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External Disturbances and Macroeconomic Performance in Sub-Saharan Africa

by

Michael Bleaney and David Greenaway

Centre for Research in Economic Development and International Trade,

University of Nottingham

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Abstract

There is evidence that specialization in primary product exports reduces growth. Possible explanations include a trend deterioration in the terms of trade associated with falls in the relative price of primary products, and the adverse impact of excessive export price volatility on investment incentives. In this paper the impact of external disturbances on investment and growth is estimated for a panel of 14 sub-Saharan African countries over the period 1980-95. Both growth and investment appear to increase when the terms of trade improve and real exchange rate overvaluation is reduced. However instability in the terms of trade and the real exchange rate were not found to have significant effects on either investment or growth.

Outline

1. Introduction
2. Background and Study Design
3. Data and Empirical Results
4. Conclusions

I INTRODUCTION

Historically, two arguments have been advanced to the effect that specialization in the export of primary products is disadvantageous to growth. One is the Prebisch-Singer thesis that the price of primary products is on a long-run downward trend relative to the price of manufactures. The other is that, because of the volatility of primary product prices, exporters of these products experience greater instability of export revenue. Neither of these arguments has received much support in the professional literature in recent years. Analysis of data back to the beginning of the twentieth century has shown that any long-run downward trend in the relative price of primary products is sufficiently slow that it can plausibly be explained by quality improvements in manufactures which are not captured in the price indices (Grilli and Yang, 1988; Bleaney and Greenaway, 1993b).[1] The evidence for greater export revenue instability amongst exporters of primary products is mixed (MacBean, 1966; Maizels, 1992) and its effects ambiguous; Krueger (1985) surveys the literature and concludes that the problem has been greatly exaggerated.

Nevertheless the idea that specialization in the production of primary products may be harmful to growth should not be dismissed too quickly. Brundell *et al*. (1981) find, for a sample of 139 countries over the period 1965-77, that export revenue instability is significantly negatively correlated with the share of manufactures in exports, which suggests that there is some truth in the proposition that export revenues are more unstable for primary commodity exporters. Sachs and Warner (1997) report the 1970 share of primary exports in GDP to have a significantly negative coefficient in a growth regression for 83 countries over the period 1965-90, and Sala-i-Martin (1997) finds the 1970 share of primary products in total exports to be robustly and negatively correlated with growth over many different alternative regression specifications. These last two results certainly suggest that specialization in primary product exports reduces growth, although they tell us nothing about the mechanism involved. Possibilities include the squeezing of import capacity because of the downward trend in primary commodity prices over the sample period; their price volatility; faster total factor productivity (TFP) growth in the manufacturing sector than in the primary sector; or the smaller increment to output of shifting factors into the higher-productivity manufacturing sector in countries that are rich in natural resources (and whose primary sector consequently has higher measured

1 This argument is reinforced by the absence of any downward trend in the real exchange rate of Australia, whose exports are still dominated by primary products (Bleaney, 1996a).

TFP).

In this paper we focus on the issue of price volatility. Does this result in uncertainty of returns to investment which inhibits asset accumulation and growth in countries that specialize in the production of primary commodities? We use data from a sample of sub-Saharan African countries which are heavily dependent on the export of primary commodities to investigate this question. Section 2 discusses the theoretical issues. In Secton 3 we describe our data set and present the empirical results. Section 4 concludes.

II. BACKGROUND AND STUDY DESIGN

We begin by discussing the relationship between growth and the terms of trade, using the recent model of Mendoza (1997). We show that, in this model, the impact on output growth of both the trend and the volatility of the terms of trade cannot be determined unambiguously, but depends on the values of particular model parameters. We then refer to relevant empirical work, and conclude by explaining the design of our own research.

Theory

Mendoza (1997) examines the impact of terms of trade movements on consumption growth within a stochastic growth model. Consumers maximize expected lifetime utility as given by

$$U(C) = E\left[\sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\gamma}}{1-\gamma}\right] \qquad \gamma > 0, 0 < \beta < 1, \qquad (1)$$

where C represents consumption of the imported good and β is a subjective discount factor. Savings are invested in a perfectly durable asset that produces the export good subject to a linear technology with a stochastic gross return of R per period. The consumption-based return on savings is equal to R times one plus the proportional rate of change of the terms of trade (which we denote by z). Mendoza assumes that the change in the terms of trade follows a stochastic process with known variance and mean. He then shows that planned consumption growth is an increasing function of the trend in the terms of trade (i.e. the mean of z), but is negatively related to terms of trade volatility (the variance of z) only if $\gamma < 2$ (if $\gamma > 2$, this relationship is positive). In the empirical part of his paper, Mendoza shows that, for a sample of 40 industrial and developing countries over the period 1971-91, the predicted positive relationship between consumption growth and the change in the

terms of trade is confirmed, whilst there is also a significant negative relationship between consumption growth and terms of trade volatility.

The strong predictions of this model with respect to the impact of the trend in the terms of trade on consumption growth do not carry over to output growth. Ignoring the stochastic element, wealth (A) – and therefore output – grows according to the following equation:

$$A_{t+1} = \beta^{1/\gamma} R^{1/\gamma} z_t^{1/\gamma - 1} A_t \qquad (2)$$

It is clear that output growth is positively correlated with z only if $\gamma < 1$. Since the purchasing power of output over the imported consumption good grows at a rate z, we have

$$C_{t+1} / C_t = z_t A_{t+1} / A_t \qquad (3)$$

Substituting this into (2) yields

$$C_{t+1} = \beta^{1/\gamma} R^{1/\gamma} z_t^{1/\gamma} C_t \qquad (4)$$

Hence Mendoza's strong result for consumption growth. On the other hand, the impact of volatility of the terms of trade on output growth is similar to its effect on consumption growth. It therefore follows that the sign of the relationship between output growth and both trend and volatility of the terms of trade depends on the value of γ. Thus even if we restrict ourselves to the case of an isoelastic utility function, the model's theoretical predictions are rather ambiguous, given that the appropriate value of γ is highly uncertain.

Previous empirical research

Export price volatility has both a microeconomic and a macroeconomic dimension. At the microeconomic level, instability of relative prices may affect the production decisions of risk-averse producers. Relatively few studies of agricultural supply response have included variables to capture price risk, but those which have tend to find some evidence that price risk reduces output (Just, 1974; Traill, 1978). Producers' response will also depend on the perceived time series properties of the price, as we discuss below.

At the macroeconomic level, the impact on the trade balance is likely to be important,

and may cause far-reaching policy adjustments in order to restore equilibrium. How much do such external shocks actually affect domestic economic performance in the long run? The experience of the last two decades, and particularly the divergent growth rates of different areas of the developing world since 1980 – with Asia far outstripping Africa and Latin America – provides a great deal of evidence on this question. It has become clear that it is not the shocks themselves but their interaction with the domestic policy response which is crucial. Adjustment to negative shocks has been achieved much more rapidly and painlessly by some countries than by others. Allowing price signals to work and maintaining sound macroeconomic policies are of key importance. Countries which avoided macroeconomic instabilities such as large budget deficits, rapid inflation and volatile real exchange rates have achieved higher growth rates (Fischer, 1993; Bleaney, 1996b, 1997). This conclusion emerges strongly from the major World Bank study of macroeconomic policy in eighteen developing countries (Little *et al*., 1993). The authors warn that windfall gains, such as export booms or an explosion of opportunities for international borrowing, can generate euphoria amongst policy-makers based on an over-optimistic assessment of future prospects. This euphoria may fuel an investment boom which proves difficult to curtail when circumstances demand, leaving the country with a legacy of serious macroeconomic imbalances (see also Cuddington (1989)). Thus even positive shocks may not turn out to be a blessing. The evidence from the eighteen countries in the World Bank study demonstrates that avoiding the big mistakes that led to a collapse in investment in the 1980s was much more crucial than the size or composition of the investment boom itself (Bleaney, 1996c). Rodrik (1998) reaches a similar conclusion with respect to "favourable" trade policy shocks, arguing that the superior growth performance of the Asian economies in the 1970s and 1980s had more to do with macroeconomic management than with trade liberalization. This raises the following question: does volatility of the terms of trade – or possibly merely unusual volatility beyond that of recent experience – render serious policy mistakes more likely, and therefore impact negatively on growth through this mechanism?

Research design

To address these issues, it is not sufficient to carry out a cross-country regression with a single (time-invariant) volatility measure for each country, since this cannot capture the effects of periods of *unusually large* external shocks. A panel data set is indicated, with volatility measures evolving over time as well as differing across countries. In order to focus on a set of countries that are highly dependent on exports of primary products, we use a data set consisting purely of sub-Saharan

African countries (it is not necessary to confine the study to one continent, but the frequency with which continent dummies emerge as significant in growth regressions suggests that continent effects should not be ignored). The issues which we address are:

(1) Are investment and growth adversely affected by volatility of the terms of trade and the real exchange rate in the recent past?

(2) Are terms of trade improvements associated with higher rates of investment and faster growth?

(3) How do changes in the level of the real exchange rate affect investment and growth?

The inclusion of real exchange rate volatility and misalignment reflects evidence from previous studies that these variables have a negative impact on growth (Cottani *et al*., 1990; Ghura and Grennes, 1993). These authors, following Edwards (1989), attempt to disentangle equilibrium and disequilibrium movements in the real exchange rate by estimating a regression model. In practice, we find that it makes little difference whether we enter the actual real exchange rate or its disequilibrium component into the regression.

The effects of export price instability will obviously depend on the institutional environment. One aspect of this is the proportion of the price risk that is borne by private producers rather than being absorbed in the government budget through devices such as marketing boards, which have been widely used in sub-Saharan Africa. The government's policy reaction to instability in this form of tax revenue is potentially important. Cuddington (1989) suggests that governments often incorrectly treat booms in tax revenue arising from export price spikes as permanent, and subsequently find themselves in serious fiscal difficulties. Even if there is no direct impact on the government budget, there are likely to be indirect effects because of fluctuations in private income and expenditure. Bevan, Collier and Gunning (1987, 1993) analyze the case of Kenya, where most of the extra income was passed on to private producers, who correctly interpreted it as temporary, but their options for income smoothing were significantly restricted by controls, which consequently had a marked impact on the resulting expenditure patterns. A further major aspect of the problem is the volatility of foreign exchange earnings. Is this volatility absorbed by the exchange rate, by reserves of foreign exchange held by the central bank, by remitted profits of foreign-owned export enterprises, or by compensating fluctuations in imports, possibly encouraged by relaxation or tightening

of trade restrictions according to the level of export revenues?[2] It has been shown empirically that macroeconomic instability in general, and real exchange rate instability in particular, tends to depress both investment and growth in developing countries (Bleaney, 1996b; Cottani *et al*., 1990).

To the extent that export price volatility is transmitted to private producers, what is the likely impact on output and investment? It matters a great deal how the producers view the time series properties of the export price. At one extreme, if the export price is treated as a random walk process, then the current price will be the producers' best estimate of the future price, and production decisions will be based on this. It is not clear, however, that the aggregate level of investment, as opposed to investment in particular products, will be affected. At the other extreme, the export price might be regarded as a stationary process, implying that price fluctuations are only temporary, and that the expected future price is largely independent of the current price. In this case, production decisions are likely to be much more stable, but risk-averse producers will prefer products with a more certain income, and may opt for production of non-export commodities. Again, it is not clear that aggregate investment will be affected directly, although a lower supply of exports may affect investment and growth through a tighter balance-of-payments constraint.

These considerations suggest that it is the macroeconomic rather than the microeconomic effects of export price volatility which are most likely to impinge on aggregate investment. There is also the question of how export price volatility should be measured. Deflation by the domestic consumer price index is attractive, since this gives a measure of the real purchasing power of a unit of exports, and is probably a reasonable proxy for the price of exports relative to that of products for the domestic market. Unfortunately, however, an export price series in domestic currency is available for only a few sub-Saharan African countries, and so we have resorted instead to using the terms of trade, data for which are available for most countries. This is reasonable so long as import prices are not too volatile, which is most likely if they are dominated by manufactures. We measure volatility as the standard deviation of the logarithm of the terms of trade over the five years up to the present year (i.e. from year *t-4* to year *t*). This measure will pick up periods of unusual volatility within a country as well as cross-country variations.

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2 See Little *et al*., 1993, Ch. 9, for evidence that developing countries have tended to use trade policy as an instrument of macroeconomic adjustment.

In the investment equations which we estimate, we use as the dependent variable the ratio of investment to GDP, as is commonly done in cross-country studies. The independent variables in this equation are: two lags of the dependent variable, a time trend, lagged GDP growth, the level and volatility of the terms of trade, the level and volatility of the real exchange rate, real interest rates and the inflation rate. For private investment we also use public investment as a regressor. The choice of independent variables is based on the findings of previous cross-country research on investment in developing countries (Bleaney and Greenaway, 1993a; Greene and Villanueva, 1991). Our growth equation includes the same terms of trade and real exchange rate variables, together with current investment and a time trend. Cross-country variation in initial GDP, education levels, openness and other factors that commonly appear in growth regressions are subsumed in the country dummies. By not including these factors explicitly, we are effectively assuming that change over time within a country is small compared with the difference between countries during the period, which seems a fair assumption.

The estimating equations therefore have the following structure:

Investment = f (country dummies, two lags of investment, time trend, two lags of GDP, current and lagged terms of trade, the real effective exchange rate, inflation, measures of recent volatility of the terms of trade and the real exchange rate).
Growth = f (country dummies, lagged GDP, investment, time trend, squared time trend, terms of trade, real effective exchange rate, measures of recent volatility of the terms of trade and the real exchange rate).

For the private investment equation, public investment is included as an additional regressor.

III. DATA AND EMPIRICAL RESULTS

Our data are taken from the IMF World Economic Outlook database. We use data on 14 sub-Saharan African countries from 1980 to 1995. In 1980, primary products accounted for more than 80% of the exports of these countries, which are: Botswana, Burkina Faso, Cameroon, Côte d'Ivoire, The Gambia, Ghana, Kenya, Malawi, Mauritius, Niger, Senegal, Tanzania, Togo and Zimbabwe.

The terms of trade appear to be stationary. A Dickey-Fuller test, allowing for country-specific intercepts but with a common coefficient of the lagged terms of trade, yields a statistic of –7.97. The hypothesis of a common coefficient is not

rejected by the data ($F(13, 224) = 1.19$). It is of course possible that the stationarity of the terms of trade is a sample rather than a population phenomenon, reflecting (for example) the particular behaviour of primary commodity prices over the period.

Table 1 reports the results both for total investment and for private investment only. The regressions are rather similar. In both cases there is a pronounced cyclical pattern to investment, with a strong positive correlation with last year's investment and a negative and much smaller correlation with investment two years previously. There is a significant negative time-trend, but this does not necessarily mean that investment is falling over time, because it is offset by the upward trend in GDP. Accelerator effects are rather stronger for total investment than for private investment. There is a strong positive correlation with the previous year's GDP and a weaker (and in the case of private investment insignificant) negative correlation with GDP two years previously. The real interest rate and consumer price inflation have negative but insignificant coefficients in both cases. In the private investment regression, public investment has a sizeable negative coefficient, implying significant crowding out – an increase of public investment by 1% of GDP is estimated to reduce private investment by 0.3% of GDP.

There is a positive correlation of investment with the lagged (but not current) terms of trade. Terms of trade have been found significant in previous studies of investment in developing countries as well, but the mechanism is not entirely clear. One possibility is that if the terms of trade improve, the balance of payments constraint eases and the government grants more import licences, so that investment increases because more capital equipment can be imported. Alternatively, improvements in the terms of trade raise domestic incomes and demand, inducing producers to invest in additional capacity. Volatility of the terms of trade appears to have a slight but statistically insignificant negative impact on investment. The lack of statistical significance may of course be a result of the relative crudity of the volatility measure, which is based on only the five years of data up to the current year. It is probable that economic agents take a much longer run of experience into account in assessing likely export price volatility, and also that they are able to perceive regime changes (if any). Using a relatively short span of data to calculate volatility is a common practice (e.g. Grobar, 1993), and in general it is an uneasy compromise between an appropriately forward-looking measure and the desirability of using a longer series of (possibly seriously outdated) information. In the present context, however, it has the additional advantage of picking up the effects of periods of unusual volatility (or lack of it) for the country concerned.

Our results also suggest significant real exchange rate effects. A lower real effective exchange rate appears to be associated with higher investment. This may be, once again, a trade policy effect: a real devaluation improves the trade balance, permitting import restrictions on capital goods to be relaxed. Volatility of the real exchange rate, measured in the same manner as for the terms of trade, has a positive but statistically negligible correlation with investment. The results shown use the IMF real effective exchange rate index. We have also estimated a model which uses only the disequilibrium component of this index, which consists of the residuals from a regression of the real exchange rate on the terms of trade, lagged output, lagged investment and country dummies. The results (not shown) were very similar to those reported in Table 1.

The diagnostics of the regression are not totally satisfactory. There is some evidence of functional misspecification (significant at the 1% level for private investment but not even at the 10% level for total investment) and of non-normality of the residuals (significant at the 1% level for total investment and at the 10% level for private investment), but there appear to be no significant problems of autocorrelation of the residuals. Residual variance tends to be particularly high in Tanzania, which implies that this country is lending excessive weight to the parameter estimates, although the problem is significant at the 5% level only for private investment.

Table 2 presents a growth regression for the same data set. Growth depends positively on current investment, and negatively on the lagged level of output. Since inter-country differences in real GDP have been filtered out through the country dummies, the negative correlation with lagged output essentially means that there is some negative serial correlation in growth rates, which may reflect uncorrelated shocks to the level of output (e.g. weather). (The inclusion of a time-trend in the regression means that the negative coefficient on lagged output cannot necessarily be interpreted as a convergence effect). Growth is positively correlated with the level of the terms of trade, but does not appear to be significantly affected by their volatility. With respect to the real exchange rate, there is a hint of a negative impact of volatility on growth, and a negative effect of the level on growth that is significant at the 10% level. As with the investment regressions, results are similar if the disequilibrium component of the real effective exchange rate is used in place of the actual index. Overall, the findings for the terms of trade and real exchange rate variables are remarkably similar in the investment and growth regressions.

These results do not suggest that countries with higher volatility of the terms of trade or the real exchange rate, or which experience sudden bursts of volatility (associated for example with temporary commodity price booms), suffer from weaker growth and investment as a result. Our findings can be compared with those of Ghura and Grennes (1993), who use a sample of 33 countries over the period 1972-87. Treating the data set as a panel, as we do, they find significant negative partial correlations of both real (US$) exchange rate misalignment and instability with various measures of macroeconomic performance. In a growth regression that is somewhat similar to that shown in Table 2, Ghura and Grennes find significant negative effects only for misalignment, and the instability variable is not significant, although its coefficient remains negative. Thus, despite differences in the sample period, sample size and real exchange rate measure, our results broadly confirm those of previous work.

IV. CONCLUSIONS

Recent research has suggested a negative correlation between specialization in primary product exports and growth. We have estimated investment and growth equations on a reasonably sized panel of annual data from 14 sub-Saharan African countries from 1980 to 1995. Sub-Saharan Africa was selected as a low-income area that is heavily dependent on exports of primary products. The investment results are broadly consistent with previous work on investment in developing countries, with significant effects of lagged output, the terms of trade and the real exchange rate, but with insignificant real interest rate effects, probably because of pervasive rationing of both bank credit and imports. Theory is ambiguous on the effects of trends and volatility of the terms of trade on growth and investment. We could find no evidence that volatility of either the terms of trade or the real exchange rate had any significant negative impact on either private or total aggregate investment. This does not however rule out the possibility that the sectoral allocation of investment is influenced by the volatility of export prices relative to that of non-traded goods.

For a given rate of investment, growth appears to be positively correlated with the lagged terms of trade and negatively correlated with the real effective exchange rate index. Since the signs are the same as in the investment regression, this implies that these variables affect growth both directly (for a given rate of investment) and indirectly (by influencing the rate of investment). Improved terms of trade mean greater international purchasing power per unit of exports, implying greater import capacity. This releases foreign exchange constraints on growth, which have been found to be important in previous research (Esfahani, 1991). Our findings imply that

the negative correlation between growth and specialization in primary exports reported by Sachs and Warner (1997) and Sala-i-Martin (1997) reflects adverse relative price trends for primary products over recent decades rather than the effects of export revenue volatility.

The relationship between real exchange rate depreciation and growth is a more complex issue. One possibility is that this partly reflects an equilibrium effect associated with trade liberalization. If so, our findings suggest significant positive trade liberalization effects. An alternative interpretation is that the results largely reflect disequilibrium or misalignment effects, with an overvalued exchange rate inhibiting growth by enforcing deflationary policies and other corrective measures such as delays in granting import licences. In this respect our findings are consistent with previous work on sub-Saharan Africa by Ghura and Grennes (1993), who find the negative effects of real exchange rate misalignment on growth to be more significant than the effects of instability.

What policy implications follow from our results? One is that they provide an additional reason for not defending an overvalued exchange rate, which would be harmful to investment and growth. With respect to the terms of trade, the issue is whether countries should actively discriminate against primary product exports, on the grounds that, even though there appear to be no significant negative effects associated with price volatility, the adverse relative price *trends* of primary products will translate into an adverse trend in the terms of trade. The fall in the relative price of primary products over the last two decades has, however, been significantly faster than the long-run trend, and the latter does not appear to be steep enough to warrant strong policy conclusions. There is nothing in our results to suggest disagreement with the standard prescription that sound macroeconomic policies and an open trade regime offer the best prospects for rapid growth.

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Table 1. Investment equations for a panel of 14 countries, 1980-95

Dependent variable:	Total investment (% of GDP)	Private investment (% of GDP)
Independent variables:		
country dummies		
Investment (t–1)	0.677 (10.55)	0.628 (9.37)
Investment (t–2)	–0.145 (–2.48)	–0.124 (–1.99)
Time trend	–0.219 (–2.89)	–0.198 (–2.52)
ln GDP (t–1)	13.74 (4.48)	9.05 (2.88)
ln GDP (t–2)	–8.24 (–2.68)	–3.69 (–1.24)
ln terms of trade (TOT)	0.140 (0.13)	–0.402 (–0.38)
TOT (t–1)	2.74 (2.59)	2.29 (2.17)
St. deviation of TOT (t-4 to t)	–2.18 (–0.83)	–1.09 (–0.41)
ln real effective exch. rate (RER)	–3.14 (–5.33)	–2.75 (–4.59)
St. deviation of RER (t–4 to t)	1.07 (0.66)	1.19 (0.75)
Real interest rate (in logs)	–3.51 (–0.96)	–4.03 (–1.11)
Consumer price inflation (in logs)	0.004 (0.00)	–0.68 (–0.30)
Public investment (% of GDP)		–0.304 (–3.71)
R-squared	0.931	0.935
standard error	1.78	1.76
functional form (χ^2_1)	2.18	12.04
normality of residuals (χ^2_2)	12.80	6.04
serial correlation (t_{167})	–1.41	–0.41
heteroscedasticity (F (13, 182))	1.71	2.11

Notes

Figures in parentheses are t-statistics. "Functional form" is a RESET test based on the regression of the residuals on the squared fitted values (5% c.v. = 3.84). "Normality" is the Jarque-Bera test for skewness and excess kurtosis (5% c.v. = 5.99). "Serial correlation" is the *t*-statistic from a regression of the residuals on their lagged values. "Heteroscedasticity" is based on the regression of the squared residuals on country dummies (5% c.v. = 1.78).

Table 2. A growth regression for a panel of 14 countries, 1980-95

Dependent variable:	Change in log of GDP
Independent variables:	
country dummies	
ln GDP (t–1)	–0.217 (–5.78)
Investment (share of GDP)	0.374 (3.04)
Time trend	0.0103 (1.86)
Time trend squared x 10^{-3}	–0.236 (–1.15)
ln terms of trade (TOT)	0.0590 (3.14)
St. deviation of TOT (t-4 to t)	0.0117 (0.20)
ln real effective exch. rate (RER)	–0.0226 (–1.72)
St. deviation of RER (t–4 to t)	–0.0417 (–1.22)
R-squared	0.380
standard error	0.407
functional form (χ^2_1)	15.72
normality of residuals (χ^2_2)	140
serial correlation (t_{167})	–0.26
heteroscedasticity (F (13, 182))	1.81

Notes

Figures in parentheses are t-statistics. "Functional form" is a RESET test based on the regression of the residuals on the squared fitted values (5% c.v. = 3.84). "Normality" is the Jarque-Bera test for skewness and excess kurtosis (5% c.v. = 5.99). "Serial correlation" is the *t*-statistic from a regression of the residuals on their lagged values. "Heteroscedasticity" is based on the regression of the squared residuals on country dummies (5% c.v. = 1.78).

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