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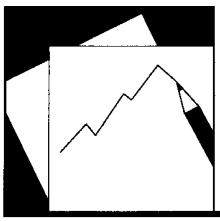

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Terms of Trade Shocks and Economic Recovery

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Terms of Trade Shocks and Economic Recovery

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Abstract

This paper identifies factors that contribute to a fast recovery in growth after persistent negative terms of trade shocks, using a sample of 159 countries for 1970–2006. The results suggest that policies matter. Fast recoveries are fairly robustly related to real exchange rate depreciation and improvements in government stability and the institutional environment. A timely increase in aid may also support recovery.

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I. INTRODUCTION

This paper focuses on the macroeconomic impact of negative terms of trade shocks and tries to identify factors that contribute to a fast recovery in growth after persistent negative shocks. It is well known that sizable terms of trade shocks, which reflect a sudden, large, and enduring change either in import or export prices tend to affect income. Though at times it is difficult to determine whether a shock is transitory or permanent, governments need to be ready to respond to a shock. While some countries seem to suffer for a prolonged period from a negative terms of trade shock, others have recovered quickly or even managed to increase average growth. Our assumption is that appropriate macroeconomic policy, supported by structural reforms and solid institutions, can help revive growth after a terms of trade decline. We will also attempt to differentiate between policies needed immediately after the shock and policies needed to keep growth momentum alive.

The paper is inspired by recent literature that focuses on growth takeoffs and accelerations. After numerous analyses of cross-country growth regressions over the past two decades, more recently the focus has shifted to understanding periods of transition to higher growth. With regard to the role of terms of trade shocks, Becker and Mauro (2006) find that for developing countries, an adverse change in the terms of trade is the most costly type of shock reducing income growth. Terms of trade shocks also appear to play a role in explaining growth accelerations or turning points to higher or lower levels of growth, although their explanatory power is somewhat limited (see, e.g., Pritchett, 2000; Haussmann, Pritchett and Rodrik, 2006; and Berg, Ostry, and Zettelmeyer, 2006).

In what follows, Section II reviews the links between terms of trade shocks and growth. Section III describes the data set and methodology and defines persistent terms of trade shocks. Section IV focuses on growth recoveries and policies needed to revive growth. Section V summarizes the main results.

II. NEGATIVE TERMS OF TRADE SHOCKS AND ECONOMIC RECOVERY

How does a negative terms of trade shock affect growth? Worsening terms of trade lead to a decline in the relative price of exportable to importable goods and thus to a *spending* effect and a *resource-movement* effect (Cordon, 1984). Lower export prices, for example as a result of a decline in the world market price for the export good, lead to a decline in national wealth and hence lower demand for both tradables and nontradables. In a small economy where presumably the price for tradables is determined in the world market and the short-run supply of nontradables is inelastic, the price of tradables relative to nontradables will decline and hence the real exchange rate will fall. The terms of trade shock reduces the marginal product of factors in the exportable sector, and resources shift away from the tradable sector. Nontradable output, however, could either grow or shrink, depending on which dominates—

the spending effect, which lowers output, or the resource effect, which raises it.[2] It is therefore changes in consumption and the investment decisions of economic agents, domestically and abroad, in response to negative terms of trade shocks that affect economic recovery; these can be positive or negative for growth.

While the textbook model of a tradable-nontradable dichotomy gives some insight into what could happen to economic growth, the reality is often more complex. Once a new equilibrium is reached after a terms of trade shock, the neoclassical models would expect growth to return to its long-term path, but through path-dependence negative terms of trade shocks can harm long-run growth if the tradable sector is "special". For example, according to the endogenous growth literature the effect of a terms of trade shock might leave a permanent mark on the economy by undermining the learning-by-doing manufacturing process (Matsuyama, 1992) or because of forward and backward linkages (Hirschman, 1958). To become fully useful in other areas of the economy, industry-specific capital and skills tied to a given industry may require scrapping and retraining, with at least a temporary negative effect on growth. However, negative terms of trade shocks can have a positive effect on income growth if they change comparative advantages and lead to discovery of new growth opportunities. Negative terms of trade shocks could help improve income growth in the medium term if they help the economy to get rid of inefficient firms (Caballero and Hammour, 1994).

What the literature misses is that policy failure is often at the core of lower growth following negative terms of trade shocks. For example, cutting real wages may be a necessary policy in the face of a negative shock, but they have been usually resisted by states in developing countries (Sachs, 1999). The result is persistent fiscal deficits that bring about growth collapse. Therefore, it is important to identify the policies needed to recover from a negative terms of trade shock.

Several empirical analyses find a close relationship between growth and terms of trade shocks. The seminal work of Easterly et al. (1993), which analyzed long-run growth differentials in a large panel of countries, found that terms of trade shocks play a large role in explaining variance in growth across countries. Much of the subsequent growth literature corroborated these findings. Mendoza (1997), using a sample of 40 developed and developing countries, found that higher terms of trade volatility has a negative impact on economic growth. He argued that the channel through which terms of trade volatility affects growth is changes in savings. Becker and Mauro (2006), using a multivariate probit model on a dataset that covers developed and developing countries for 1970–2001, found that for developing countries the largest output costs are associated with terms of trade shocks. They found that on average a 10 percent decline in the terms of trade leads to a 2.8 percent annual decline in growth (p. 29).

Both long-run and short-run growth studies have consistently identified exchange rate policy and the institutional environment as determinants of the impact of terms of trade shocks on income growth. Using a sample of 75 countries for 1973–1996, Broda (2004) found that the

[2] However, Sachs (1981) tried to introduce dynamics in the terms of trade models, by explicitly modeling savings and investment decisions. The key insight of this literature is that the effect of terms of trade shocks on income growth depend critically on its persistence, and on whether it is anticipated or not.

effect of a terms of trade shock on per capita income depends on the exchange rate regime. The impact is smaller in countries with a flexible exchange rate, where relative prices tend to adjust more rapidly through the nominal exchange rate. In countries with a fixed exchange rate the adjustment of relative prices may be slower, depending on the stickiness of domestic prices. Countries subject to negative terms of trade shocks recover more rapidly if their exchange rate is flexible.

Rodrik (1999) emphasized that how severely a terms of trade shock affects economic growth depends on the interaction of institutions of conflict management with the terms of trade shock. Using a large sample for the 1960–89 period, he showed that the drop in growth is most abrupt when divided (e.g., unequal or ethnically fragmented) societies interact with weak institutions. Well-functioning institutions are therefore helpful in reducing the severity of terms of trade shocks. Similarly, Jerzmanowski (2006), using a Markow-switching model for 89 countries for 1962–94, found that in countries switching among growth regimes—miracle growth, stable growth, stagnation, and crisis—the severity of a terms of trade shock is mainly determined by the quality of institutions. Better institutions improve a country's long-run growth by making episodes of fast growth more persistent.

Because the determinants of long-run growth are not robust, and because there is a lack of practical advice, the growth literature recently has shifted its focus from exploring the determinants of long-term growth to shedding light on the short-run growth acceleration/ deceleration process. A number of analyses have terms of trade shocks among the explanatory variables. Haussmann et al. (2006) attempted to explain turning points of GDP growth between 1957 and 1992 for both developed and developing countries. In addition to standard explanatory variables, they incorporated three types of shocks into their regressions: domestic economic reforms, political-regime shocks (change in regimes, wars), and external shocks (terms of trade). In general terms of trade shocks do not matter in most growth accelerations and decelerations, but more than a quarter of growth accelerations are preceded by negative terms of trade shocks and only 5 percent of positive terms of trade shocks are followed by a growth acceleration.

Berg, Ostry, and Zettelmeyer (2006) analyzed "growth spells," the period between an acceleration and a deceleration in growth. In their panel data study of 140 countries over four decades, they found that external shocks are negatively associated with growth spells. Using survival analysis, they found that a 1 percent improvement in terms of trade will reduce the probability of a growth downbreak by 2–3 percent. But again, while the results do show that terms of trade matter for growth spells, their overall importance is small.

The studies surveyed show that exchange rate changes and institutional improvements help reduce the effect of a terms of trade shock on growth. They do not, however, attempt to identify policies to restart growth after a negative shock. In the following, we will look at the policies that are needed to revive growth after a negative terms of trade shock.

III. IDENTIFYING PERSISTENT TERMS OF TRADE SHOCKS

We first need to identify when a terms of trade shock is persistent. Hausmann et al. (2006) used the annual change in the terms of trade to measure their impact on growth accelerations and decelerations. While useful in explaining terms of trade shocks, this methodology does not differentiate persistent from temporary shocks. Berg et al. (2006) applied the Bai-Perron test to identify a structural break, but the standard Bai-Perron test is a conservative measure that captures major collapses and growth jumps but not smaller breaks. Focusing on large terms of trade changes, Becker and Mauro (2006) used a 10 percent annual change as threshold. Identifying terms of trade shocks in this manner has the disadvantage of lumping short-lived and persistent shocks together.

As we analyze the terms of trade series for goods and services for an unbalanced panel of 159 countries using annual data for 1970 through 2006, to focus on *persistent* terms of trade shocks we use a more restrictive definition, taking into account longer time horizons. We consider a terms of trade shock to be persistent if the five-year mean of the terms of trade for the period *t-4* to *t* compared to period *t+1* and *t+5* differs by a predetermined threshold, where *t* is the period of the shock. Initially, the threshold is set to minus 10 percent for negative shocks. As a sensitivity test we also increase the threshold to minus 30 percent.[3]

Using this definition we identify 228 persistent terms of trade shocks that exceed the 10 percent threshold, 79 of which exceed the 30 percent threshold. Persistent terms of trade shocks have been more frequent in developing countries than in advanced economies, and negative and positive shocks are about equally frequent (see Table 1), in part because one country's positive terms of trade shock results in a negative shock in partner countries.

Table 1: Distribution of Terms of Trade Shocks

	Number of countries	Size and Type of Shocks					
		10 percent			30 percent		
		overall	positive	negative	overall	positive	negative
All	159	228	110	118	79	46	33
Advanced	28	19	9	10	2	1	1
Emerging markets / developing countries	131	209	101	108	77	45	32
of which Middle-East	17	32	14	18	13	7	6
Sub-Saharan Africa	23	47	16	31	19	7	12
Asia	12	13	6	7	3	3	0
Western Emisphere	21	35	19	16	9	6	3
Europe	29	21	12	9	1	1	0
Transition Economies	57	80	43	37	34	22	12

Source: Authors' calculations.

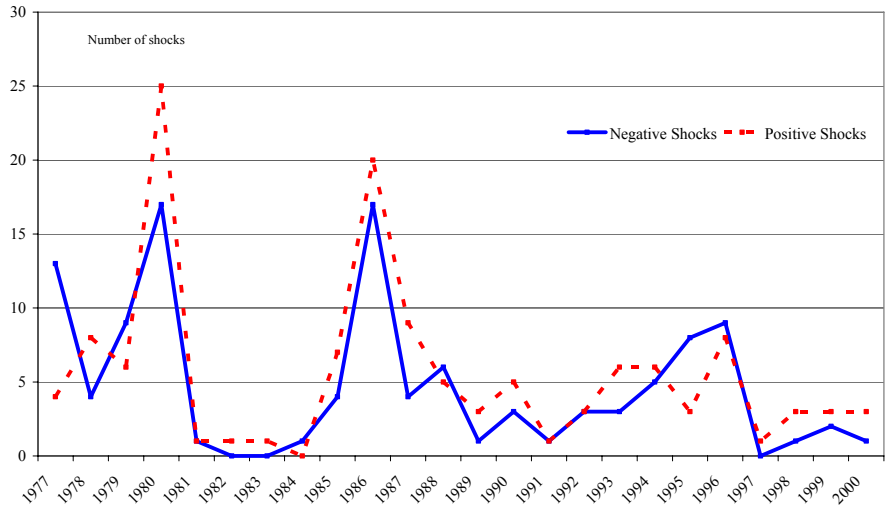
A closer look at the regional breakdown suggests that sub-Saharan Africa and the Middle-East have been more affected than Western Hemisphere and Asia-Pacific countries. This applies to both shocks above 10 percent and above 30 percent. This could be because the former two regions are less diversified than the latter two; they are focused on a few natural

[3] To select the year of the break, we then analyze developments around *t* and choose the year that registers the highest percentage change in the terms of trade for the periods *t-2* and *t+2*. We verify that the mean between the five years preceding the shock differs from the mean of the five years after the shock by at least the threshold.

resources and have a lower manufacturing base. Countries in sub-Saharan Africa averaged more than two persistent terms of trade shocks during the observation period.

While sizable terms of trade shocks took place in most years, their frequency rose in three periods: toward the end of the 1970s, in the mid-1980s, and in the mid-1990s (Figure 1). The timing of terms of trade shocks is highly correlated with the evolution of prices of minerals, notably oil. The second oil shock at the end of the 1970s and the busts in oil prices in the mid-1980s and again in the mid-1990s are symptomatic of the terms of trade shocks experienced by the world economy. Some symmetry between positive and negative shocks is to be expected; for example during oil shocks oil-exporting countries encounter a positive shock and oil-importing countries a negative one.

Figure 1: Frequency of Positive and Negative Terms of Trade Shocks

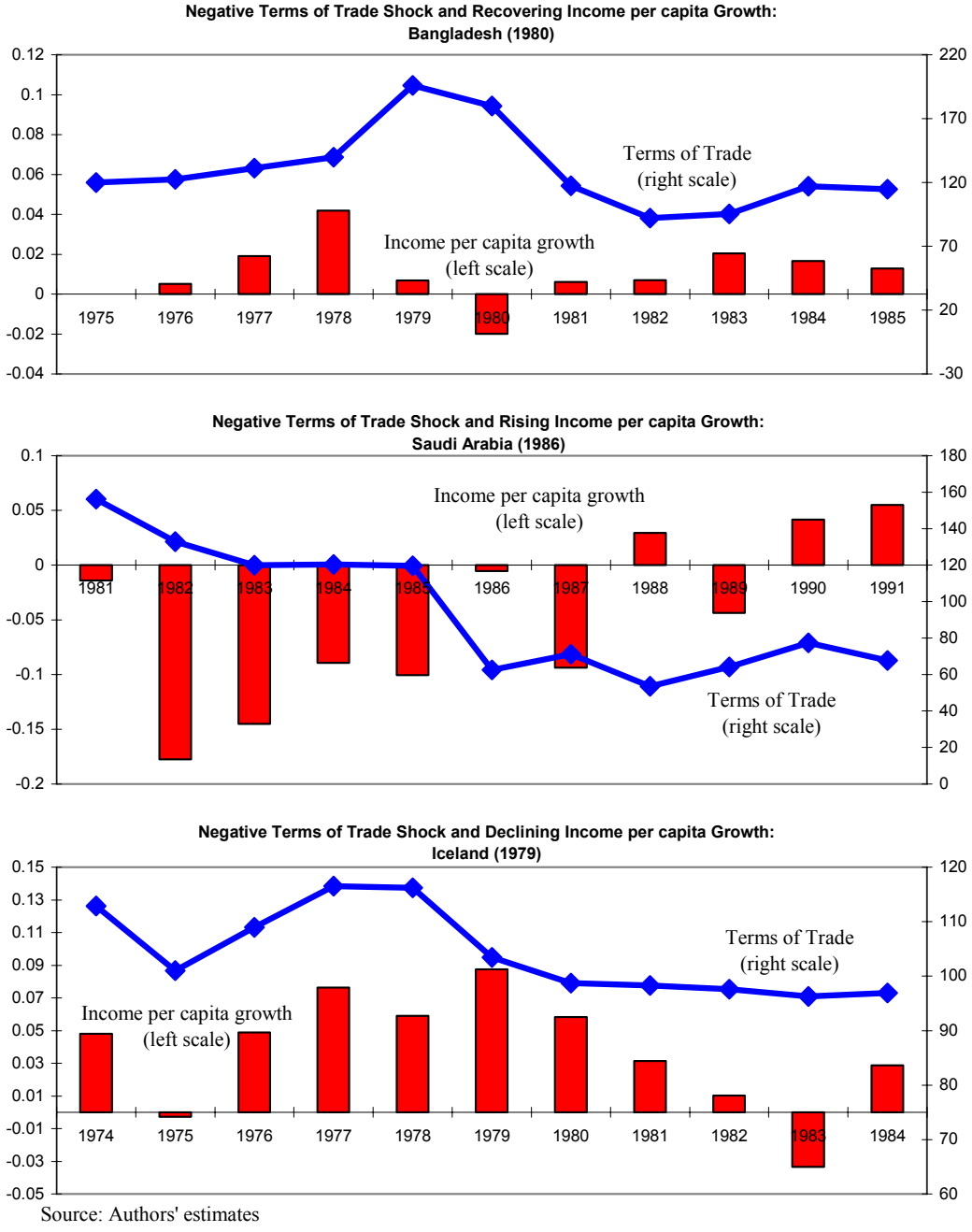


IV. Negative Terms of Trade Shocks and Economic Recovery

A. Differences in Macroeconomic Performance

While in some countries subject to negative terms of trade shocks a period of growth revival followed, in others it did not (see Figure 2). There are cases, like Bangladesh in 1980, where a negative terms of trade shock was accompanied by a recovery in income growth. In Saudi Arabia, the negative terms of trade shock of 1986 lead to a slow revival in per capita income growth. By contrast, the negative shock in Iceland in 1979 was accompanied by a decline in income growth. This suggests that the recessionary effects of a terms of trade shock are not inevitable. Our aim is to discover policies that will promote recovery.

Figure 2: Negative Terms of Trade Shocks and Growth



Source: Authors' estimates

In the following we analyze growth performance after a persistent negative shock to the terms of trade by distinguishing between three cases: (i) countries where a negative terms of trade shock led to a decline in growth; (ii) countries where growth remained almost unchanged; and (iii) countries where growth increased. Countries that experienced an increase in the average growth rate of at least 2 (or 1) percent after a terms of trade shock are deemed "increase in growth" countries; those countries that experienced a decrease in the average growth rate of at least 1 percent are considered "decline in growth" countries. "Stagnating" countries are those for which the change in the average growth rate was relatively small between -2 (or -1) and +2 (or +1) percent.

More generally, the unconditional probability of increasing average growth after a negative terms of trade shock of at least 10 percent is over one–third, and after a 30 percent shock one-fifth (see Table 2). Most countries subject to a negative shock experience negative growth, or to a lesser extent stagnation. The proportion of declines, stagnations, and increases in growth are similarly distributed for shocks of both 10 percent and 30 percent.

Table 2: Terms of Trade Shocks and Economic Recovery

	Decline in growth x<-1 percent	Stagnation 1>x>-1 percent	Increase in growth x>1 percent	Decline in growth x<-2 percent	Stagnation 2>x>-2 percent	Increase in growth x> 2 percent
10 Percent Shock (245 shocks)						
Negative Shock	0.42	0.21	0.36	0.27	0.52	0.21
30 Percent Shock (96 shocks)						
Negative Shock	0.45	0.21	0.33	0.36	0.43	0.21

x= change in mean growth rate over 5 years

Countries that grow rapidly after a negative terms of trade shock ("high growth countries") typically experienced negative growth rates before the shock occurred (see Table 3). While subdued growth in the period before the shock points to other economic challenges pre-shock, median growth in the high-growth cases was higher in the five years after the shock than in the stagnation or lower-growth scenario.

Table 3: Macroeconomic Developments Before and After Terms of Trade Shocks

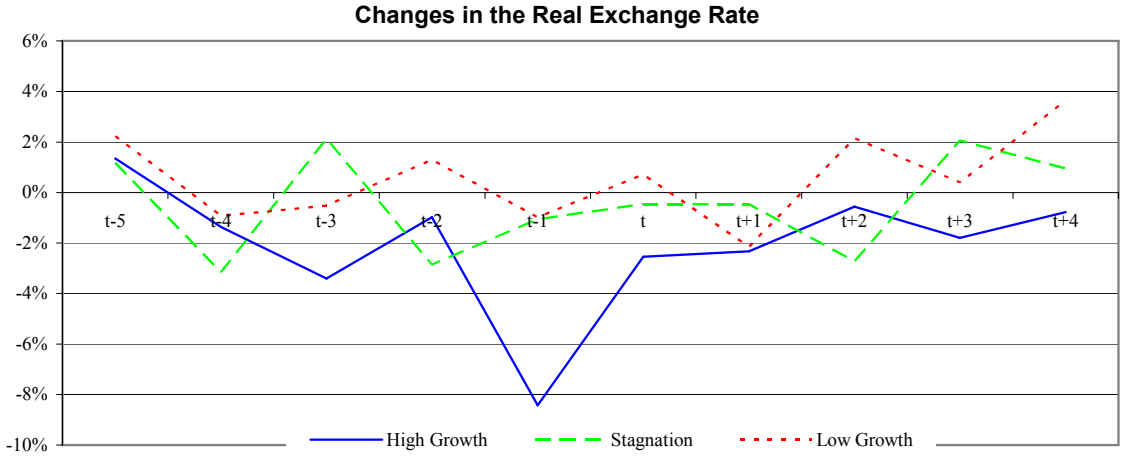
	Higher Growth		**Stagnation**		**Lower Growth**	
	before shock	after shock	before shock	after shock	before shock	after shock
Growth rate (percent)						
mean	-1.69	2.54	0.72	0.55	2.81	-1.66
median	-1.17	1.93	1.51	1.35	2.90	-0.44
Current account (percent of GDP)						
mean	-6.30	-6.70	-3.32	-3.13	-6.31	-4.61
median	-5.61	-6.15	-2.46	-3.62	-2.88	-3.50
Fiscal balance (percent of GDP)						
mean	3.41	-5.58	-0.58	-1.01	-3.60	-7.70
median	-1.71	-2.14	-0.35	-0.92	-0.44	-1.33
Annual Inflation (percent)						
mean	21.50	25.44	17.12	12.33	16.71	22.86
median	11.76	8.91	11.91	10.53	10.00	11.71
Change in real effective exchange rate (percent)						
mean	-4.60	-0.84	-1.03	-1.41	-3.22	10.44
median	-1.85	-2.49	-1.78	-0.11	-0.54	-0.07
Law and Order (index, 1-7)						
mean	2.63	2.71	2.66	3.22	3.06	3.09
median	2.67	2.91	2.88	3.33	3.00	3.00
Aid/GNI (percent)						
mean	10.50	11.94	7.22	10.92	7.69	7.84
median	6.43	7.06	4.89	6.62	2.47	2.62
Trade Openness (percent of GDP)	69.59	74.88	57.59	62.02	61.05	62.74
mean	55.07	61.93	51.41	56.15	51.73	52.69
median						

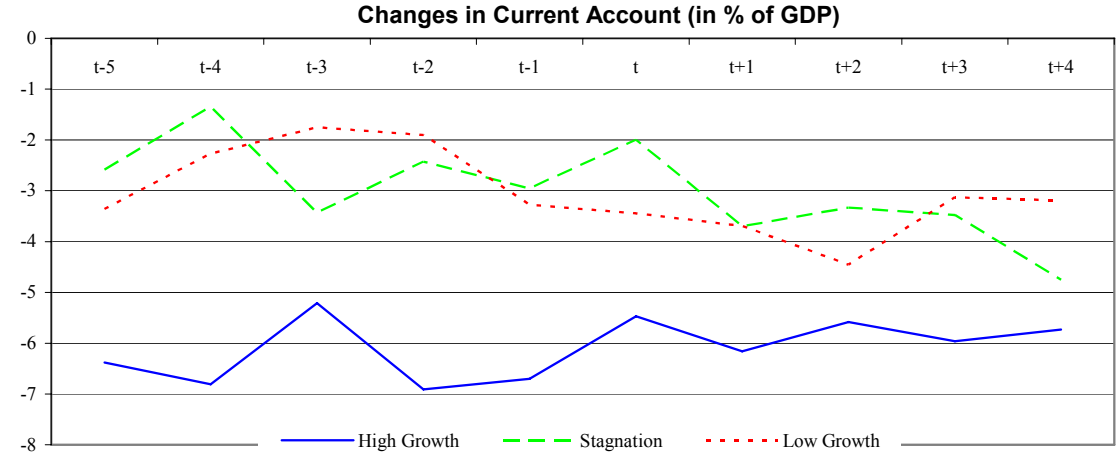
Source: Authors' calculations

The differences are not very clear. In all cases the average current account and fiscal balance deteriorates (Table 3). In low-growth cases, inflation tended to rise and the real effective exchange rate hardly changed. The real effective exchange rate therefore appears to act as a shock absorber. Depreciation in the real effective exchange rate could help make the economy more flexible by helping to adjust relative prices. Finally, the successful growth cases are much more open than countries that stagnate or have lower growth after the shock.

Figure 3 graphically illustrates the sharp real effective exchange rate adjustment after a terms of trade shock for countries that recover rapidly. This indicates that the real exchange rate adjustment plays a key role in growth recoveries.

Figure 3: Macroeconomic Developments Before and After Negative Terms of Trade Shocks of at Least 10 Percent





Source: Authors' Estimates

B. Probit Analyses

In the following, we use a probit model to analyze what economic policies differentiated countries that successfully recovered from those that did not. The analysis focuses on shocks

above the 10 percent threshold, given that relative few number of observations take place in the thresholds above 30 percent; there are only five cases of countries recovering from the 30 percent level—seven if we bring the threshold down to 20 percent. We first reduce our sample to countries subject to negative terms of trade shocks.

In the probit analysis, we differentiate between countries in which average growth increased after the negative terms of trade shock and countries whose growth stagnated or declined. We estimate the following model:

$$\begin{aligned} DGrowth = {} & \alpha_i + \beta_1 \Delta RER_{i,t} + \beta_2 \Delta budgetbalance_{i,t} + \beta_3 \Delta govstability_{i,t} + \beta_4 \Delta aid_{i,t} \\ & + \beta_5 \Delta trade_{i,t} + \beta_6 \Delta law_{i,t} + \beta_7 RER_{i,t-1} + \beta_8 \Delta budgetbalance_{i,t-1} + \beta_9 \Delta govstability_{i,t-1} \\ & + \beta_{10} \Delta aid_{i,t-1} + \beta_{11} \Delta trade_{i,t-1} + \beta_{12} \Delta law_{i,t-1} + \beta_{12} Open1975 + \varepsilon_{it} \end{aligned} \quad (1)$$

where DGrowth takes the value of 1 if average growth was at least 1 percentage point higher after the terms of trade shock than before. Arguably in some cases, country specific positive supply side shock may have contributed to growth acceleration. The other variables are the same as above (Appendix 1 describes the sources). Because the impact of terms of trade shocks on growth may depend on the initial openness of a country, we also add an openness variable for a base year (Open1975). To correct for heteroscedasticity, we use robust variance estimates. Although causality cannot be determined conclusively, following the growth literature we assume the small country case—terms of trade shocks cause changes in output; it is unlikely that causality runs in the other direction. The goodness-of-fit measure we employ is McFaddan's pseudo-R^2, which compares the likelihood for the intercept-only model to the likelihood for the model with the predictors.[4] McFaddan's pseudo-R^2 seems reasonably high, suggesting that the variables explain much of the variation in the data.

What relationship do we expect between the independent variables and the dependent one?

We expect that a depreciation of the real effective exchange rate will have a positive effect on income growth. Countries hit by negative terms of trade shocks will adjust more easily the faster relative prices change. With relatively sticky domestic prices, relative prices will adjust faster through changes in the real exchange rate. With a real exchange rate depreciation, a country can ride out a negative shock through substitution effects (less imports, more exports). The real exchange rate effect will therefore be stronger the more elastic exports and imports are.

The impact of the budgetary balance on growth after a negative terms of trade shock is ambiguous. In Keynesian models, raising aggregate demand after a negative shock would stimulate growth. The Ricardian equivalence argues that the budget position of the government is irrelevant for growth because it will not affect aggregate demand in the economy: Governments either finance their spending by taxing current taxpayers or issue

[4] The McFadden R^2 (1974) is calculated as $R^2_{McF} = 1 - \dfrac{\ln L(M_{Full})}{\ln L(M_{Intercept})}$

bonds to taxpayers that need to be repaid in the future. The choice is therefore between "tax now" and "tax later." The Ricardian equivalence suggests that fiscal policies cannot raise growth, even in the short run, But some argue that budget cuts during a shock might also be good for growth through the anti-Keynesian effect. This school argues that running budget surpluses during crises could be good for growth. By running surpluses, or lowering budget deficits, governments can help restore investor confidence. A budget surplus, by reducing debt, will crowd in private investment by lowering interest rates.

Improvement in government stability is expected to have a positive impact on growth. As the terms of trade shock can be assumed to be exogenous, the population should in principle not blame the government for any subsequent recession. During negative shocks, however, social conflicts tend to appear, based, for instance, on ethnicity or inequality. How government decisions interact with the negative shock depends on how stable the government is. Less stable governments are likely to be driven by the desire to stay in power by avoiding the necessary costly adjustments, thereby increasing the uncertainty the economy faces in the longer run. One reason why sub-Saharan Africa has handled negative shocks less well than Asia is precisely the instability of African governments, which for fear of being ousted were unable to take the right long-term economic decisions, whether that might be cutting the budget deficit or devaluing the exchange rate, (e.g., Rodrik, 1997).

Because rising investment is considered a driver of growth, it should have a positive impact on GDP growth. Empirical evidence shows that investment is indeed a growth force (Stiroh, 2000). When uncertainty rises after a terms of trade shock, investment might become riskier, however. Industry-specific capital and skills tied to a given industry will rise only when uncertainty about the impact of the terms of trade shock diminishes.

It is not clear how increased aid will affect growth after a terms of trade shock. The effect of aid on growth in cross-country regressions has not been found to be robust. Part of the difficulty may relate to how aid is aggregated in the data. Different types of aid can have different effects on growth. Emergency and humanitarian aid is likely to be negatively correlated with growth. Other forms of aid, such as aid to support health or education, affect growth only over time. Finally, the aid that is likely to have the biggest effect on growth is budgetary support, which facilitates investments in infrastructure, and aid for productive sectors, such as agriculture and industry. But lack of data prevents us from differentiating the various forms of aid. However, we could expect aid inflows after a negative terms of trade shock to raise growth by increasing aggregate demand.

Improvements in institutions are expected to have a positive effect on economic revival, but the effect may take time to fully materialize. Institutions, by forming the incentive structure of a society, are the underlying determinant of economic performance By reducing uncertainty and lowering transaction costs, they enhance growth. However, institutional changes, unlike first-generation reforms such as economic stabilization or tariff cuts, cannot be achieved in a short time. These second-generation reforms encompass broad restructuring of the state, the civil service, and institutions that provide an environment in which the private sector can effectively trade (strong regulation, more competition). All such reforms take years to achieve and therefore might not necessarily show up as statistically significant in the regressions.

It is expected that openness is conducive to growth—but with a caveat: True, more open economies, by allowing a country to take advantage of its comparative advantages, should grow faster. The process of exporting, combined with cheap imported inputs and machinery, should accelerate technological advances and allow countries to gain economies of scale and production. In the short run, however, more open economies could also be more vulnerable to shocks than insulated economies.

The probit results are summarized in Table 4. Column (i) is the benchmark estimation; column (ii) adds trade openness as an explanatory variable, and column (iii) includes a dummy for a fixed exchange rate regime. Growth recoveries after negative terms of trade shocks are associated with a depreciation of the real effective exchange rate, improvements in government stability, and the rule of law, as well as an increase in donor support. In particular, a real exchange rate depreciation seems to act as a shock absorber, presumably by leading to reallocation of expenditure, reducing importables and raising exportables. The exchange rate regime does not seem to have a statistically significant impact on fast recovery of growth. This suggests that what matters is the combination of the nominal exchange rate and price movements, which is captured in the real effective exchange rate.

Table 4: Probit Estimates

	(i)		(ii)		(iii)	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Δ real effective exchange rate	-0.010 ***	-0.002	-0.011 ***	-0.002	-0.012 ***	-0.002
	(0.003)		(0.003)		(0.003)	
Δ_budget balance	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)		(0.000)		(0.000)	
Δ government stability	0.148 ***	0.024	0.150 ***	0.024	0.154 ***	0.025
	(0.055)		(0.056)		(0.054)	
Δ aid	0.002 *	0.000	0.002 *	0.000	0.002 *	0.000
	(0.001)		(0.001)		(0.001)	
Δ law	-0.001	0.000	-0.001	0.000	-0.001	0.000
	(0.003)		(0.003)		(0.00)	
Δ investment	-(0.003)	-0.001	-(0.002)	0.000	-0.003	0.000
	(0.004)		(0.004)		(0.00)	
Δ trade			-0.003	0.000	-0.003	0.000
			(0.003)		(0.00)	
Δ real effective exchange rate (-1)	-0.011 ***	-0.002	-0.011 ***	-0.002	-0.011 ***	-0.002
	(0.003)		(0.004)		(0.003)	
Δ budget balance (-1)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)		(0.000)		(0.000)	
Δ government stability (-1)	0.054	0.009	0.055	0.009	0.058	0.009
	(0.049)		(0.049)		(0.048)	
Δ aid (-1)	0.002 *	0.000	0.002 *	0.000	0.002 *	0.000
	(0.001)		(0.001)		(0.001)	
Δ law (-1)	0.005 *	0.001	0.006 *	0.001	0.006 *	0.001
	(0.003)		(0.003)		(0.00)	
Δ investment (-1)	-(0.004)	-0.001	-(0.005)	-0.001	-0.005	-0.001
	(0.004)		(0.004)		(0.00)	
Δ trade (-1)			0.001	0.000	0.001	0.000
			(0.003)		(0.00)	
d_openness75	(0.000)	(0.000)	(0.000)	0.000	0.000	0.000
	(0.003)		(0.003)		(0.00)	
d_Fixed ER					-0.117	-0.018
					(0.21)	
_cons	-1.377 ***		-1.377 ***		-1.374 ***	
	(0.219)		(0.220)		(0.221)	
No. of Observations	893		885		885	
No. of Countries	61		61		61	
Pseudo-R^2	0.75		0.76		0.76	

Immediate Response Versus Medium-Term Response

To test whether there is a difference between the first two years of the adjustment to terms of trade shocks and subsequent years, we split our post shock period into two subperiods and compare years 1 and 2 (the short term) with years 3 to 5 (the medium term).[5] The response needed to kick-start the adjustment to the terms of trade shock may not be the same as what is needed to maintain growth.

Table 5: Probit Estimates: Short Run Versus Long Run

	(i)		(ii)	
	Short-Run Recovery		**Long-Run Recovery**	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Δ real effective exchange rate	-0.027 ***	-0.001	0.005	0.001
	(0.007)		(0.004)	
Δ_budget balance	0.000	0.000	0.000	0.000
	(0.000)		(0.000)	
Δ government stability	0.014	0.001	0.174 ***	0.020
	(0.089)		(0.052)	
Δ aid	0.003 *	0.000	0.000	0.000
	(0.002)		(0.001)	
Δ law	0.009 *	0.000	-0.008 ***	-0.001
	(0.005)		(0.003)	
Δ investment	0.005	0.000	-0.006	-0.001
	(0.004)		(0.005)	
Δ trade	-0.013 **	-0.001	0.011 *	0.001
	(0.005)		(0.007)	
Δ real effective exchange rate (-1)	-0.017	-0.001	-0.001	0.000
	(0.007)		(0.006)	
Δ budget balance (-1)	0.000	0.000	0.000	0.000
	(0.000)		(0.000)	
Δ government stability (-1)	-0.131 *	-0.007	0.110 *	0.013
	(0.073)		(0.061)	
Δ aid (-1)	0.003 **	0.000	0.000	0.000
	(0.001)		(0.001)	
Δ law (-1)	0.008 ***	0.000	0.002	0.000
	(0.003)		(0.004)	
Δ investment (-1)	-0.001	0.000	-0.004	-0.001
	(0.003)		(0.005)	
Δ trade (-1)	0.001	0.000	0.006	0.001
	(0.007)		(0.007)	
d_openness75	-0.001	0.000	0.001	0.000
	(0.003)		(0.003)	
_cons	-1.997 ***		-1.701 ***	
	(0.197)		(0.214)	
No. of Observations	885		885	
No. of Countries	61		61	
Pseudo-R^2	0.80		0.77	

[5] We also tested for other variations, such as comparing the first year with years 2-5 and the average of the first three years with the next two, but the results were less satisfactory.

The results (see Table 5) confirm some of the previous findings. However, some variables that matter in the short run do not seem to play a role in the medium term. While a real effective exchange rate depreciation is needed in the short run to better absorb the shock, in the medium term the effect on growth of real exchange rate depreciation fades. Furthermore, timely donor support and institutional improvements seem to be particularly supportive of growth recovery after a negative terms of trade shock. Aid helps in the short-run recovery phase, presumably by raising aggregate demand in an economy that has some slack, either through increasing government spending or raising investment rates. The fiscal policy response does not differentiate between countries that recovered and countries that stagnated or declined. Improvements in government stability appear less important in the short run but are a key factor differentiating countries that recover in the medium term from those that do not. Trade openness in the short-run estimation may have a negative sign because trade declines in the wake of a negative shock; law and order may have a negative sign because the estimation is sensitive to the specification.

Impact of Terms of Trade Across Regions

Are there regional specificities of economic growth after a terms of trade shock? To find out, we divide the sample by region, using the *World Economic Outlook* classification as our benchmark and categorizing our countries into (i) sub-Saharan Africa; (ii) Middle East; (iii) Asia-Pacific; (iv) Western Hemisphere; (v) Europe, and (vi) transition economies. Because there are few recoveries in Europe and transition economies, we focus on the first four regions. The results are displayed in Table 6.

For all regions real exchange rate depreciation after terms of trade shocks is important to revive growth. The effect is most important in sub-Saharan Africa and in the Asia-Pacific region. In the Middle East, the effect of real exchange rate depreciation occurs with a lag.

For some of the other variables there are some regional differences. Running budget surpluses seems to be good for growth in several regions, suggesting that budget surpluses generate confidence. In the Middle East the Keynesian effect seems to be important, as running budget deficits following terms of trade shocks revives growth.

In general government stability is vital to reviving growth in all regions. But whereas stability is positive in sub-Saharan Africa, the Middle East, and the Western Hemisphere, surprisingly it is negative in the Asia-Pacific region.

Institutions appear to have a positive effect on growth, though with a lag for most countries, but are not necessarily statistically significant. In several regions, more aid does not have a statistically significant effect.

Table 6: Terms of Trade Shocks and Recovery by Region

	(i)		(ii)		(iii)		(iv)	
	Sub-Saharan Africa		**Middle-East**		**Asia-Pacific**		**Western Hemisphere**	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Δ real effective exchange rate	-0.024 ***	-0.003	-0.011	-0.002	-0.020 **	-0.002	-0.006	-0.001
	(0.006)		(0.010)		(0.009)		(0.008)	
Δ_budget balance	0.001 ***	0.000	-0.001 ***	0.000	0.000	0.000	0.000 ***	0.000
	(0.000)		(0.000)		(0.000)		(0.000)	
Δ government stability	0.351 ***	0.045	0.414 ***	0.062	-0.230 **	-0.026	0.069 ***	0.012
	(0.111)		(0.140)		(0.123)		(0.026)	
Δ aid	0.004	0.001	0.004 ***	0.001	0.000	0.000	0.004	0.001
	(0.006)		(0.001)		(0.003)		(0.003)	
Δ law	0.011	0.001	-0.005 **	-0.001	-0.017	-0.002	0.003	0.000
	(0.010)		(0.002)		(0.012)		(0.003)	
Δ investment	-0.008	-0.001	-0.002	0.000	-0.005	-0.001	-0.002	0.000
	(0.013)		(0.007)		(0.019)		(0.004)	
Δ trade	-0.015 *	-0.002	-0.001	0.000	-0.023 ***	-0.003	0.001	0.000
	(0.008)		(0.006)		(0.005)		(0.005)	
Δ real effective exchange rate (-1)	-0.018 ***	-0.002	-0.017 **	-0.003	-0.030 **	-0.003	-0.010	-0.002
	(0.006)		(0.007)		(0.014)		(0.010)	
Δ budget balance (-1)	0.001 ***	0.000	-0.001 ***	0.000	0.000	0.000	0.000 *	0.000
	(0.000)		(0.000)		(0.000)		(0.000)	
Δ government stability (-1)	-0.121	-0.015	0.317 ***	0.047	-0.174 **	-0.020	-0.042	-0.007
	(0.132)		(0.064)		(0.083)		(0.045)	
Δ aid (-1)	0.006	0.001	0.003	0.000	0.003	0.000	0.001	0.000
	(0.006)		(0.003)		(0.002)		(0.002)	
Δ law (-1)	0.020 **	0.003	0.002	0.000	-0.003	0.000	0.004	0.001
	(0.009)		(0.011)		(0.007)		(0.006)	
Δ investment (-1)	-0.019	-0.002	-0.006	-0.001	-0.011	-0.001	0.001	0.000
	(0.015)		(0.005)		(0.007)		(0.002)	
Δ trade (-1)	-0.006	-0.001	0.007	0.001	-0.039 ***	-0.004	0.001	0.000
	(0.005)		(0.005)		(0.011)		(0.005)	
d_openness75	-0.004	0.000	0.005	0.001	0.001	0.000	0.006	0.001
	(0.007)		(0.013)		(0.016)		(0.007)	
_cons	-1.364 ***		-1.906 **		-1.471		-1.577 ***	
	(0.475)		(0.867)		(1.418)		(0.402)	
No. of Observations	148		213		94		218	
No. of Countries	10		13		7		16	
Pseudo-R^2	0.82		0.73		0.83		0.76	

Declining Growth

We carried out a robustness test for our findings by redefining the dependent variable to test what explains declines in growth after terms of trade shocks (see Reddy and Minoiu, 2007). The dependent variable takes the value of 1 if the average growth rate was at least 1 percentage point lower after the terms of trade shock than before. An alternative specification is to look at periods where average growth after the negative shock was below average growth before. None of the variables seem to explain slow growth after the shock in countries where growth stagnated or declined (Table 7). Most importantly, the real exchange rate did not depreciate compared to countries where it recovered. However, most of the explanatory variables that helped explain growth recovery are not statistically significant. However, countries that did not recover seem to have received more aid, possibly emergency assistance. Because the sample size is small in some cases, developments in a few countries may be driving the results.

Table 7: Probit Estimates: Robustness Tests

	(i)		**(ii)**	
	Average Growth Less than Before shock		**Average Growth at Least 1 Percent Lower than Before**	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Δ real effective exchange rate	0.003	0.000	0.004	0.000
	(0.005)		(0.006)	
Δ_budget balance	0.000	0.000	0.000	0.000
	(0.000)		(0.000)	
Δ government stability	0.055	0.007	-0.008	-0.001
	(0.053)		(0.053)	
Δ aid	0.001	0.000	0.001	0.000
	(0.001)		(0.001)	
Δ trade	-0.002	0.000	-0.002	0.000
	(0.004)		(0.004)	
Δ law	-0.002	0.000	-0.001	0.000
	(0.004)		(0.006)	
Δ real effective exchange rate (-1)	-0.004	0.000	-0.006	-0.001
	(0.003)		(0.004)	
Δ budget balance (-1)	0.000 *	0.000	0.000	0.000
	(0.000)		(0.000)	
Δ government stability (-1)	0.083 *	0.010	0.040	0.004
	(0.043)		(0.040)	
Δ aid (-1)	0.001 *	0.000	0.001 *	0.000
	(0.001)		(0.001)	
Δ trade (-1)	-0.004	0.000	-0.004	0.000
	(0.004)		(0.005)	
Δ law (-1)	0.000	0.000	0.000	0.000
	(0.003)		(0.004)	
_cons	-1.539 ***		-1.702 ***	
	(0.122)		(0.139)	
No. of Observations	1,050		1,050	
No. of Countries	80		80	
Pseudo-R^2	0.62		0.77	

V. Policy Conclusions

Terms of trade shocks are more frequent in developing countries than in advanced economies. Though persistent negative terms of trade shocks tend to reduce income, some countries have been very successful in absorbing shocks and have even managed to increase growth. After a decline of 10 percent or more in the terms of trade, in a third of the cases average real GDP growth increased by at least 1 percentage point compared with the pre-shock average. Growth recoveries after negative terms of trade shocks are robustly related to real exchange rate depreciation and improvements in government stability and institutions. Timely donor support is also conducive to absorbing the shock. A real depreciation of the exchange rate is possibly the most important determinant and particularly critical immediately after a persistent negative terms of trade shock—it is the change in the real exchange rate that matters, rather than the exchange rate regime per se. In the medium term, as growth rises the real effective exchange rate will likely recover.

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Appendix 1: Data Source

TABLE 1: DATA-SOURCE

VARIABLE	Description	Source
GDP per Capita:	Real GDP per capita	WEO
Terms of Trade:	Trade in goods (% of GDP)	WDI
Aid:	Aid as a share of GNI/Aid per capita	WDI
Human Capital:	school enrollment, secondary (% net)	WDI
Investment:	Gross Fixed Capital Investment	WDI
Budget Deficit:	Budget Deficit/GDP	WEO
Financial Development:	Liquid Liability in % of GDP, Domestic credit to private sector (% of GDP)	WDI
Openness:	Export and Imports/GDP	WEO
Civil Liberties:	Freedom House Index	www.freedomhouse.org
Institutions:	Law and Order	International Country Risk Guide
Consumer Price Index:	Consumer price index (1995 = 100)	WDI
Exchange Rate Classification	De Jure Classification	IMF
Government Stability	Likelihood that government will be destabilized or overthrown by possibly unconstitutional and/or violent means, including domestic violence and terrorism	www.worldbank.org/wbi/governance
Exchange Rate:	Real Exchange Rate/Nominal Exchange Rate	IFS

Appendix II: Transmission Mechanism of Terms of Trade Shocks across the Economy

While the textbook model described in the body of the paper provides a framework for structural adjustment within the economy, the reality is often very disruptive. The transmission mechanism of terms of trade shocks at the micro-level can best be analyzed in terms of the private sector, the banking system, and the public sector.

Analyzing the adjustment to terms of trade shocks this way can easily explain why adjustments are seldom smooth. To grow after a terms of trade shock an economy needs to be flexible, and resources need to be allocated rapidly to reflect the new relative prices. Frictions within the private sector, the banking system, and the public sector, combined with the suboptimal reaction of economic agents and government, can explain part of the mystery.

Private Sector: Terms of trade shocks affect the actions of the private sector. After a negative shock, former investments may no longer be profitable enough to continue operating, particularly in the export sector, and may have to be scrapped, thereby reducing the capital stock. Given that tradables (manufacturing) are often considered to be more productive than nontradables and hence better for long-term income growth, a country will specialize in less productive sectors. Uncertainty can rise to such an extent that investment becomes unattractive for a given level of risk.

Banking System: The banking system is often a victim of terms of trade shocks. During negative shocks, a contraction in deposits can also destabilize it. If banks lack liquidity, they will have to lend less, thereby straining borrowers, both investors and consumers affected by the income shock.

Even positive terms of trade shocks can destabilize the banking system. A positive shock leads to an increase in domestic deposits as part of the income from the terms of trade improvement is saved. This increase in bank deposits often leads to a destabilizing lending boom. The result of often a financial crisis.

Public Sector: Terms of trade shocks are often felt directly in the public sector, either because the government is a direct owner of the commodity or indirectly via the tax revenue change brought about by a change in economic activity. Historically, policymakers have made the mistake of assuming (or at least acting as if they assumed) that positive terms of trade shocks are permanent and negative shocks are transitory. As a result, contrary to textbook theory, the fiscal response is often procyclical. When governments obtain a large increase in revenue, they should ideally save it. In practice, there is pressure to spend the windfall. During negative shocks, governments are often unable to borrow, obliging them to cut back on spending.