

This chapter investigates the long-run relationship between the real effective exchange rate and a set of fundamentals. The estimation relies on an unbalanced panel of annual data covering 1980–2006. Panel unit root tests show the unit root nature of the variables involved in the estimation, apart from the natural shocks (Table 4.1). Panel cointegration tests have been performed for the benchmark regressions of interest (columns 3 in Tables 4.2 and 4.3) and reject the null of no cointegration.<sup>2</sup> Under the assumption of I(1) cointegrated variables, dynamic ordinary least squares (DOLS) with fixed effects regression provides—from the coefficients of the variables in levels—an estimate of the long-run cointegrating relationship between the real exchange rate and the set of fundamentals. As part of the DOLS specification, in addition to the variables in levels, the analysis introduces changes in right-hand-side variables and—given the short length of the sample—one lead and one lag of these changes.<sup>3</sup>

### Benchmark Real Effective Exchange Rate Regressions for Low-Income Countries

Tables 4.2 and 4.3 report the preferred specifications for low-income countries with two different measures of the real effective exchange rate.<sup>4</sup> The first is consumer price index–based, as offered by

the IMF’s Information Notice System (INS). The second is constructed from the average domestic price level relative to the United States as reported in the Penn World Table, then turned into a real effective exchange rate by applying the same trading partner weights employed in the calculation of the IMF-INS real effective exchange rate. Results are virtually identical, with a few exceptions discussed below. The regression specifications include traditional variables such as net foreign assets, productivity, government consumption, terms of trade, and trade restrictions, but also LIC-specific variables such as aid flows and capital account liberalization. Moreover, demographics and price controls, which have also been shown to matter in other samples (Rose, Saktiandi, and Braude, 2009; and Ricci, Milesi-Ferretti, and Lee, 2008), are likely to be relevant for LICs. The first column of Tables 4.2 and 4.3 includes a dummy for natural disaster as defined in Chapter 3, given that LICs are widely affected by such natural occurrences. The results hint at a negative effect of these shocks on the real exchange rate. However, given that the econometric nature of these (0,1) indicators is uncertain (the panel unit root test rejects the unit root hypothesis; see Table 4.1), column (2) (and subsequent regressions) excludes this indicator. These temporary shocks should be expected to have only temporary effects and no long-run impact on the real exchange rate.

Column (3) drops insignificant variables and derives a benchmark regression. Consistent with the previous literature, government consumption is associated with an appreciation in the real exchange rate, which is usually the case under the presumption that government spending goes toward nontradables (as opposed to tradables) in a higher proportion than does private spending. An improvement in the terms of trade causes the real exchange rate to appreciate with effects similar to

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<sup>2</sup>Panel unit root tests are based on Pesaran (2007) to control for cross-sectional dependence. The authors are grateful to Peter Pedroni for running the panel unit root tests using his programs developed in the Regression Analysis of Time Series. Panel cointegration tests are based on group mean augmented Dickey-Fuller panel cointegration tests (Pedroni, 1999, 2004).

<sup>3</sup>See Chapters 1 and 2 for a discussion of the literature and of the data set. The data set is presented in detail in the Appendix.

<sup>4</sup>The benchmark regressions are virtually unchanged if time dummies are included to account for possible common movements in the real effective exchange rate of LICs associated

with, for example, an exchange rate adjustment in advanced economies.

**Table 4.1. Panel Unit Root Test Statistic**

Variables	Statistic <sup>1</sup>	
	Sample A <sup>2</sup>	Sample B <sup>2</sup>
Log of REER (INS)	-1.59	-1.57
Log of REER (PWT)	-1.82	-1.97
Net foreign assets to GDP	-2.02	-2.06
Net foreign assets to trade	-1.58	-1.39
Net foreign assets (w/NPV debt) to GDP	-2.06	-2.03
Net foreign assets (w/NPV debt) to trade	-1.83	-1.53
Relative productivity (log) <sup>3</sup>	-1.53	-1.22
Terms of trade, goods (log)	-1.45	-1.36
Government consumption to GDP <sup>3</sup>	-1.99	-2.12 <sup>4</sup>
Trade restrictions <sup>3</sup>	-2.04	-1.75
Administered agricultural prices <sup>3</sup>	-0.79	-1.12
Maximum agricultural price intervention <sup>3</sup>	-1.26	-0.96
Aid flows to GDP <sup>3</sup>	-2.19 <sup>4</sup>	-2.07
Fertility <sup>3</sup>	-0.54	-0.57
Capital account liberalization <sup>3</sup>	-1.95	-1.85
Domestic financial liberalization <sup>3</sup>	-1.50	-1.50
Natural disaster	-3.66 <sup>4</sup>	-3.52 <sup>4</sup>
Constraint on executive	-0.85	-0.80
Public debt to GDP	-1.52	-1.53
Public debt to trade	-1.82	-1.87
NPV of external debt to trade	...	-1.63

Note: REER = real effective exchange rate; NPV = net present value; PWT = Penn World Table; INS = IMF's Information Notice System.

<sup>1</sup>Test based on Pesaran (2007).

<sup>2</sup>Samples A and B refer to restricting the sample to having at least 14 or 20 observations per country, respectively.

<sup>3</sup>The variable is constructed relative to the weighted average of the trading partners.

<sup>4</sup>Reject null hypothesis of unit root at 5 percent one-sided.

those found in other samples of countries (Ricci, Milesi-Ferretti, and Lee, 2008). Fertility is associated with an appreciation of the real exchange rate, as in Rose, Saktiandi, and Braude (2009). The net foreign assets position is not significant because possible expectations of debt relief may blur the intertemporal role of this variable in this sample of LICs. Overall productivity is not significant with respect to the IMF-INS real exchange rate and is negative with respect to the Penn World Table.<sup>5</sup>

<sup>5</sup>Note that for data set consistency, the productivity indicator is based on GDP per worker from the Penn World Table data set.

One possible explanation is that, in LICs, measures of overall productivity reflect tradable and nontradable sectors' productivities equally, and occasionally may even reflect productivity in nontradables more closely than in tradables.<sup>6</sup>

Turning to variables specific to LICs, aid inflows are associated in the long run with a more depreciated exchange rate, potentially indicating a positive effect on productivity in the nontradable sector relative to the tradable sector. Aid is generally thought to increase domestic prices (especially of nontradables), thus leading to appreciation of the real exchange rate (Dutch disease) in the short run, that is, when the supply side of the economy has not had a chance to adjust. In the long run, however, an increase in aid would be consistent with depreciation of the real exchange rate if aid raises productivity of nontradables relative to the productivity of tradables (Torvik, 2001).<sup>7</sup> Given that the regressions control for government consumption, the estimated effect of aid should operate through government investment or private expenditure financed by aid; this also implies that the overall effect of aid, including through the government consumption channel, would be smaller in absolute value or may even be positive.

Capital account liberalization is associated with an appreciation of the real exchange rate, sug-

<sup>6</sup>The opposite assumption stands behind the standard presumption for using aggregate productivity as a proxy for the Balassa-Samuelson effect. Unfortunately, it was not possible to construct a better proxy for the Balassa-Samuelson effect despite extensive efforts. For this reason, in Table 4.3, the proxy was dropped in column (3) even though significant.

<sup>7</sup>An alternative explanation for the negative coefficient is the presence of endogeneity. In particular, countries that are simultaneously experiencing depreciating exchange rates and economic difficulties may also be aid receivers. However, such an interpretation would not be consistent with the long-run nature of the estimated cointegration relationship (unless changes in the real exchange rate can have long-term effects on donor countries' aid policies). Moreover, when replacing the aid measure with the ratio of aggregate aid to aggregate GDP in LICs (which is positively related to countries' aid ratios, but is not related to country-specific exchange rate fluctuations) the coefficient remains negative and significant. The analysis also considered the short-run effect of aid, via the coefficients of change in the aid measure in an error correction specification (which will be discussed below), but these are insignificant when either one, two, three, or four lags of the changes are entered.

gesting that, in the long run, such liberalization promotes persistent net capital inflows. Price distortions are also somewhat significant. In particular, the presence of marketing boards (as captured by the indicator “maximum agricultural price intervention”) is likely to keep prices high and thus lead the real exchange rate to appreciate.

The last column of Tables 4.2 and 4.3 includes the black market premium, which, unfortunately, halves the sample size. Because real exchange rates are normally measured at official rates, the positive and significant coefficient is consistent with the standard interpretation that the presence of a black market premium usually signals an overvalued official exchange rate. Generally, in these circumstances, most public transactions occur at the official rate, while private transactions tend to occur at the black market rate, so the actual average exchange rate is likely to lie between the official and the black market rates. This would correspond to a coefficient between zero and one, which is what the analysis finds. However, the sample size decreases substantially, which limits the usefulness of the regressions. Measuring the exchange rate correctly is an important issue, deserving wide attention in real exchange rate analysis—especially when focusing on LICs that have traditionally been more prone to dual exchange rate systems and problems of measurements of price levels—and requiring additional efforts in data collection.

### Are Low-Income Countries Different?

Low-income countries differ from high-income countries (HICs) mainly because of the specific factors controlled for in the regressions (distortions, financing, and shocks). Traditional factors do not show great difference when these specific factors are controlled for. However, neglecting the presence of the specific factors would lead to misspecifications, and even coefficients on traditional factors would appear different. Columns (1) and (2) of Table 4.4 present a specification typically used for HICs (Ricci, Milesi-Ferretti, and Lee, 2008), but estimated with separate coefficients for LICs and HICs. All coefficients appear to be significantly different (see Table 4.5, column 1). Column (3) in

**Table 4.2. Real Effective Exchange Rate (IMF Information Notice System Definition) Regressions**

(Panel dynamic ordinary least squares with fixed effects; only long-run coefficients reported)

Variables	(1)	(2)	(3)	(4)
Net foreign assets (w/NPV debt) to trade	-0.0168 (0.2661)	-0.0175 (0.2511)		
Relative productivity (log) <sup>1</sup>	-0.1019 (0.3613)	-0.0770 (0.4869)		
Terms of trade, goods (log)	0.3458*** (0.0000)	0.3455*** (0.0000)	0.3931*** (0.0000)	0.4353*** (0.0000)
Government consumption to GDP <sup>1</sup>	1.2667* (0.0622)	1.1259* (0.0910)	2.0271*** (0.0002)	1.9688*** (0.0074)
Aid flows to GDP <sup>1</sup>	-2.2405*** (0.0000)	-2.1679*** (0.0000)	-1.6187*** (0.0000)	-1.3812*** (0.0016)
Capital account liberalization <sup>1</sup>	0.3152*** (0.0025)	0.2916*** (0.0056)	0.2978*** (0.0011)	0.4910*** (0.0000)
Trade restrictions <sup>1</sup>	0.0975 (0.2836)	0.1003 (0.2630)		
Administered agricultural prices <sup>1</sup>	-0.0004 (0.9954)	-0.0223 (0.7174)		
Maximum agricultural price intervention <sup>1</sup>	0.0596 (0.2059)	0.0691 (0.1368)	0.0596 (0.1660)	0.0129 (0.8473)
Fertility <sup>1</sup>	0.1239*** (0.0000)	0.1221*** (0.0000)	0.0979*** (0.0000)	0.1512*** (0.0000)
Natural disaster	-0.0951* (0.0559)			
Black market premium (percent)				0.2547*** (0.0015)
Observations	522	522	609	338
R-squared	0.71	0.70	0.65	0.78

Note: NPV = net present value. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Robust  $p$ -values in parentheses. Robust dynamic ordinary least squares panel regressions with fixed effects of the real effective exchange rate (IMF, Information Notice System source) on net foreign assets (with NPV of external debt) to trade ratio, log of relative productivity, terms of trade for goods, government consumption to GDP, aid to GDP (or its components: concessional loans and grants), capital account liberalization, trade restrictions, agricultural price reforms, fertility, natural disaster, and black market premium. Unbalanced panel with annual data 1980–2006.

<sup>1</sup>The variable is constructed relative to the weighted average of the trading partners.

Table 4.4 shows a regression equivalent to the one in column (2) of Table 4.2—the benchmark before dropping variables that have been found relevant for a broader sample of advanced economies—but again with different slopes for LICs and HICs.

**Table 4.3. Real Effective Exchange Rate (Penn World Table) Regressions***(Panel dynamic ordinary least squares with fixed effects; only long-run coefficients reported)*

Variables	(1)	(2)	(3)	(4)
Net foreign assets (w/NPV debt) to trade	0.0094 (0.4610)	0.0087 (0.5053)		
GDP per worker PWT (log)	-0.4418*** (0.0006)	-0.4266*** (0.0010)		
Terms of trade, goods (log)	0.1634** (0.0281)	0.1600** (0.0326)	0.1970*** (0.0077)	0.2040** (0.0318)
Government consumption to GDP <sup>1</sup>	2.0186** (0.0350)	1.8770* (0.0507)	3.3371*** (0.0000)	5.3549*** (0.0000)
Aid flows to GDP <sup>1</sup>	-3.2405*** (0.0000)	-3.1855*** (0.0000)	-2.0504*** (0.0000)	-1.3181*** (0.0049)
Capital account liberalization <sup>1</sup>	0.1746** (0.0418)	0.1520* (0.0850)	0.1984** (0.0233)	0.3048** (0.0265)
Trade restrictions <sup>1</sup>	-0.0434 (0.6543)	-0.0258 (0.7934)		
Administered agricultural prices <sup>1</sup>	-0.0299 (0.6735)	-0.0650 (0.3607)		
Maximum agricultural price intervention <sup>1</sup>	0.0343 (0.4661)	0.0530 (0.2462)	0.1842*** (0.0002)	0.0574 (0.4864)
Fertility <sup>1</sup>	0.1464*** (0.0001)	0.1484*** (0.0001)	0.1247*** (0.0001)	0.1072*** (0.0060)
Natural disaster	-0.1549*** (0.0057)			
Black market premium (percent)				0.4344*** (0.0000)
Observations	522	522	622	364
R-squared	0.75	0.74	0.69	0.81

Note: NPV = net present value; PWT = Penn World Table. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Robust  $p$ -values in parentheses. Robust dynamic ordinary least squares panel regressions with fixed effects of the real effective exchange rate (PWT source) on net foreign assets (with NPV of external debt) to trade ratio, log of relative productivity, terms of trade for goods, government consumption to GDP, aid to GDP (or its components: concessional loans and grants), capital account liberalization, trade restrictions, agricultural price reforms, fertility, natural disaster, and black market premium. Unbalanced panel with annual data 1980–2006.

<sup>1</sup>The variable is constructed relative to the weighted average of the trading partners.

Because this regression encompasses indicators that are relevant for both sets of countries, it may be the best for assessing the different roles of these indicators across samples of countries. The difference in the coefficients of the traditional variables

is now insignificant in most indicators (Table 4.5, column 2). Net foreign assets appear to play a different role in the two sets of countries, which is not surprising given that an expectation of possible debt relief may reduce the relevance of this variable in LICs. However, the key LIC factors (apart from fertility) seem to play different roles in the two samples, which is again not surprising given that these indicators are likely to be less relevant in HICs. Column (3) of Table 4.4 shows the income split for a regression equivalent to the baseline in Table 4.2, column (3) (i.e., dropping variables not relevant for LICs), and Table 4.5, column (3), presents the corresponding test of equality of coefficients; results are now somewhat different, but it may be because the regression is tailored to LICs and is misspecified for the other group.

## Robustness

The benchmark model for LICs is generally robust to alternative specifications. Tables 4.6 and 4.7 repeat in column (1) the benchmark derived in column (3) of Tables 4.2 and 4.3 and then explore the robustness of alternative indicators. In particular, columns (2) and (3) allow for the terms of trade (respectively, in goods only or goods and services) to be split into the two components (price of exports and price of imports), and show that the effect is mainly due to the price of exports. This is expected, and is consistent with the robustness results for the current account regressions (Table 3.3): an improvement in the terms of trade from a decline in import prices may generate not only a positive income effect (increasing demand for domestic goods), but also an additional substitution effect away from domestic goods, thus with offsetting effects on the real exchange rate.<sup>8</sup> Results for the other variables are consistent with the previous regressions.

<sup>8</sup>See Christiansen, Kolovich and Tokarick (2008) for a broad theoretical and empirical analysis of the effect of the components of the terms of trade.

**Table 4.4. Real Effective Exchange Rate (IMF Information Notice System Definition) Regressions with Different Slopes for Low-Income and High-Income/Emerging Market Countries***(Panel dynamic ordinary least squares with fixed effects; only long-run coefficients reported)*

Variables	(1)		(2)		(3)	
	HIC/EM	LIC	HIC/EM	LIC	HIC/EM	LIC
Net foreign assets (w/NPV debt) to trade	0.0276*** (0.0020)	0.0074 (0.6476)	0.0847*** (0.0000)	-0.0165 (0.2699)		
Relative productivity (log) <sup>1</sup>	-0.1346** (0.0350)	0.2087*** (0.0028)	-0.1235 (0.1336)	-0.1157 (0.2598)		
Terms of trade, goods (log)	0.1023 (0.1466)	0.3811*** (0.0000)	0.1745** (0.0262)	0.3325*** (0.0000)	0.1564** (0.0331)	0.3938*** (0.0000)
Government consumption to GDP <sup>1</sup>	1.3367*** (0.0015)	0.1634 (0.7362)	1.5695*** (0.0017)	1.2225** (0.0489)	1.7819*** (0.0004)	2.0246*** (0.0002)
Trade restrictions <sup>1</sup>	0.3179*** (0.0004)	0.0474 (0.5393)	0.2767*** (0.0048)	0.0833 (0.2646)		
Administered prices	-0.1070*** (0.0000)					
Administered agricultural prices <sup>1</sup>			-0.2448*** (0.0011)	0.0283 (0.5365)		
Maximum agricultural price intervention <sup>1</sup>			-0.1081 (0.1006)	0.0789* (0.0558)	-0.0417 (0.5501)	0.0591 (0.1187)
Aid to GDP <sup>1</sup>			3.3650** (0.0373)	-2.4081*** (0.0000)	0.7691 (0.5668)	-1.6192*** (0.0000)
Fertility <sup>1</sup>			0.1054** (0.0392)	0.1213*** (0.0000)	0.1939*** (0.0000)	0.0970*** (0.0000)
Capital account liberalization <sup>1</sup>			0.0283 (0.7224)	0.2823*** (0.0046)	0.3209*** (0.0001)	0.2999*** (0.0008)
Observations	1,916		1,361		1,471	
R-squared	0.53		0.72		0.66	

Note: NPV = net present value. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Robust  $p$ -values in parentheses. Robust dynamic ordinary least squares panel regressions with fixed effects of the real effective exchange rate (IMF Information Notice System source) on same determinants as Tables 4.2 and 4.3. Independent variables are interacted with dummy variables for low-income countries (LICs) and high-income countries (HICs) and emerging markets (EM). First two columns present standard determinants only. Second two columns encompass determinants in column (2) of Tables 4.2 and 4.3. Last two columns present determinants in column (3) of Tables 4.2 and 4.3. Unbalanced panel with annual data, 1980–2006.

<sup>1</sup>The variable is constructed relative to the weighted average of the trading partners.

### Speed of Adjustment

To assess the speed at which the real exchange rate adjusts toward its long-run cointegrating relationship, the analysis imposes the estimated cointegrating relationship in an error-correction specification. The error-correction term is constructed by using the difference of the real exchange rate from the sum of the products of the fundamentals entering the baseline regression in Table 4.2, column (3), multiplied by the corresponding level coefficients. The analysis then runs changes of the real exchange rate on the lag of the error-correction term as well as on lagged

**Table 4.5. F-Tests of Equality ( $p$ -values) of Coefficients of Regressions in Table 4.4**

Variables	(1)	(2)	(3)
Net foreign assets (w/NPV debt) to trade	0.2710	0.0000	
Relative productivity (log) <sup>1</sup>	0.0003	0.9525	
Terms of trade, goods (log)	0.0020	0.1165	0.0175
Government consumption to GDP <sup>1</sup>	0.0678	0.6628	0.7432
Trade restrictions <sup>1</sup>	0.0221	0.1168	
Administered agricultural prices <sup>1</sup>		0.0019	
Maximum agricultural price intervention <sup>1</sup>		0.0161	0.2043
Aid to GDP <sup>1</sup>		0.0006	0.0818
Fertility <sup>1</sup>		0.7801	0.0308
Capital account liberalization <sup>1</sup>		0.0465	0.8620

Note:  $p$ -values for the null hypotheses: coefficient HIC = coefficient LIC. NPV = net present value.

<sup>1</sup>The variable is constructed relative to the weighted average of the trading partners.

**Table 4.6. Real Effective Exchange Rate (IMF Information Notice System Definition) Regressions, Robustness***(Panel dynamic ordinary least squares with fixed effects; only long-run coefficients reported)*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Terms of trade, goods (log)	0.3931*** (0.0000)			0.2578*** (0.0000)	0.4281*** (0.0000)	0.3766*** (0.0000)	0.3930*** (0.0000)	0.3871*** (0.0000)
Government consumption to GDP <sup>1</sup>	2.0271*** (0.0002)	1.8930*** (0.0003)	1.6995** (0.0167)	1.2982* (0.0871)	2.6090*** (0.0000)	1.7860*** (0.0009)	2.3317*** (0.0000)	2.0402*** (0.0004)
Aid flows to GDP <sup>1</sup>	-1.6187*** (0.0000)	-1.4091*** (0.0000)	-1.5832*** (0.0000)	-4.6194*** (0.0000)	-1.8067*** (0.0000)	-1.4648*** (0.0000)	-1.9358*** (0.0000)	-1.6471*** (0.0000)
Capital account liberalization <sup>1</sup>	0.2978*** (0.0011)	0.2890*** (0.0011)	0.2594** (0.0103)		0.3374*** (0.0001)	0.2611*** (0.0022)	0.2511*** (0.0057)	0.2816*** (0.0025)
Maximum agricultural price intervention <sup>1</sup>	0.0596 (0.1660)	0.0657 (0.1223)	0.1616*** (0.0002)	0.0886** (0.0238)	0.0501 (0.2247)	-0.0295 (0.4794)	0.0058 (0.8933)	0.0528 (0.2153)
Fertility <sup>1</sup>	0.0979*** (0.0000)	0.0821*** (0.0005)	0.1100*** (0.0003)	0.1490*** (0.0000)			0.1156*** (0.0000)	0.1013*** (0.0000)
Price of exports, goods		0.3698*** (0.0000)						
Price of imports, goods		-0.3754*** (0.0000)						
Price of exports, goods and services			0.1554* (0.0921)					
Price of imports, goods and services			-0.0751 (0.3470)					
Capital account liberalization (other) <sup>1</sup>				0.0668 (0.3459)				
Infant mortality rate (UN) <sup>1</sup>					0.0052*** (0.0001)			
Old-age dependency <sup>1</sup>						5.2828*** (0.0000)		
GDP per worker, PWT (log)							-0.2360** (0.0255)	
Relative productivity (log) <sup>1</sup>								-0.0363 (0.6816)
Observations	609	609	609	561	609	609	555	609
R-squared	0.65	0.66	0.61	0.64	0.64	0.68	0.68	0.66

Note: PWT = Penn World Table. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Robust  $p$ -values in parentheses. Robust dynamic ordinary least squares panel regressions with fixed effects of the real effective exchange rate (IMF Information Notice System source) on same determinants as in the benchmark derived in column (3) of Table 4.2. Additional controls encompass splitting terms of trade in price of exports and of imports (either of goods only or of goods and services), and alternative measures of capital account liberalization, of demographics, and of productivity. Unbalanced panel with annual data, 1980–2006.

<sup>1</sup>The variable is constructed relative to the weighted average of the trading partners.

changes of the real exchange rate and of the other right-hand-side variables entering the baseline. In the four specifications derived by progressively entering from one up to four lags, the robust OLS coefficient of the lagged error-correction term hovered around 0.2, suggesting that a shock to the gap would have a half-life of about three

years. The analysis replicated the exercise with the alternative measure of the real exchange rate (using Table 4.3, column 3) and obtained a somewhat higher speed of adjustment, on the order of 0.3, indicative of a half-life of about two years. These results are consistent with the previous literature (Rogoff, 1996).

**Table 4.7. Real Effective Exchange Rate (Penn World Table) Regressions, Robustness***(Panel dynamic ordinary least squares with fixed effects; only long-run coefficients reported)*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Terms of trade, goods (log)	0.1970*** (0.0077)			0.1098 (0.1327)	0.3453*** (0.0000)	0.2593*** (0.0000)	0.1892*** (0.0092)	0.2023*** (0.0045)
Government consumption to GDP <sup>1</sup>	3.3371*** (0.0000)	3.0899*** (0.0000)	2.8125*** (0.0002)	2.1511** (0.0230)	4.0085*** (0.0000)	2.8295*** (0.0001)	3.4689*** (0.0000)	4.0020*** (0.0000)
Aid flows to GDP <sup>1</sup>	-2.0504*** (0.0000)	-1.5720*** (0.0002)	-1.5319*** (0.0006)	-3.9983*** (0.0000)	-2.4248*** (0.0000)	-1.6520*** (0.0001)	-2.1860*** (0.0000)	-2.6034*** (0.0000)
Capital account liberalization <sup>1</sup>	0.1984** (0.0233)	0.1995** (0.0166)	0.2124** (0.0167)		0.3337*** (0.0002)	0.1672** (0.0314)	0.1747* (0.0575)	0.1140 (0.1836)
Maximum agricultural price intervention <sup>1</sup>	0.1842*** (0.0002)	0.2037*** (0.0000)	0.1958*** (0.0000)	0.2401*** (0.0000)	0.1764*** (0.0009)	0.0412 (0.3679)	0.1770*** (0.0003)	0.1095** (0.0290)
Fertility <sup>1</sup>	0.1247*** (0.0001)	0.1311*** (0.0000)	0.1553*** (0.0000)	0.1485*** (0.0000)			0.1364*** (0.0002)	0.1354*** (0.0001)
Price of exports, goods		0.2490*** (0.0012)						
Price of imports, goods		-0.0875 (0.3106)						
Price of exports, goods and services			0.2331*** (0.0060)					
Price of imports, goods and services			-0.0715 (0.3759)					
Capital account liberalization (other)				0.1540* (0.0883)				
Infant mortality rate (UN) <sup>1</sup>					0.0046*** (0.0077)			
Old-age dependency <sup>1</sup>						6.3982*** (0.0000)		
Relative productivity (log) <sup>1</sup>							-0.0889 (0.4985)	
GDP per worker, PWT (log)								-0.3678*** (0.0029)
Observations	622	622	622	571	622	622	622	587
R-squared	0.69	0.70	0.70	0.74	0.63	0.70	0.69	0.70

Note: PWT = Penn World Table. \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ . Robust  $p$ -values in parentheses. Robust dynamic ordinary least squares panel regressions with fixed effects of the real effective exchange rate (Penn World Table source) on same determinants as in the benchmark derived in column (3) of Table 4.3. Additional controls encompass splitting terms of trade in price of exports and of imports (either of goods only or of goods and services), and alternative measures of capital account liberalization, of demographics, and of productivity. Unbalanced panel with annual data 1980–2006.

<sup>1</sup>The variable is constructed relative to the weighted average of the trading partners.