1}^m}{P_{t-1}^C}\right)$ accounting for the influence of the competitiveness effect. A homogeneity restriction is imposed on domestic demand in MFMod to

ensure that in the very long run imports remain as a steady share of GDP ($\beta_1 = 1$) as in the first order condition. For the panel, it is estimated freely to test this hypothesis. It is also expected that $\varepsilon_{i,m} > 0$ suggesting that a rise in import prices relative to domestic prices will reduce imports.

The short-run elasticities and the error-correction parameter vary across countries. There are no a priori expectations about the size of the parameters, but it is expected that they have the correct theoretical sign (i.e. positive for domestic demand and negative for relative prices).

To ensure stability of the current account balance under simulation (the Marshall-Lerner condition) the sum of the absolute elasticities of exports and imports to relative prices should be greater than unity ($|\varepsilon_m| + |\varepsilon_x| > 1$).

All the estimated coefficients reported in Table ***4***4 are statistically significant, and the error correction estimate suggests that there is a common stochastic trend between import volumes, domestic demand and relative prices. The long-run elasticities meet a priori expectations and there is evidence for the Marshall-Lerner condition ($|\varepsilon_m| + |\varepsilon_x| > 1$). As with export volumes, the equilibrating mechanism is close to 10 years – thus shocks that cause imports to deviate from their long-run path will take a considerable time to move back to that path.

As discussed in World Bank (2019) the coefficient on the ECM likely reflects rising import (and export) to GDP ratios during the 1990s and early 2000s. Indeed, the discussion in the Appendix demonstrates that the long-run elasticity is not constant without the trend – thus violating an important condition for interpreting the elasticities as structural. The historical increase in import penetration likely reflects a range of actors including: reduced shipping costs, access to credit markets, accession of China into the WTO, and economies of scale (Evenett and Keller, 2004). The third column in Table 4 summarizes results from an alternative specification, where a trend is assumed to capture the innovations. The income elasticity is still positive but slightly lower than one in Column 2, while the coefficient on the ECM is much larger, suggesting that, once the trend rise in import shares is accounted for, adjustment to equilibrium occurs much more quickly, in about four years *ceteris paribus*.

Table 4: Import volume coefficients

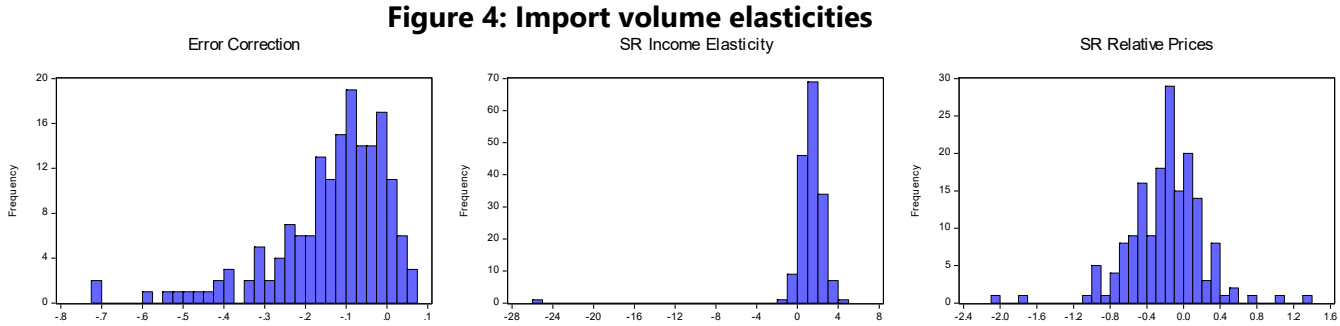
Long-run	Standard Specification	Specification including trend
$y_{i,t-1}^{gde}$	1.22***	0.78***
$ln\left(\frac{P_{i,t-1}^{m}}{P_{i,t-1}}\right)$	-0.57***	-0.35***
$\overline{\theta_i}$	-0.12***	-0.22***
$trend$		0.01***
Short-run (average over country list)		
$\Delta\left(y_{i,t-1}^{gde}\right)$	1.31***	1.31***

$\Delta ln\left(\frac{P^{m}_{i,t-1}}{P_{i,t-1}}\right)$	-0.10***	-0.10***
$\overline{\alpha_i}$	-0.45***	0.24***
$n * t$	5834	5834

Notes:*,**,*** signify statistical significance at 10%, 5% and 1%, respectively.

The average short-run domestic demand elasticity is larger than one, while the dispersion by country is quite narrow (Figure **4**5). In the case of MFMod, if traditional estimates of parameters follow outside the 80-20 bound, they are calibrated to the closest boundary, as are estimates for data poor countries that are among the outliers in Figure 5. In cases where relative prices have a positive effect on imports, the associated parameter is set equal to 0. Appendix B summarizes the short-run and ECM parameters for the countries that hit the bounds in the sample.

Figure 4: Import volume elasticities



Producer prices

In MFMod producer prices are a function of the firm's marginal costs expressed in nominal terms. This is obtained by substituting the marginal product of labor into the production function. The price equation shows the close relationship between prices and wages in the model. In the long-run, prices will grow at the rate of wages adjusted for productivity growth (provided that the capital-output ratio converges to a fixed point):

$$P^{*}_{i,t} = \left(\frac{1}{A_{i,t}}\right)^{\frac{1}{\alpha_i}} \left(\frac{W_{i,t}}{\alpha_i}\right) \left(\frac{K_{i,t}}{Y_{i,t}}\right)^{\frac{\alpha_i}{1-\alpha_i}}$$

Note that $A_{i,t}$ is the model's trend TFP for each country, $W_{i,t}$ is the nominal wage, $K_{i,t}/Y_{i,t}$ is the capital output ratio while α_i is the labor share in output. In the model these equilibrium conditions are not assumed to hold in the short-term. Instead, short-term interaction of demand-side factors and the production factors will drive the economy back towards equilibrium over the medium- to long-term.

The pricing equation follows Franz and Gordon (1993), where price is equal to the marginal-cost plus markup.

$$P_{i,t} = u_{i,t}\left(MC_{i,t}\right)^{\beta_i}$$

Where $u_{i,t}$ is the economy-wide markup and $MC_{i,t}$, as defined above, is the nominal marginal cost. The producer price equation is predetermined to ensure consistency between GDP at factor costs and at market prices) and is expressed as:

$$\triangle p_{i,t}^{fcst} = \alpha_i + \theta_i\left[p_{i,t-1}^{fcst} - \delta p_{i,t-1}^{*}\right] + \beta_{i,2} \triangle p_{i,t-1}^{fcst} + \beta_{i,3} \triangle p_{i,t}^{*} + e_{i,t}^{p} \quad (8)$$

The markup is expressed as $\left(\frac{\alpha}{\theta} = \ln(u_t - 1)\right)$ if $\delta = 1$. Note, for this equation to be dynamically stable, the error-correction parameter needs to satisfy $-1 < \theta_i < 0$. The model incorporates persistence of prices, which is determined econometrically. Factor cost inflation will grow at rate of inflation expectations (which are exogenous) in the long-run.

The panel estimates reported in Table 5 suggest that there is a common stochastic trend between marginal costs and prices (the long-run elasticity is basically equal to one). The ECM parameter suggests that it takes approximately four years for the economy to move back into equilibrium. Price stickiness (i.e. $\beta_{i,2}$) moves in line with the equilibrium estimate and suggests prices adjust in just over a year $\left(\frac{1}{1-\beta_{i,2}} = 1.19\right)$. The estimated average mark-up is roughly double that of marginal costs.

Table 5: Price equation for producers

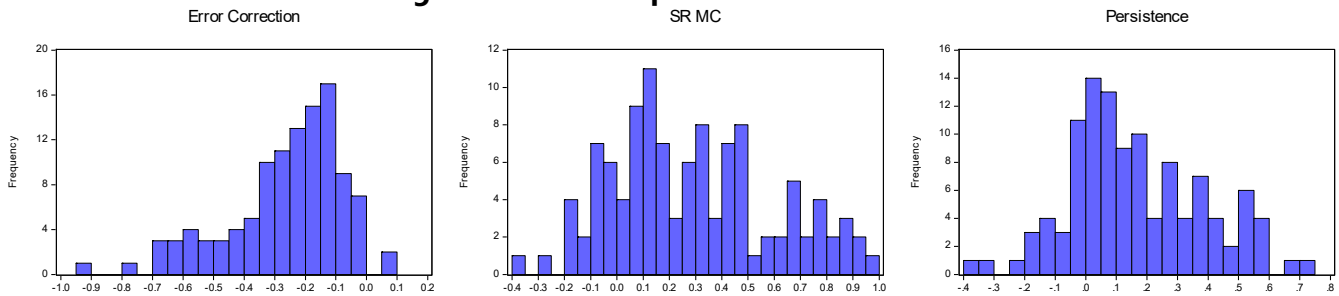
Long-run	
$p_{i,t-1}^{*}$	0.95***
$\overline{\theta_i}$	-0.26***
Short-run (average over country list)	
$\triangle p_{i,t-1}^{fcst}$	0.16***
$\triangle p_{i,t}^{*}$	0.28***
$\overline{\alpha_i}$	0.02** $\left[u_t = e^{\frac{\alpha}{\lvert\theta\rvert}} - 1 = 2.06\right]$
$n * t$	2723

Notes: *,**,*** signify statistical significance at 10%, 5% and 1%, respectively.

There is quite a wide dispersion of parameter estimates for persistence (Figure 6), with an insignificant number of countries having the wrong sign (i.e. a negative sign). This result remains

robust regardless of the lag structure used. As with other parameters, where MFMod estimates fall outside the 80 and 20 percent boundaries, then they are set to the closest bound, while if they cannot be estimated they are set to the modal value. Appendix B summarizes the short-run and ECM parameters for the countries that hit the bounds in the sample.

Figure 5: Producer price elasticities



Consumer prices

Consumer prices in MFMod are determined by a combination of domestic prices and import prices in the long-run. In addition to the same variables representing the short-run, the output gap is added to identify demand-pull pressures. Thus, any excess demand over supply will generate an increase in prices, which erodes real incomes and increases the cost of capital. Prices will continue to rise until the economy moves back into equilibrium. A priori it is expected that the long-run should have a homogeneity restriction on domestic and import prices. The elasticities σ_1 *and* σ_2 should sum to one and give an indication, econometrically, of the relative weight of imports in the consumption basket.

$$\Delta p_{i,t}^{C} = \alpha_i - \theta\left[p_{i,t-1}^{C} - \sigma_1 p_{i,t-1}^{fcst} - \sigma_2 p_{i,t-1}^{m}\right] + \beta_{i,1}\Delta p_{i,t}^{fcst} + \beta_{i,2}\Delta p_{i,t}^{m} + \beta_{i,3}\Delta p_{i,t-1}^{C} + \beta_{i,4} YGAP_{i,t-1} + \varepsilon_{i,t}^{C} \quad (9)$$

The estimated elasticities in Table **6**6 are consistent with the theoretical expectations. The homogeneity condition is met ($\sigma_1 + \sigma_2 \approx 1$), while the data suggest that the equilibrium conditions are correctly identified (the ECM parameter is statistically significant). The output gap enters the equation with a positive sign, an indication that the Phillips curve holds on average.

Table 6: Price equation for consumers

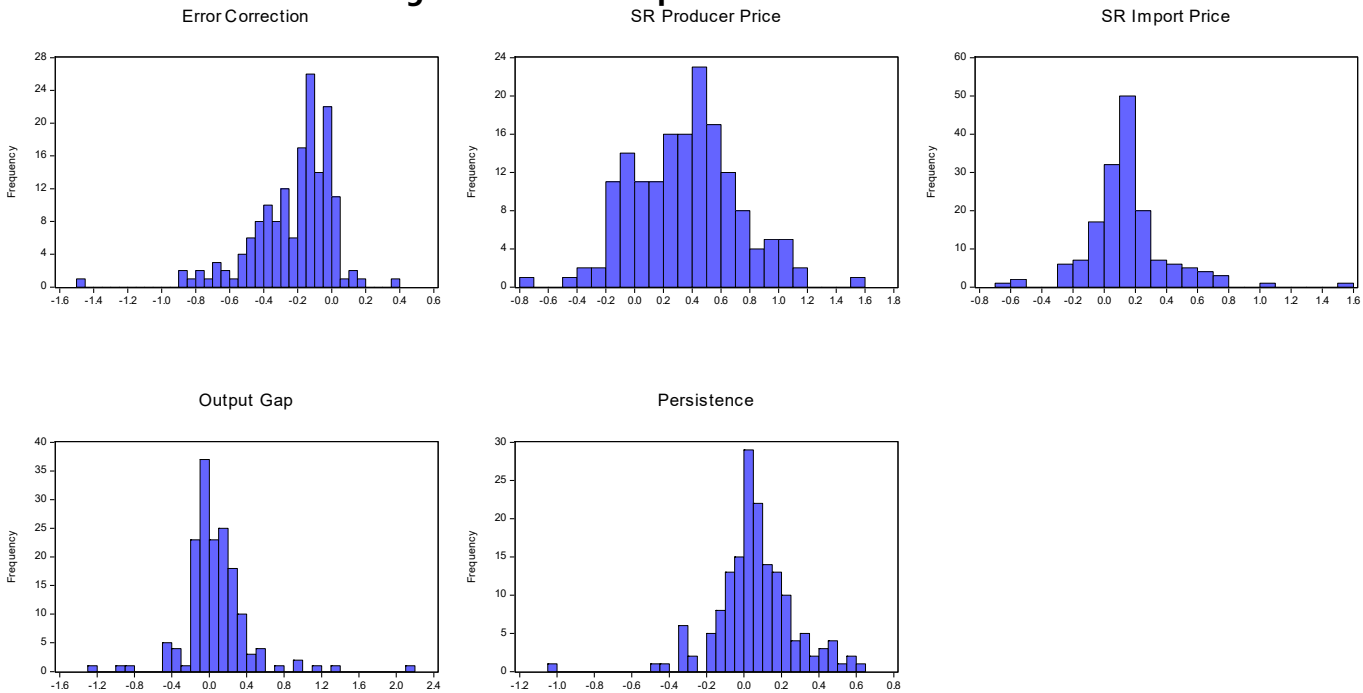
Long-run	
$p_{i,t-1}^{fcst}$	0.86***
$p_{i,t-1}^{m}$	0.15***
$\overline{\theta_i}$	-0.22***
Short-run (average over country list)	

$\triangle p_{i,t-1}^{fcst}$	0.36***
$\triangle p_{i,t}^{m}$	0.15***
$\Delta p_{i,t-1}^{C}$	0.06
$YGAP_{i,t-1}$	0.08**
$\overline{\alpha_i}$	0.012***
$n * t$	4029

Notes: *,**,*** signify statistical significance at 10%, 5% and 1%, respectively.

For most countries the equation correctly identifies a common stochastic trend. The dispersion in the output gap is mainly positive – suggesting that there is some evidence of a short-run Phillips curve. However, the small output gap coefficient might imply that retail mark-ups are small for many of the countries in the sample or simply that the output gap is not the most robust explanatory variable, especially for data poor countries and countries with under-developed markets where external shocks (such as food prices) are the principal determinants of inflation. In the case of MFMod, when estimates fall outside the 80 and 20 percentile bounds, they are calibrated to the closest boundary, while parameters for data poor countries are calibrated to the modal parameter value. In the case, where the estimated parameter for the output gaps is negative it is calibrated to 0. Appendix B summarizes the short-run and ECM parameters for the countries that hit the bounds in the sample

Figure 6: Consumer price elasticities



Import prices

The imports of goods and services price equation is expressed as:

$$\Delta p_{i,t}^{M} = \alpha_i - \theta\left[p_{i,t-1}^{M} - \sigma_1(1+\tau_{t-1}^{cust})p_{i,t-1}^{mKey}e_{i,t-1} - \sigma_2 p_{i,t-1}^{C}\right] + \beta_{i,1}\Delta p_{i,t}^{C} + \beta_{i,2}\Delta(1+\tau_{t-1}^{cust}) * p_{i,t}^{mKey}e_{i,t} + \varepsilon_{i,t}^{M} \quad (10$$

The term in square brackets is the error-correction specification, which states that import price of goods and services converges to a weighted average of the global prices of traded goods ($p_{i,t}^{mKey}$)[6] adjusted for the exchange rate (e_t) and domestic prices (p_t^C). Import tariffs (τ_t^{cust}) are applied above the foreign import basket. In MFMod an homogeneity restriction is imposed such that import prices solve to a weighted average of domestic prices and foreign prices such that ($\sigma_1 + \sigma_2 = 1$). The negative coefficient on the trend suggests that on average import prices have risen 1 percentage point less quickly than would be expected given domestic inflation and global prices of traded goods. In the panel estimates reported in Table 7, the restriction that $\Sigma\sigma_i = 1$ is relaxed. The estimated import price equation is summarized in Table ***7***7. The results suggest that there is

[6] $p_{i,t-1}^{mKey}$ the so-called Keyfitz price is a trade-weighted index of the world price of 30 traded goods, where the weights are given by the average share of each good in the goods imports of each country over the period 2009-2011.

a cointegrating relationship between import prices and the world import price. However, the homogeneity constraint does not hold ($\sigma_1 + \sigma_2 = 0.79$). In another formulation, adding in a time-trend the homogeneity restriction cannot be rejected (column 3 of Table 7), with the time-trend taking a coefficient of -.01 implying that import prices are growing 1 percentage point slower than can be explained by the other factors in the equation. Falling transport margins, changes in the composition of traded goods (notably manufacturing goods) or productivity differentials between exporting and importing countries may be among the factors that could explain that differential. With this specification, the error-correction parameter is also much higher, suggesting that it takes roughly three years to return to equilibrium holding all else constant.

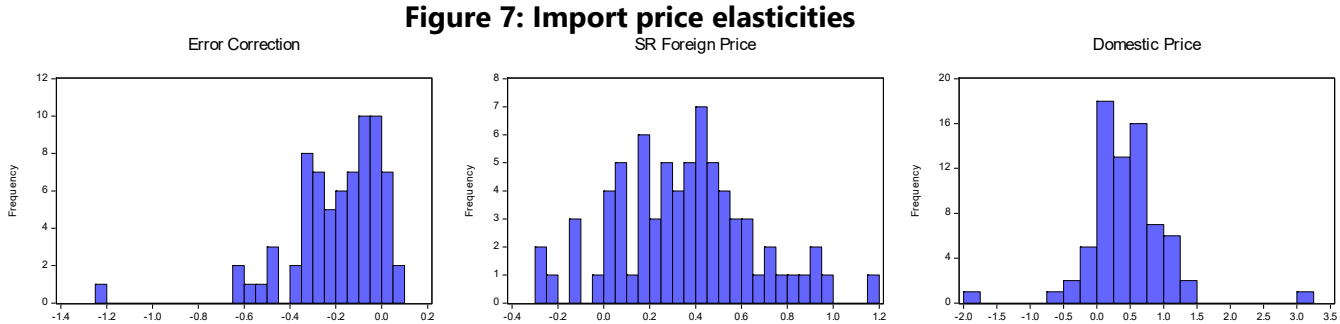
Table 7: Price equation for importers

Long-run	Standard specification	Specification with trend
$(1+\tau_t^{cust})p_{i,t}^{mKey}e_{i,t}$	0.23***	0.23***
$p_{i,t}^{C}$	0.56***	0.73***
$\overline{\theta_i}$	-0.19***	-0.31***
$trend$		-0.01
Short-run (average over country list)		
$\Delta(1+\tau_t^{cust})p_{i,t}^{mKey}e_{i,t}$	0.35***	0.30***
$\Delta p_{i,t}^{C}$	0.43***	0.35***
$\overline{\alpha_i}$	-0.15***	-0.22***
$n * t$	1639	1639

Notes: *,**,*** signify statistical significance at 10%, 5% and 1%, respectively.

Figure 8 reports parameter estimates for the specification without a time trend. For most countries the ECM term falls within the negative unit interval, suggesting that the theoretical specification identifies the long-run. The impact of foreign prices on the import price deflator is very dispersed across countries, but primarily positive as expected. In MFMod, parameter estimates that fall outside the 80 and 20 percentiles are constrained to the closest boundary, and data poor countries are calibrated to the modal value of the associated parameter. Appendix B summarizes the short-run and ECM parameters for the countries that hit the bounds in the sample.

Figure 7: Import price elasticities



Export prices

Using a similar approximation as the import price deflator, the panel version of the standard export price equation can be written as:

$$\Delta p_{i,t}^{x} = \alpha_i - \theta_i\left[p_{i,t-1}^{x} - \sigma_1 p_{i,t-1}^{xKey} e_{i,t-1} - \sigma_2 p_{i,t-1}^{C}\right] + \beta_{i,1}\Delta p_{i,t}^{C} + \beta_{i,2}\Delta p_{i,t}^{xKey} e_{i,t} + \varepsilon_{i,t}^{xnoil} \quad (11$$

This equation encapsulates the export price formation process of both price-takers and price makers. In instances where countries are pure price takers the price of export goods will be fully determined by the world USD prices of the exports of country i proxied by the Keyfitz export price multiplied by its bilateral exchange rate with respect to the US dollar e_{t-1}. In this instance, domestic prices would be proxying for services prices, assuming that exporters price to market. In the case where countries are price-makers the expected coefficient on world prices will be smaller and the domestic inflation variable proxies for both service prices as above and cost pressures that leak into the export prices.

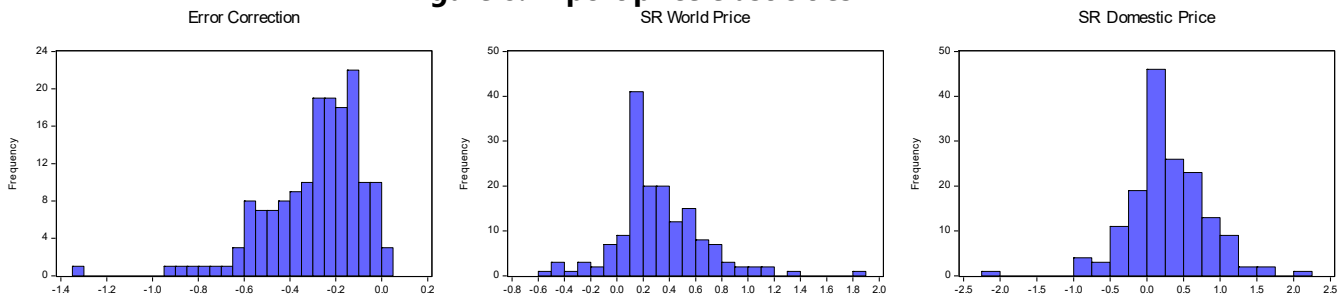
Table 8 indicates that the data do not reject the theoretical export price deflator equation, and that it takes approximately three years for export prices to converge to equilibrium once it is out of equilibrium. There is near homogeneity in the long-run ($\sigma_1 + \sigma_2 = 0.95$) (statistically indistinguishable from 1) and all the short-run parameters are statistically significant. In MFMod, parameter estimates that fall outside the 80 and 20 percentiles are constrained to the closest boundary, and data poor countries are calibrated to the modal value of the associated parameter. Appendix B summarizes the short-run and ECM parameters for the countries that hit the bounds in the sample.

Table 8: Price equation for exporters

Long-run	
$p_{i,t}^{xKey} e_{i,t}$	0.56***
$p_{i,t}^{C}$	0.39***
$\overline{\theta}_i$	-0.29***
Short-run (average over country list)	
$\Delta p_{i,t}^{xKey} e_{i,t}$	0.31***
$\Delta p_{i,t}^{C}$	0.27***
$\overline{\alpha}_i$	-0.53***
$trend$	-0.00
$n * t$	5567

Notes: *,**,*** signify statistical significance at 10%, 5% and 1%, respectively.

Figure 8: Export price elasticities



5. Conclusion

This paper uses a dynamic panel approach (a natural extension to the methodology employed in MFMod) to estimate parameters from several of the key equations in the World Bank's macro structural model (MFMod). The objective is to find an empirical basis for imposing parameters for countries where a short sample period (or regime change) precludes the identification of country-specific parameters using standard time-series techniques.

For most of the equations, the panel estimation results support (do not reject) the theoretically derived long-run relationships and restrictions. They indicate that there is significant variation across countries in terms of short-run elasticities and the movement towards equilibrium when they are perturbed. Taken together these results support imposing long-run theoretical parameters on equations, when country-specific data are scarce, but suggest more work may be required to identify the factors (such as income levels, commodity dependency, exchange rate regime) that might be influencing the wider dispersion observed for short-term parameters.

The country specific short-term elasticities with the error-correction components are used when calibrating data poor countries in MFMod. The 80th and 20th percentiles for each variable in the panel are used as cut-off points to force outlier countries within reasonable estimates. Future work may entail finding country groups that share similar economic structures to find appropriate bounds for outlier data poor countries.

While most of the results fall within a priori expectations, further work on both the trade deflators and trade volumes is warranted. The results suggest that it is hard to pin down the effects of relative prices on export volumes – the elasticities suggest that several countries set prices independently of world prices. One explanation is that the number of variables does not adequately explain the trade behavior over the last decade – as such additional variables identified in the literature should be added to obtain unbiased trade elasticities.

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Appendix A: The trend in trade

This section illustrates how the mean of the long-run estimates of domestic demand in the import equation have changed as a function of time. The simple model is now cast in a Bayesian setup where the import equation can be reformulated as follows:

$$\Delta m_{i,t} \sim N\left(\alpha_i + \theta m_{i,t-1} + \beta_{i,t} y_{i,t-1} - \gamma ln\left(\frac{P_{t-1}^M}{P_{t-1}^C}\right) - \rho\Delta\left(\frac{P_t^M}{P_t^C}\right) + \omega\Delta y_{i,t-1}, \sigma_m^2\right)$$

Where $\sim N$ expresses the growth rate of imports being generated from a normal distribution where the mean is the right-hand side of equation (7).

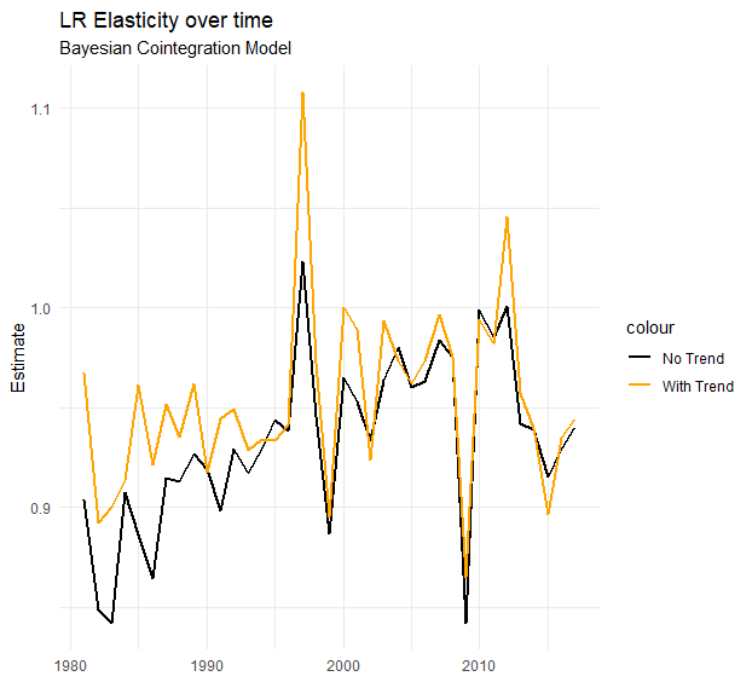
This specification requires priors where it is assumed that the country specific intercepts are drawn from a normal distribution. The long-run import demand elasticity is specified as a normal distribution that varies over time.

$$\alpha_i \sim N\left(\alpha_0 + u_{0,i}, \sigma_\alpha^2\right)$$
$$\beta_{i,t} \sim N\left(\beta_0 + v_{0,i} T, \sigma_\beta^2\right)$$

The setup above compares the time varying income elasticity to the same specification but also adding a trend. For the income elasticity to be valid, it has to be constant and independent of time. It is thus expected that $E\left(\beta_{i,t}\right) = E\left(\beta_0 + v_{0,i} T\right) = u$.

Figure 9 shows the long-run elasticities for the specifications with and without the trends. Both have a constant mean after 2000, but prior to 2000 the specification without a trend shows that the elasticity trends upward – i.e. suggesting that import penetration increased in those years. The specification with the trend corrects for the non-constant long-run elasticity. This is the specification that is preferred in MFMod.

Figure 9: $\frac{\beta_{i,t}}{|\theta|}$ with and without trend



Appendix B: Short-run estimates by country (with 80% and 20% bounds imposed on outlier countries)

Each table below reports the individual country parameter estimates from the panel exercise (panel sizes differ across equations). Numbers in white are the actual estimated values and fall within the 80 and 20 percent confidence intervals. Numbers on a green (red) background indicate that the associated parameter estimate fell outside the 20th (80th) percentile.

Assuming this result is also reflected in the standard time-series estimates for that country (which need not be the case). The number in the table in these instances is the 20th (80th) percentile frontier for that parameter estimate.

Household consumption elasticities

Country	ECM	Income	Interest rates	Country	ECM	Income	Interest rates	Country	ECM	Income	Interest ra	Country	ECM	Income	Interest rates
AFG	-0.10	0.60	-0.08	DZA	-0.09	0.06	0.00	KGZ	-0.37	0.28	-0.22	PAN	-0.16	0.46	0.00
AGO	-0.23	0.06	0.00	ECU	-0.09	0.49	-0.16	KOR	-0.38	0.61	0.00	PER	-0.32	0.06	0.00
ALB	-0.36	0.58	-0.22	EGY	-0.09	0.06	-0.09	KWT	-0.33	0.54	-0.22	PHL	-0.09	0.25	0.00
ARE	-0.30	0.61	-0.22	ERI	-0.14	0.61	-0.22	LAO	-0.38	0.61	-0.22	POL	-0.25	0.26	-0.17
ARG	-0.11	0.61	-0.03	ESP	-0.09	0.61	0.00	LBN	-0.12	0.61	-0.22	PRT	-0.31	0.20	0.00
ARM	-0.12	0.45	-0.03	ETH	-0.38	0.48	-0.04	LBY	-0.09	0.60	-0.22	QAT	-0.26	0.06	0.00
AUT	-0.09	0.47	0.00	FIN	-0.13	0.42	-0.15	LKA	-0.38	0.06	0.00	ROU	-0.27	0.61	-0.02
AZE	-0.16	0.16	0.00	FRA	-0.26	0.41	-0.05	LSO	-0.24	0.61	0.00	RUS	-0.38	0.06	0.00
BEL	-0.09	0.40	0.00	GBR	-0.09	0.61	0.00	LTU	-0.38	0.17	-0.22	RWA	-0.25	0.61	-0.09
BEN	-0.09	0.49	0.00	GEO	-0.33	0.61	0.00	LUX	-0.09	0.22	0.00	SAU	-0.20	0.06	0.00
BGR	-0.38	0.26	-0.22	GHA	-0.33	0.61	0.00	LVA	-0.38	0.30	0.00	SDN	-0.12	0.17	0.00
BHR	-0.16	0.06	0.00	GMB	-0.38	0.06	0.00	MAR	-0.22	0.61	-0.22	SLB	-0.15	0.61	0.00
BHS	-0.38	0.27	0.00	GNB	-0.38	0.10	0.00	MDG	-0.26	0.06	0.00	SLV	-0.09	0.61	-0.22
BIH	-0.30	0.33	0.00	GRC	-0.35	0.38	0.00	MEX	-0.09	0.61	-0.11	SRB	-0.38	0.10	-0.22
BLZ	-0.12	0.06	0.00	GTM	-0.20	0.50	-0.22	MKD	-0.09	0.14	0.00	SVK	-0.34	0.28	0.00
BRA	-0.32	0.34	-0.07	HKG	-0.09	0.61	0.00	MLI	-0.24	0.26	0.00	SVN	-0.17	0.45	0.00
BRB	-0.13	0.61	-0.11	HRV	-0.11	0.09	-0.11	MLT	-0.13	0.06	0.00	SWE	-0.24	0.21	0.00
CAN	-0.09	0.45	0.00	HTI	-0.38	0.06	0.00	MNE	-0.38	0.55	-0.22	SWZ	-0.38	0.45	-0.22
CHE	-0.09	0.26	0.00	HUN	-0.20	0.59	0.00	MNG	-0.38	0.06	-0.16	SYR	-0.09	0.61	0.00
CHL	-0.37	0.14	-0.15	IDN	-0.14	0.06	0.00	MOZ	-0.38	0.06	0.00	TCD	-0.38	0.06	0.00
CHN	-0.11	0.18	0.00	IND	-0.30	0.06	0.00	MRT	-0.09	0.06	0.00	TGO	-0.26	0.06	0.00
CMR	-0.09	0.24	0.00	IRL	-0.09	0.28	0.00	MUS	-0.11	0.11	-0.22	TUN	-0.10	0.15	0.00
COD	-0.17	0.41	0.00	IRN	-0.13	0.32	0.00	MYS	-0.09	0.61	-0.22	TUR	-0.38	0.44	-0.01
COG	-0.15	0.22	0.00	IRQ	-0.38	0.06	0.00	NAM	-0.13	0.13	-0.15	UKR	-0.37	0.06	0.00
COL	-0.17	0.60	-0.08	ISL	-0.13	0.61	-0.04	NER	-0.30	0.16	-0.21	URY	-0.38	0.18	-0.22
CRI	-0.09	0.31	-0.22	ISR	-0.38	0.46	-0.22	NGA	-0.22	0.06	0.00	USA	-0.13	0.61	-0.22
CYP	-0.09	0.61	-0.22	ITA	-0.19	0.60	0.00	NIC	-0.35	0.06	-0.12	UZB	-0.17	0.14	-0.10
CZE	-0.32	0.16	0.00	JAM	-0.38	0.21	-0.22	NLD	-0.09	0.61	0.00	VEN	-0.38	0.06	0.00
DEU	-0.30	0.06	0.00	JOR	-0.16	0.61	-0.08	NOR	-0.14	0.11	0.00	VNM	-0.18	0.06	0.00
DJI	-0.34	0.34	-0.22	JPN	-0.09	0.37	0.00	NPL	-0.31	0.33	0.00	ZAF	-0.38	0.38	0.00
DNK	-0.29	0.46	0.00	KAZ	-0.20	0.26	-0.22	NZL	-0.22	0.43	-0.03	ZMB	-0.38	0.60	-0.22
DOM	-0.10	0.35	0.00	KEN	-0.09	0.47	-0.22	PAK	-0.09	0.37	-0.08				

Note: reflecting the low explanatory power of the statistically insignificant interest rate variable in the main equation, 68 of the 172 estimates (roughly 40%) fall outside of the 20-80 confidence interval.

Export volume elasticities (with price of exports expressed a ratio to world prices)

Country	ECM	XMK	Relative price	Country	ECM	XMK	Relative price	Country	ECM	XMK	Relative price	Country	ECM	XMK	Relative price
AGO	-0.13	0.86	-0.33	DJI	-0.18	0.02	0.00	KEN	-0.40	0.28	-0.08	POL	-0.40	0.36	0.00
ALB	-0.13	0.72	0.00	DMA	-0.17	0.28	0.00	KGZ	-0.33	0.16	0.00	PRT	-0.37	0.67	0.00
ARE	-0.25	0.68	-0.33	DNK	-0.14	0.51	-0.18	KHM	-0.37	0.86	-0.12	PRY	-0.27	0.52	-0.29
ARG	-0.24	0.68	-0.13	DOM	-0.15	0.73	-0.33	KOR	-0.17	0.76	-0.33	PSE	-0.17	0.17	-0.31
ARM	-0.23	0.86	-0.33	DZA	-0.14	0.23	0.00	KWT	-0.13	0.86	-0.22	QAT	-0.13	0.86	-0.21
AUS	-0.21	0.14	-0.15	ECU	-0.21	0.27	0.00	LAO	-0.17	0.02	-0.33	ROU	-0.39	0.42	0.00
AUT	-0.15	0.86	-0.09	EGY	-0.13	0.85	-0.33	LBN	-0.13	0.29	0.00	RUS	-0.13	0.33	0.00
AZE	-0.13	0.86	-0.01	ERI	-0.17	0.46	0.00	LBY	-0.34	0.02	0.00	RWA	-0.40	0.20	0.00
BDI	-0.39	0.55	-0.23	ESP	-0.33	0.75	0.00	LKA	-0.13	0.86	-0.01	SAU	-0.13	0.86	-0.27
BEL	-0.21	0.71	-0.02	EST	-0.39	0.43	-0.09	LSO	-0.13	0.02	-0.03	SDN	-0.13	0.56	-0.25
BEN	-0.28	0.02	-0.22	ETH	-0.23	0.75	-0.33	LTU	-0.31	0.54	-0.06	SEN	-0.17	0.07	0.00
BFA	-0.20	0.02	0.00	FIN	-0.17	0.74	-0.21	LUX	-0.13	0.86	0.00	SGP	-0.29	0.65	-0.29
BGD	-0.40	0.02	-0.08	FRA	-0.31	0.64	-0.02	LVA	-0.13	0.77	-0.04	SLB	-0.13	0.59	0.00
BGR	-0.19	0.72	-0.33	GAB	-0.13	0.15	-0.12	MAR	-0.40	0.54	-0.04	SLE	-0.40	0.21	-0.33
BHR	-0.40	0.04	0.00	GBR	-0.16	0.68	-0.05	MDA	-0.40	0.52	0.00	SLV	-0.25	0.70	-0.06
BHS	-0.13	0.18	-0.04	GEO	-0.40	0.49	0.00	MDG	-0.40	0.69	0.00	SVK	-0.13	0.86	0.00
BIH	-0.40	0.52	0.00	GHA	-0.18	0.02	-0.33	MEX	-0.25	0.86	0.00	SVN	-0.16	0.77	0.00
BLR	-0.40	0.26	0.00	GIN	-0.37	0.02	0.00	MKD	-0.29	0.78	-0.33	SWE	-0.18	0.86	-0.13
BLZ	-0.14	0.02	-0.31	GMB	-0.40	0.02	-0.06	MLI	-0.33	0.02	-0.10	SWZ	-0.27	0.07	0.00
BOL	-0.21	0.54	0.00	GNB	-0.40	0.02	0.00	MLT	-0.40	0.02	-0.30	SYC	-0.13	0.36	0.00
BRA	-0.26	0.57	0.00	GNQ	-0.15	0.66	-0.33	MNG	-0.40	0.02	-0.30	SYR	-0.27	0.86	-0.33
BRB	-0.13	0.02	-0.33	GRC	-0.18	0.86	-0.33	MOZ	-0.13	0.10	0.00	TCD	-0.23	0.86	-0.13
BRN	-0.13	0.02	0.00	GTM	-0.29	0.24	0.00	MRT	-0.21	0.02	0.00	TGO	-0.30	0.02	-0.33
BTN	-0.14	0.86	0.00	HKG	-0.36	0.86	0.00	MUS	-0.40	0.11	0.00	THA	-0.40	0.45	-0.22
BWA	-0.40	0.86	-0.33	HND	-0.13	0.86	-0.15	MWI	-0.14	0.02	-0.33	TJK	-0.22	0.70	0.00
CAF	-0.40	0.45	-0.12	HRV	-0.21	0.62	0.00	MYS	-0.40	0.75	-0.02	TUN	-0.15	0.06	-0.33
CAN	-0.13	0.86	-0.33	HTI	-0.28	0.02	0.00	NAM	-0.24	0.17	0.00	TUR	-0.40	0.17	0.00
CHE	-0.40	0.17	-0.33	HUN	-0.13	0.86	-0.13	NER	-0.23	0.02	-0.25	TZA	-0.40	0.02	-0.12
CHL	-0.13	0.37	0.00	IDN	-0.40	0.67	-0.33	NGA	-0.30	0.86	0.00	UGA	-0.38	0.05	-0.33
CHN	-0.13	0.86	-0.07	IND	-0.13	0.86	-0.33	NIC	-0.30	0.38	-0.11	UKR	-0.24	0.86	-0.05
CIV	-0.40	0.02	-0.29	IRL	-0.22	0.47	0.00	NLD	-0.14	0.68	-0.18	URY	-0.17	0.49	-0.07
CMR	-0.21	0.59	0.00	IRN	-0.33	0.32	0.00	NOR	-0.20	0.08	0.00	USA	-0.26	0.78	0.00
COG	-0.15	0.06	0.00	IRQ	-0.40	0.02	0.00	NPL	-0.28	0.02	-0.33	UZB	-0.21	0.41	-0.33
COL	-0.13	0.20	0.00	ISL	-0.28	0.02	0.00	NZL	-0.20	0.11	0.00	VEN	-0.13	0.76	-0.16
COM	-0.40	0.02	-0.23	ISR	-0.32	0.86	-0.33	OMN	-0.22	0.16	-0.04	VNM	-0.40	0.16	-0.21
CPV	-0.26	0.31	-0.33	ITA	-0.26	0.86	0.00	PAK	-0.40	0.19	-0.33	VUT	-0.22	0.02	0.00
CRI	-0.13	0.62	0.00	JAM	-0.18	0.53	-0.33	PAN	-0.20	0.52	-0.33	YEM	-0.13	0.86	-0.31
CYP	-0.40	0.14	0.00	JOR	-0.40	0.41	-0.15	PER	-0.18	0.32	0.00	ZAF	-0.15	0.86	-0.33
CZE	-0.13	0.86	0.00	JPN	-0.40	0.86	-0.02	PHL	-0.13	0.86	0.00	ZMB	-0.23	0.86	-0.33
DEU	-0.13	0.86	-0.05	KAZ	-0.13	0.86	-0.03	PNG	-0.29	0.04	0.00	ZWE	-0.13	0.36	-0.33

Export deflator elasticities

Country	ECM	KEYFITZ	Consumption	Country	ECM	KEYFITZ	Consumption	Country	ECM	KEYFITZ	Consumption	Country	ECM	KEYFITZ	Consumption
AGO	-0.12	0.12	0.68	DJI	-0.36	0.12	0.00	KEN	-0.30	0.19	0.04	POL	-0.12	0.30	0.00
ALB	-0.43	0.21	0.00	DMA	-0.12	0.32	0.06	KGZ	-0.43	0.12	0.06	PRT	-0.21	0.15	0.60
ARE	-0.17	0.51	0.01	DNK	-0.19	0.21	0.59	KHM	-0.14	0.12	0.68	PRY	-0.32	0.58	0.00
ARG	-0.43	0.30	0.10	DOM	-0.22	0.12	0.68	KOR	-0.18	0.51	0.45	PSE	-0.40	0.12	0.00
ARM	-0.14	0.12	0.68	DZA	-0.12	0.58	0.00	KWT	-0.12	0.58	0.00	QAT	-0.17	0.58	0.12
AUS	-0.42	0.22	0.47	ECU	-0.24	0.58	0.16	LAO	-0.43	0.45	0.00	ROU	-0.43	0.13	0.24
AUT	-0.12	0.12	0.68	EGY	-0.29	0.46	0.00	LBN	-0.30	0.58	0.00	RUS	-0.43	0.58	0.11
AZE	-0.23	0.58	0.03	ERI	-0.43	0.38	0.00	LBY	-0.12	0.58	0.00	RWA	-0.43	0.58	0.00
BDI	-0.43	0.56	0.36	ESP	-0.16	0.14	0.68	LKA	-0.40	0.23	0.06	SAU	-0.14	0.58	0.00
BEL	-0.14	0.14	0.68	EST	-0.12	0.12	0.68	LSO	-0.14	0.22	0.68	SDN	-0.24	0.20	0.53
BEN	-0.40	0.12	0.21	ETH	-0.43	0.12	0.12	LTU	-0.43	0.26	0.68	SEN	-0.22	0.12	0.52
BFA	-0.20	0.18	0.35	FIN	-0.19	0.12	0.13	LUX	-0.19	0.12	0.68	SGP	-0.31	0.12	0.57
BGD	-0.24	0.12	0.68	FRA	-0.12	0.14	0.68	LVA	-0.12	0.12	0.68	SLB	-0.12	0.21	0.00
BGR	-0.16	0.58	0.10	GAB	-0.12	0.58	0.08	MAR	-0.36	0.39	0.68	SLE	-0.43	0.12	0.68
BHR	-0.39	0.58	0.00	GBR	-0.43	0.17	0.37	MDA	-0.43	0.23	0.00	SLV	-0.26	0.30	0.00
BHS	-0.24	0.21	0.03	GEO	-0.25	0.20	0.56	MDG	-0.20	0.58	0.04	SVK	-0.21	0.51	0.68
BIH	-0.29	0.40	0.24	GHA	-0.43	0.12	0.00	MEX	-0.33	0.29	0.44	SVN	-0.12	0.12	0.68
BLR	-0.39	0.13	0.62	GIN	-0.12	0.12	0.37	MKD	-0.12	0.21	0.68	SWE	-0.26	0.12	0.63
BLZ	-0.16	0.12	0.18	GMB	-0.43	0.12	0.00	MLI	-0.43	0.18	0.15	SWZ	-0.14	0.37	0.04
BOL	-0.21	0.14	0.68	GNB	-0.30	0.12	0.54	MLT	-0.22	0.14	0.44	SYC	-0.21	0.58	0.00
BRA	-0.43	0.31	0.14	GNQ	-0.18	0.43	0.01	MNG	-0.43	0.12	0.66	SYR	-0.12	0.20	0.13
BRB	-0.28	0.58	0.08	GRC	-0.12	0.15	0.51	MOZ	-0.31	0.55	0.31	TCD	-0.43	0.12	0.65
BRN	-0.15	0.54	0.00	GTM	-0.24	0.58	0.00	MRT	-0.29	0.41	0.00	TGO	-0.43	0.12	0.41
BTN	-0.43	0.23	0.28	HKG	-0.20	0.15	0.49	MUS	-0.12	0.12	0.21	THA	-0.18	0.30	0.24
BWA	-0.25	0.12	0.00	HND	-0.12	0.58	0.68	MWI	-0.12	0.58	0.46	TJK	-0.43	0.13	0.41
CAF	-0.28	0.32	0.17	HRV	-0.12	0.20	0.68	MYS	-0.35	0.22	0.54	TUN	-0.17	0.44	0.00
CAN	-0.24	0.41	0.68	HTI	-0.43	0.19	0.00	NAM	-0.19	0.35	0.06	TUR	-0.38	0.51	0.06
CHE	-0.27	0.15	0.30	HUN	-0.12	0.46	0.68	NER	-0.15	0.12	0.62	TZA	-0.14	0.30	0.00
CHL	-0.24	0.58	0.06	IDN	-0.26	0.35	0.43	NGA	-0.23	0.58	0.34	UGA	-0.36	0.19	0.47
CHN	-0.16	0.38	0.68	IND	-0.43	0.20	0.65	NIC	-0.43	0.31	0.22	UKR	-0.28	0.12	0.59
CIV	-0.31	0.18	0.20	IRL	-0.18	0.37	0.34	NLD	-0.13	0.32	0.68	URY	-0.43	0.44	0.09
CMR	-0.28	0.56	0.00	IRN	-0.43	0.12	0.38	NOR	-0.12	0.58	0.34	USA	-0.14	0.19	0.68
COG	-0.14	0.58	0.10	IRQ	-0.12	0.12	0.68	NPL	-0.18	0.39	0.18	UZB	-0.43	0.58	0.00
COL	-0.43	0.33	0.31	ISL	-0.43	0.20	0.19	NZL	-0.43	0.20	0.41	VEN	-0.43	0.54	0.00
COM	-0.39	0.12	0.00	ISR	-0.30	0.35	0.38	OMN	-0.30	0.58	0.52	VNM	-0.43	0.40	0.00
CPV	-0.12	0.47	0.00	ITA	-0.13	0.18	0.68	PAK	-0.39	0.12	0.02	VUT	-0.43	0.12	0.00
CRI	-0.23	0.55	0.25	JAM	-0.12	0.35	0.68	PAN	-0.29	0.28	0.27	YEM	-0.26	0.12	0.68
CYP	-0.12	0.16	0.00	JOR	-0.30	0.58	0.00	PER	-0.34	0.58	0.00	ZAF	-0.12	0.48	0.17
CZE	-0.13	0.25	0.50	JPN	-0.43	0.17	0.04	PHL	-0.12	0.42	0.68	ZMB	-0.12	0.58	0.02
DEU	-0.28	0.12	0.06	KAZ	-0.26	0.58	0.12	PNG	-0.12	0.58	0.00	ZWE	-0.43	0.12	0.00

Import volume elasticities

Country	ECM	GDE	Relative price	Country	ECM	GDE	Relative price	Country	ECM	GDE	Relative price	Country	ECM	GDE	Relative price
AFG	-0.09	0.64	-0.43	DJI	-0.22	0.90	0.00	KHM	-0.04	0.64	-0.47	PRT	-0.01	2.09	-0.24
AGO	-0.01	0.64	-0.32	DMA	-0.08	1.19	-0.13	KOR	-0.22	1.88	-0.01	PRY	-0.12	1.74	-0.39
ALB	-0.10	0.64	-0.47	DNK	-0.01	1.84	0.00	KWT	-0.17	0.64	0.00	PSE	-0.02	0.99	-0.25
ARE	-0.02	0.87	-0.10	DOM	-0.01	1.83	-0.16	LAO	-0.22	2.12	-0.41	QAT	-0.17	0.80	-0.27
ARG	-0.07	2.12	-0.27	DZA	-0.13	2.12	-0.28	LBN	-0.18	0.92	-0.47	ROU	-0.09	0.82	-0.47
ARM	-0.03	0.72	-0.47	ECU	-0.22	2.07	-0.11	LBR	-0.01	0.64	0.00	RUS	-0.06	1.61	-0.18
AUS	-0.13	2.12	-0.47	EGY	-0.09	1.33	-0.19	LBY	-0.03	1.09	-0.26	RWA	-0.03	0.64	-0.47
AUT	-0.08	1.44	0.00	ERI	-0.03	2.12	-0.34	LKA	-0.01	1.92	-0.28	SAU	-0.16	0.64	-0.06
AZE	-0.01	0.64	-0.24	ESP	-0.08	2.12	-0.16	LSO	-0.01	0.64	0.00	SDN	-0.07	1.82	-0.47
BDI	-0.07	1.72	-0.47	EST	-0.01	1.06	-0.47	LTU	-0.02	1.33	0.00	SEN	-0.14	0.64	-0.12
BEL	-0.01	2.12	0.00	ETH	-0.08	1.26	-0.46	LUX	-0.07	0.81	0.00	SGP	-0.05	1.58	0.00
BEN	-0.21	2.12	-0.21	FIN	-0.02	1.64	0.00	LVA	-0.01	0.64	0.00	SLB	-0.10	1.21	-0.10
BFA	-0.08	1.33	-0.47	FRA	-0.01	2.12	-0.04	MAR	-0.22	0.64	0.00	SLE	-0.15	1.03	-0.20
BGD	-0.22	2.12	-0.47	GAB	-0.03	1.66	-0.08	MDA	-0.13	0.64	-0.20	SLV	-0.17	2.12	0.00
BGR	-0.09	2.12	-0.47	GBR	-0.06	1.71	0.00	MDG	-0.16	2.12	-0.20	SRB	-0.22	2.12	0.00
BHR	-0.04	0.64	0.00	GEO	-0.01	0.80	0.00	MEX	-0.02	1.76	-0.47	SVK	-0.01	0.85	0.00
BHS	-0.22	1.10	-0.26	GHA	-0.22	2.12	-0.32	MKD	-0.01	1.14	-0.17	SVN	-0.22	1.16	-0.36
BIH	-0.20	1.02	0.00	GIN	-0.16	2.12	-0.04	MLI	-0.06	0.89	-0.22	SWE	-0.12	1.96	0.00
BLR	-0.17	1.67	-0.18	GMB	-0.10	0.64	-0.03	MLT	-0.16	1.51	0.00	SWZ	-0.09	0.64	-0.20
BLZ	-0.04	1.06	0.00	GNB	-0.22	0.64	-0.14	MMR	-0.20	0.64	-0.46	SYC	-0.22	0.91	0.00
BOL	-0.22	1.72	-0.13	GNQ	-0.04	0.84	0.00	MNE	-0.22	2.12	-0.47	SYR	-0.22	0.64	-0.03
BRA	-0.05	1.82	-0.36	GRC	-0.10	1.34	0.00	MNG	-0.22	1.25	-0.13	TCD	-0.12	0.81	-0.47
BRB	-0.22	2.12	-0.47	GTM	-0.22	2.12	0.00	MOZ	-0.22	0.64	0.00	TGO	-0.15	1.68	-0.47
BRN	-0.22	0.64	-0.36	HKG	-0.05	1.58	-0.23	MRT	-0.08	0.64	0.00	THA	-0.22	1.76	-0.44
BTN	-0.11	0.64	0.00	HND	-0.19	1.43	0.00	MUS	-0.03	2.06	-0.14	TJK	-0.01	0.77	0.00
BWA	-0.12	1.33	-0.27	HRV	-0.22	0.86	-0.40	MWI	-0.01	0.64	-0.47	TLS	-0.10	1.89	-0.47
CAF	-0.11	0.79	-0.47	HTI	-0.14	1.27	0.00	MYS	-0.01	2.12	0.00	TUN	-0.14	0.64	-0.02
CAN	-0.13	2.12	-0.15	HUN	-0.01	1.44	0.00	NAM	-0.22	0.64	-0.13	TUR	-0.22	2.04	-0.26
CHE	-0.11	1.75	-0.20	IDN	-0.16	1.18	0.00	NER	-0.22	0.84	-0.47	TZA	-0.21	2.11	-0.47
CHL	-0.15	2.12	-0.14	IND	-0.05	1.33	-0.47	NGA	-0.11	0.72	-0.32	UGA	-0.01	1.77	-0.43
CHN	-0.16	2.12	-0.45	IRL	-0.19	0.95	0.00	NIC	-0.03	1.88	0.00	UKR	-0.17	1.17	-0.47
CIV	-0.09	1.19	-0.47	IRN	-0.14	1.63	-0.08	NLD	-0.01	1.79	0.00	URY	-0.21	2.12	0.00
CMR	-0.22	1.95	-0.04	IRQ	-0.22	1.29	0.00	NOR	-0.09	1.32	0.00	USA	-0.07	2.12	0.00
COD	-0.22	2.12	-0.13	ISL	-0.22	1.48	-0.46	NPL	-0.18	1.12	-0.47	UZB	-0.06	1.07	-0.15
COG	-0.07	0.64	0.00	ISR	-0.01	2.12	0.00	NZL	-0.22	1.30	0.00	VEN	-0.22	2.12	-0.47
COL	-0.08	2.12	-0.47	ITA	-0.01	2.12	-0.08	OMN	-0.02	0.64	-0.19	VNM	-0.02	2.12	-0.27
COM	-0.11	1.40	-0.47	JAM	-0.06	1.33	-0.15	PAK	-0.08	2.00	-0.47	VUT	-0.11	0.92	0.00
CPV	-0.01	0.80	-0.16	JOR	-0.04	0.64	0.00	PAN	-0.01	1.82	-0.47	XKX	-0.22	0.64	-0.47
CRI	-0.10	2.12	-0.25	JPN	-0.10	1.34	0.00	PER	-0.01	2.01	-0.03	YEM	-0.22	1.32	-0.45
CYP	-0.15	1.84	0.00	KAZ	-0.01	1.57	-0.24	PHL	-0.08	2.06	0.00	ZAF	-0.21	2.12	-0.15
CZE	-0.02	1.81	-0.47	KEN	-0.22	0.66	-0.25	PNG	-0.13	0.64	0.00	ZMB	-0.10	1.94	-0.47
DEU	-0.01	2.01	0.00	KGZ	-0.22	0.64	-0.47	POL	-0.01	1.58	-0.47	ZWE	-0.07	0.92	0.00

Import deflator elasticities

Country	ECM	KEYFITZ	Consumption	Country	ECM	KEYFITZ	Consumption
AGO	-0.32	0.27	0.06	IRQ	-0.03	0.09	0.81
ALB	-0.32	0.17	0.36	JOR	-0.03	0.59	0.41
ARM	-0.20	0.59	0.06	KEN	-0.10	0.37	0.20
BDI	-0.32	0.40	0.81	KGZ	-0.06	0.14	0.81
BEN	-0.03	0.38	0.81	KHM	-0.03	0.09	0.37
BFA	-0.06	0.43	0.70	LAO	-0.28	0.59	0.28
BGD	-0.10	0.09	0.81	LSO	-0.13	0.41	0.06
BGR	-0.15	0.45	0.61	MAR	-0.04	0.50	0.06
BIH	-0.29	0.26	0.46	MDA	-0.09	0.32	0.50
BOL	-0.03	0.33	0.81	MKD	-0.32	0.26	0.81
BRA	-0.03	0.59	0.06	MLI	-0.32	0.09	0.22
BWA	-0.16	0.09	0.06	MOZ	-0.03	0.59	0.63
CAF	-0.23	0.09	0.63	MRT	-0.06	0.54	0.81
CHL	-0.32	0.58	0.34	MUS	-0.11	0.59	0.69
CIV	-0.32	0.20	0.24	MWI	-0.03	0.09	0.36
CMR	-0.32	0.35	0.78	NAM	-0.32	0.09	0.20
COG	-0.32	0.27	0.10	NER	-0.30	0.16	0.23
COL	-0.06	0.54	0.50	NPL	-0.17	0.46	0.06
COM	-0.28	0.17	0.57	PAK	-0.04	0.24	0.72
CPV	-0.32	0.16	0.12	PAN	-0.21	0.49	0.07
DJI	-0.03	0.30	0.06	PHL	-0.05	0.40	0.71
DOM	-0.07	0.59	0.06	POL	-0.32	0.27	0.06
ECU	-0.03	0.59	0.29	ROU	-0.30	0.46	0.56
EGY	-0.18	0.34	0.81	RWA	-0.32	0.09	0.81
ETH	-0.12	0.55	0.64	SEN	-0.05	0.38	0.81
GAB	-0.07	0.59	0.29	SWZ	-0.11	0.43	0.06
GEO	-0.25	0.09	0.60	SYC	-0.27	0.59	0.06
GHA	-0.17	0.09	0.15	TGO	-0.08	0.43	0.81
GIN	-0.04	0.47	0.30	TJK	-0.25	0.59	0.06
GMB	-0.31	0.09	0.81	TUR	-0.17	0.59	0.06
GNB	-0.32	0.09	0.60	TZA	-0.17	0.59	0.47
GNQ	-0.23	0.20	0.06	UGA	-0.03	0.37	0.31
HRV	-0.32	0.09	0.55	YEM	-0.03	0.09	0.81
HTI	-0.03	0.22	0.81	ZAF	-0.03	0.59	0.19
IDN	-0.03	0.44	0.58	ZMB	-0.21	0.09	0.23
IND	-0.13	0.21	0.07	ZWE	-0.32	0.59	0.47

Investment elasticities

Country	ECM	ISTAR	Gap	Country	ECM	ISTAR	Gap	Country	ECM	ISTAR	Gap	Country	ECM	ISTAR	Gap
AFG	-0.28	0.41	1.31	DMA	-0.22	0.41	3.57	KHM	-0.28	0.00	1.31	PRY	-0.11	0.41	2.18
AGO	-0.28	0.41	2.55	DNK	-0.15	0.05	2.08	KOR	-0.02	0.19	2.29	PSE	-0.06	0.03	1.82
ALB	-0.09	0.00	2.09	DOM	-0.08	0.00	3.16	KWT	-0.05	0.00	1.42	QAT	-0.28	0.00	3.57
ARE	-0.28	0.00	1.90	DZA	-0.02	0.04	1.31	LAO	-0.02	0.04	1.73	ROU	-0.08	0.03	2.98
ARG	-0.05	0.14	3.28	ECU	-0.08	0.19	2.88	LBN	-0.13	0.05	3.19	RUS	-0.06	0.04	2.25
ARM	-0.13	0.24	1.46	EGY	-0.28	0.00	1.79	LBR	-0.02	0.24	1.92	RWA	-0.12	0.00	2.64
AUS	-0.05	0.34	3.57	ERI	-0.04	0.41	2.68	LKA	-0.24	0.06	2.46	SAU	-0.15	0.20	1.31
AUT	-0.14	0.00	1.49	ESP	-0.24	0.00	2.06	LSO	-0.28	0.12	3.12	SDN	-0.21	0.41	3.10
AZE	-0.24	0.34	1.31	EST	-0.02	0.16	2.83	LTU	-0.02	0.02	2.62	SEN	-0.28	0.00	1.31
BDI	-0.28	0.11	1.31	ETH	-0.02	0.00	1.81	LUX	-0.02	0.11	1.64	SGP	-0.02	0.41	1.57
BEL	-0.18	0.00	1.87	FIN	-0.17	0.00	1.55	LVA	-0.10	0.13	2.15	SLB	-0.28	0.09	2.46
BEN	-0.02	0.05	3.57	FRA	-0.10	0.13	2.42	MAR	-0.25	0.20	1.31	SLV	-0.23	0.09	3.57
BFA	-0.06	0.00	1.31	GAB	-0.28	0.10	3.57	MDA	-0.05	0.28	2.30	SRB	-0.07	0.14	3.18
BGD	-0.05	0.41	1.86	GBR	-0.10	0.01	3.00	MDG	-0.09	0.41	3.57	SVK	-0.02	0.17	2.52
BGR	-0.22	0.14	2.29	GEO	-0.25	0.41	3.57	MEX	-0.02	0.02	3.57	SVN	-0.17	0.00	2.04
BHS	-0.10	0.02	3.57	GHA	-0.28	0.41	1.79	MKD	-0.02	0.00	1.34	SWE	-0.02	0.18	2.26
BIH	-0.28	0.41	1.82	GIN	-0.22	0.41	3.57	MLI	-0.24	0.00	1.31	SWZ	-0.15	0.23	1.48
BLR	-0.02	0.34	2.48	GMB	-0.28	0.41	1.41	MMR	-0.28	0.00	3.57	SYC	-0.14	0.10	2.13
BLZ	-0.23	0.35	3.53	GNB	-0.18	0.00	1.31	MNE	-0.02	0.31	3.57	SYR	-0.02	0.00	1.31
BOL	-0.02	0.41	3.57	GNQ	-0.28	0.00	1.69	MNG	-0.28	0.06	3.28	TCD	-0.28	0.41	2.08
BRA	-0.02	0.10	1.92	GRC	-0.19	0.00	2.43	MOZ	-0.08	0.41	1.31	TGO	-0.08	0.41	2.66
BRB	-0.28	0.01	2.92	GTM	-0.21	0.00	1.31	MRT	-0.28	0.00	3.57	THA	-0.02	0.41	3.57
BRN	-0.24	0.05	2.53	HKG	-0.02	0.11	1.31	MUS	-0.07	0.00	1.31	TJK	-0.06	0.14	2.07
BTN	-0.12	0.41	1.31	HND	-0.02	0.15	3.57	MWI	-0.04	0.41	1.31	TLS	-0.06	0.19	3.57
BWA	-0.08	0.41	1.31	HRV	-0.12	0.02	2.61	MYS	-0.06	0.41	3.57	TUN	-0.02	0.41	2.75
CAF	-0.02	0.00	2.78	HUN	-0.11	0.01	1.53	NAM	-0.28	0.21	1.47	TUR	-0.02	0.06	2.95
CHE	-0.02	0.07	1.90	IDN	-0.08	0.17	2.54	NER	-0.28	0.41	2.01	TZA	-0.04	0.41	2.64
CHL	-0.15	0.00	3.30	IND	-0.15	0.41	2.61	NGA	-0.02	0.38	3.57	UGA	-0.19	0.37	2.53
CHN	-0.02	0.18	1.31	IRL	-0.12	0.41	1.31	NIC	-0.15	0.18	3.57	UKR	-0.02	0.11	3.09
CIV	-0.28	0.09	3.57	IRN	-0.02	0.24	1.90	NLD	-0.13	0.12	2.40	URY	-0.08	0.28	2.90
CMR	-0.05	0.09	2.76	IRQ	-0.02	0.00	1.31	NOR	-0.07	0.18	1.86	USA	-0.17	0.16	2.63
COD	-0.11	0.06	2.14	ISL	-0.22	0.41	3.57	NPL	-0.28	0.00	1.31	UZB	-0.04	0.00	3.57
COG	-0.28	0.41	1.31	ISR	-0.09	0.00	1.78	NZL	-0.14	0.18	3.15	VEN	-0.02	0.21	3.56
COL	-0.13	0.34	3.39	ITA	-0.12	0.00	1.90	PAK	-0.14	0.00	1.31	VNM	-0.14	0.41	2.81
COM	-0.20	0.41	1.31	JAM	-0.02	0.16	3.57	PAN	-0.28	0.00	3.57	VUT	-0.02	0.15	1.31
CPV	-0.14	0.00	1.31	JOR	-0.08	0.29	3.41	PER	-0.02	0.34	3.57	XKX	-0.09	0.00	1.75
CRI	-0.28	0.00	2.07	JPN	-0.03	0.14	1.33	PHL	-0.02	0.32	3.57	YEM	-0.28	0.13	3.57
CYP	-0.11	0.17	3.23	KAZ	-0.02	0.08	1.55	PNG	-0.28	0.41	1.31	ZAF	-0.08	0.21	1.31
CZE	-0.09	0.07	2.12	KEN	-0.28	0.32	1.36	POL	-0.09	0.26	3.57	ZMB	-0.20	0.00	1.31
DEU	-0.10	0.02	1.84	KGZ	-0.06	0.23	1.31	PRT	-0.03	0.07	3.18	ZWE	-0.02	0.15	3.57
DJI	-0.19	0.41	3.57												

Consumer price elasticities

Country	ECM	P_factor	P_imports	Gap	Persistence
AFG	-0.38	0.45	-0.01	0.00	-0.07
AGO	-0.33	0.64	-0.01	0.00	-0.07
ALB	-0.26	0.64	-0.01	0.15	0.02
ARE	-0.38	0.04	0.27	0.24	-0.07
ARG	-0.15	0.64	-0.01	0.00	-0.07
ARM	-0.35	0.43	0.22	0.04	0.01
AUS	-0.06	0.14	0.04	0.20	0.14
AUT	-0.04	0.64	0.23	0.02	0.07
AZE	-0.38	0.31	0.01	0.00	0.13
BDI	-0.38	0.01	0.10	0.02	0.10
BEL	-0.04	0.64	0.17	0.05	0.10
BEN	-0.25	0.18	0.27	0.19	0.02
BFA	-0.38	0.29	0.11	0.21	0.06
BGD	-0.04	0.53	0.05	0.24	0.19
BGR	-0.04	0.64	0.15	0.00	0.03
BHS	-0.04	0.41	-0.01	0.00	-0.07
BIH	-0.11	0.07	0.20	0.22	0.11
BLR	-0.12	0.64	0.12	0.00	0.03
BLZ	-0.38	0.01	0.24	0.24	-0.07
BOL	-0.26	0.63	0.11	0.24	0.00
BRA	-0.25	0.64	0.07	0.00	-0.03
BRB	-0.15	0.01	0.27	0.24	0.14
BRN	-0.04	0.01	0.21	0.24	-0.07
BTN	-0.21	0.01	0.27	0.00	-0.07
BWA	-0.19	0.01	-0.01	0.01	0.20
CAF	-0.09	0.47	0.12	0.00	0.10
CHE	-0.04	0.46	0.06	0.00	0.20
CHL	-0.04	0.01	0.18	0.00	0.20
CHN	-0.16	0.29	0.09	0.00	-0.03
CIV	-0.32	0.42	-0.01	0.00	0.11
CMR	-0.09	0.38	0.14	0.24	0.20
COD	-0.38	0.64	-0.01	0.00	0.01
COG	-0.32	0.01	0.11	0.24	-0.07
COL	-0.04	0.49	0.14	0.08	0.18
COM	-0.33	0.52	0.18	0.24	-0.06
CPV	-0.32	0.01	-0.01	0.24	-0.07
CRI	-0.13	0.35	0.27	0.00	0.07
CYP	-0.04	0.62	0.01	0.13	-0.05
CZE	-0.12	0.47	0.17	0.15	0.07
DEU	-0.07	0.55	0.19	0.05	0.10
DJI	-0.16	0.01	-0.01	0.24	-0.07

Country	ECM	P_factor	P_imports	Gap	Persistence
DMA	-0.04	0.64	0.27	0.00	0.13
DNK	-0.04	0.22	0.09	0.00	0.20
DOM	-0.16	0.01	0.27	0.21	0.20
DZA	-0.04	0.01	0.27	0.00	0.20
ECU	-0.17	0.64	-0.01	0.12	-0.07
EGY	-0.10	0.52	0.21	0.00	-0.07
ERI	-0.17	0.64	0.27	0.18	-0.07
ESP	-0.18	0.32	0.18	0.00	0.08
EST	-0.04	0.45	0.27	0.02	0.19
ETH	-0.27	0.64	0.10	0.21	0.04
FIN	-0.20	0.19	0.11	0.04	0.20
FRA	-0.38	0.30	0.11	0.00	0.06
GAB	-0.05	0.01	0.27	0.00	-0.07
GBR	-0.11	0.21	0.08	0.00	0.20
GEO	-0.38	0.29	-0.01	0.08	0.20
GHA	-0.38	0.22	-0.01	0.00	0.20
GIN	-0.36	0.25	0.23	0.00	0.06
GMB	-0.38	0.46	0.16	0.00	-0.07
GNB	-0.34	0.01	0.14	0.24	-0.05
GNQ	-0.38	0.01	-0.01	0.24	-0.07
GRC	-0.17	0.40	0.18	0.00	0.05
GTM	-0.38	0.43	0.05	0.00	0.02
HKG	-0.19	0.17	0.27	0.15	0.20
HND	-0.04	0.21	0.27	0.13	0.12
HRV	-0.13	0.37	0.20	0.00	0.20
HUN	-0.17	0.39	0.21	0.03	0.13
IDN	-0.38	0.45	-0.01	0.24	0.20
IND	-0.07	0.45	-0.01	0.00	0.20
IRL	-0.38	0.01	0.03	0.00	0.20
IRN	-0.04	0.30	0.13	0.22	0.20
IRQ	-0.04	0.64	0.23	0.00	0.00
ISL	-0.10	0.16	0.18	0.19	0.09
ISR	-0.36	0.55	0.02	0.06	0.12
ITA	-0.29	0.26	0.09	0.00	0.14
JAM	-0.38	0.24	0.18	0.00	0.00
JOR	-0.36	0.01	0.27	0.00	-0.06
JPN	-0.35	0.07	0.02	0.02	0.07
KAZ	-0.09	0.64	-0.01	0.00	0.03
KEN	-0.20	0.64	0.00	0.06	-0.07
KGZ	-0.38	0.30	0.17	0.00	0.02
KHM	-0.38	0.01	-0.01	0.00	-0.07

Country	ECM	P_factor	P_imports	Gap	Persistence
KOR	-0.37	0.18	-0.01	0.12	-0.07
KWT	-0.12	0.01	0.27	0.00	0.05
LAO	-0.38	0.40	0.05	0.24	0.13
LBN	-0.26	0.64	0.14	0.00	-0.03
LBR	-0.13	0.64	0.27	0.17	-0.04
LKA	-0.15	0.52	0.27	0.00	-0.07
LSO	-0.07	0.01	-0.01	0.00	-0.07
LTU	-0.14	0.19	0.10	0.12	0.20
LUX	-0.04	0.08	0.16	0.11	0.03
LVA	-0.38	0.17	0.06	0.00	0.01
MAR	-0.08	0.44	0.12	0.24	0.02
MDA	-0.04	0.01	0.27	0.00	0.20
MDG	-0.25	0.24	0.23	0.24	0.20
MEX	-0.14	0.31	0.16	0.00	0.20
MKD	-0.30	0.64	-0.01	0.00	-0.05
MLI	-0.38	0.11	0.23	0.24	0.05
MMR	-0.35	0.09	-0.01	0.24	0.17
MNE	-0.11	0.01	0.18	0.00	0.20
MNG	-0.16	0.56	0.20	0.24	-0.02
MOZ	-0.29	0.59	0.13	0.00	0.03
MRT	-0.13	0.01	-0.01	0.14	-0.07
MUS	-0.06	0.42	0.16	0.24	0.11
MWI	-0.33	0.57	-0.01	0.00	-0.07
MYS	-0.04	0.37	-0.01	0.00	0.20
NAM	-0.04	0.32	0.27	0.00	0.16
NER	-0.35	0.22	-0.01	0.08	0.19
NGA	-0.16	0.58	0.16	0.24	-0.07
NIC	-0.04	0.56	0.27	0.11	0.03
NLD	-0.12	0.49	0.10	0.00	0.20
NOR	-0.04	0.01	0.07	0.08	0.08
NPL	-0.38	0.63	-0.01	0.00	-0.07
NZL	-0.15	0.01	0.07	0.24	0.20
PAK	-0.05	0.64	0.07	0.22	-0.06
PAN	-0.38	0.01	0.18	0.00	0.20
PER	-0.04	0.44	0.27	0.24	0.10
PHL	-0.04	0.39	0.01	0.00	0.20
PNG	-0.04	0.64	0.27	0.24	0.03
POL	-0.38	0.45	0.06	0.00	0.01
PRT	-0.25	0.01	0.16	0.00	0.20
PRY	-0.38	0.01	0.16	0.24	-0.07

Country	ECM	P_factor	P_imports	Gap	Persistence
PSE	-0.18	0.64	0.27	0.00	-0.07
QAT	-0.12	0.20	0.09	0.24	0.08
ROU	-0.21	0.64	0.08	0.00	0.06
RUS	-0.04	0.51	0.27	0.00	0.01
RWA	-0.26	0.64	0.12	0.11	0.03
SAU	-0.05	0.01	0.00	0.00	0.20
SDN	-0.04	0.64	0.17	0.23	0.06
SEN	-0.14	0.56	0.15	0.00	0.03
SGP	-0.06	0.09	0.11	0.00	0.20
SLB	-0.38	0.64	-0.01	0.24	-0.07
SLV	-0.36	0.08	0.15	0.18	0.20
SRB	-0.11	0.53	0.27	0.05	-0.03
SVK	-0.04	0.64	0.11	0.24	-0.02
SVN	-0.04	0.64	0.02	0.11	-0.01
SWE	-0.28	0.40	0.27	0.00	0.02
SWZ	-0.18	0.16	0.20	0.00	0.19
SYC	-0.04	0.01	0.10	0.19	0.18
SYR	-0.09	0.54	0.16	0.09	0.06
TCD	-0.17	0.20	-0.01	0.00	-0.07
TGO	-0.04	0.40	0.27	0.24	-0.07
THA	-0.17	0.31	0.27	0.16	0.02
TJK	-0.38	0.09	0.02	0.05	-0.01
TLS	-0.38	0.42	-0.01	0.15	0.17
TUN	-0.38	0.01	0.21	0.00	-0.01
TUR	-0.10	0.64	0.00	0.00	0.18
TZA	-0.13	0.64	-0.01	0.06	-0.04
UGA	-0.09	0.57	0.14	0.00	0.20
UKR	-0.38	0.56	0.08	0.00	0.04
URY	-0.13	0.01	0.27	0.00	0.20
USA	-0.04	0.64	0.13	0.18	-0.07
UZB	-0.04	0.36	0.12	0.00	0.20
VEN	-0.38	0.25	0.04	0.24	0.07
VNM	-0.07	0.46	0.27	0.24	0.12
VUT	-0.14	0.64	-0.01	0.00	-0.04
XKX	-0.29	0.01	0.27	0.24	-0.03
YEM	-0.38	0.12	0.15	0.19	0.07
ZAF	-0.04	0.01	0.27	0.00	0.00
ZMB	-0.04	0.64	0.00	0.06	0.17
ZWE	-0.38	0.48	-0.01	0.16	0.04
ZWE	-0.14	0.64	0.27	0.14	-0.07

Producer price elasticities

Country	ECM	MC	Gap	Country	ECM	MC	Gap
ALB	-0.36	0.15	0.28	KOR	-0.37	0.01	0.32
ARE	-0.13	0.54	0.11	KWT	-0.17	0.26	-0.01
ARG	-0.26	0.50	0.04	LAO	-0.13	0.57	0.22
ARM	-0.37	0.44	0.01	LBN	-0.22	0.06	0.19
AUT	-0.13	0.01	0.36	LKA	-0.17	0.27	0.34
AZE	-0.36	0.57	0.07	LSO	-0.13	0.20	0.24
BEL	-0.14	0.09	0.20	LTU	-0.18	0.12	0.18
BEN	-0.25	0.57	0.02	LUX	-0.15	0.09	-0.01
BGR	-0.17	0.57	0.00	LVA	-0.37	0.50	0.04
BHS	-0.13	0.57	0.04	MAR	-0.29	0.01	0.04
BIH	-0.36	0.44	0.31	MEX	-0.37	0.33	-0.01
BLZ	-0.36	0.07	0.11	MKD	-0.37	0.41	0.02
BRA	-0.37	0.49	-0.01	MLI	-0.37	0.45	0.19
BRB	-0.37	0.01	-0.01	MNE	-0.13	0.47	0.05
CHE	-0.26	0.01	0.24	MOZ	-0.17	0.31	0.29
CHL	-0.33	0.12	-0.01	MRT	-0.13	0.45	-0.01
CHN	-0.17	0.42	0.12	MUS	-0.13	0.31	0.30
CMR	-0.37	0.33	0.29	MYS	-0.28	0.03	-0.01
COD	-0.13	0.57	-0.01	NAM	-0.25	0.20	0.10
COG	-0.37	0.16	-0.01	NER	-0.31	0.01	0.14
COL	-0.17	0.49	-0.01	NIC	-0.17	0.38	0.17
CRI	-0.29	0.18	0.14	NLD	-0.31	0.01	0.36
CYP	-0.13	0.01	0.36	NOR	-0.13	0.57	0.04
CZE	-0.16	0.01	0.36	NPL	-0.23	0.43	0.10
DEU	-0.16	0.01	0.36	NZL	-0.13	0.23	0.01
DJI	-0.13	0.01	-0.01	PAK	-0.13	0.57	0.07
DNK	-0.21	0.11	0.29	PAN	-0.14	0.09	0.36
DOM	-0.13	0.57	-0.01	PER	-0.37	0.42	-0.01
DZA	-0.37	0.57	0.08	PHL	-0.30	0.01	0.05
ECU	-0.32	0.47	0.06	POL	-0.22	0.33	0.35
ESP	-0.25	0.28	0.36	PRT	-0.26	0.10	0.36
ETH	-0.22	0.50	0.06	QAT	-0.15	0.25	0.15
FIN	-0.13	0.01	-0.01	ROU	-0.24	0.57	0.05
FRA	-0.18	0.01	0.36	RUS	-0.31	0.57	0.01
GBR	-0.29	0.01	0.18	RWA	-0.13	0.25	0.17
GEO	-0.37	0.40	0.06	SAU	-0.37	0.21	-0.01
GHA	-0.13	0.57	0.06	SDN	-0.30	0.57	0.06
GMB	-0.37	0.13	-0.01	SLV	-0.13	0.15	0.36
GNB	-0.37	0.01	-0.01	SRB	-0.24	0.57	-0.01
GRC	-0.13	0.09	0.36	SVK	-0.15	0.09	0.36
GTM	-0.37	0.17	0.17	SVN	-0.37	0.11	0.27
HRV	-0.13	0.01	0.36	SWE	-0.13	0.01	0.25
HUN	-0.20	0.33	0.36	SWZ	-0.14	0.57	-0.01
IDN	-0.13	0.57	0.15	SYR	-0.35	0.02	0.36
IND	-0.23	0.01	0.36	TCD	-0.33	0.27	0.03
IRL	-0.13	0.13	0.36	TUN	-0.22	0.21	-0.01
IRN	-0.32	0.11	0.36	TUR	-0.37	0.08	0.35
IRQ	-0.14	0.07	0.27	UKR	-0.37	0.35	0.14
ISL	-0.14	0.57	0.36	URY	-0.18	0.37	0.19
ISR	-0.13	0.14	0.36	USA	-0.13	0.14	0.36
ITA	-0.22	0.01	0.36	UZB	-0.26	0.57	-0.01
JAM	-0.37	0.01	-0.01	VEN	-0.19	0.57	0.07
JPN	-0.20	0.01	0.36	VNM	-0.13	0.57	0.03
KAZ	-0.32	0.57	0.07	ZAF	-0.34	0.01	0.30
KEN	-0.13	0.57	0.01	ZMB	-0.37	0.14	-0.01
KGZ	-0.37	0.31	0.16				