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The initial impact of the crisis on emerging market countries

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Introduction

One of the striking characteristics of the crisis is how quickly and how broadly it spread from the United States to the rest of the world. When the financial crisis intensified first in the United States, and then in Europe, in the fall of 2008, emerging market countries thought they might escape more or less unharmed. There was talk of decoupling. This was not to be.

Figure 1 shows growth rates for advanced countries and emerging market countries from the first quarter of 2006 on.¹ Note how the two lines have moved together. In the fourth quarter of 2008 and the first quarter of 2009, advanced country growth was -7.2% and -8.3% respectively (at annual rates). In the same two quarters, emerging country growth was -1.9% and -3.2% respectively. As the figure shows, the better numbers for emerging countries reflect their underlying higher average growth rate. In both cases, growth rates during those two quarters were roughly 10 percentage points below their 2007 value.

Figure 1. Growth in advanced and emerging countries, 2006:1 to 2009:4

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1. The group of advanced countries includes 17 countries. The group of emerging market countries includes 29 countries. The list of countries in the second group, which is the group of countries we focus on primarily in the paper, is given in the appendix.

The parallel lines in Figure 1 hide however substantial heterogeneity within each group. Figure 2 shows, for each emerging market country, the actual growth rate for the semester composed of the two quarters with large negative growth, 2008:4 and 2009:1, minus the IMF forecast for the growth rate over the corresponding period, as of April 2008—*unexpected growth rates in what follows*. All the countries in the sample had negative unexpected growth, but with considerable variation across countries. In seven countries, including countries as diverse as Latvia and Turkey, growth was lower than forecast by more than 20% (at an annual rate); at the same time, in five countries, China and India most notable among them, the unexpected growth shortfall was smaller than 5%. (Looking at growth rates themselves, or at deviations of growth rates from trend rates gives a very similar ordering.)

Figure 2. Unexpected growth rates in emerging market countries, 2008:3 to 2009:1.

Figure 2 motivates the question we take up in this paper, namely whether one can explain the diverse pattern of growth across emerging market countries during the crisis. The larger goal is an obvious one, to understand better the role and the nature of trade and financial channels in the transmission of shocks in the global economy.

We focus on emerging market countries. We leave out low income countries, not on the basis of their economic characteristics, but because they typically do not have the quarterly data we think are needed to look at the impact effects of the crisis. We focus only on the acute part of the crisis, namely 2008:4 and 2009:1. Looking at later quarters, which, in most countries, are now characterized by positive growth and recovery, would be useful, even to understand what happened in the acute phase of the crisis. But, for data and scope reasons, we leave this to further research.²

We start by presenting a simple model in Section I. It is clear that emerging market countries were affected primarily by external shocks, mainly through

2. Other studies that attempt to explain differences across countries, include Lane and Milesi-Ferretti (2009), Giannone et al (2009), Berkmen et al (2009), Rose and Spiegel (2009a,b). These studies typically use annual data, either for just 2008 or for 2008 and 2009, and a larger sample of countries than we do. For differences across emerging European countries, see Bakker and Gulde (2009), and Berglof et al (2009). A parallel and larger effort within the IMF (2010), with more of a focus on policy implications, is being currently conducted. We relate our results to the various published studies below.

two channels. The first was a sharp decrease in their exports, and, in the case of commodity producers, a sharp drop in their terms of trade. The second was a sharp decrease in net capital flows. Countries were exposed in various ways; some were very open to trade, others not; some had large short-term external debt or large current account deficits, or both, others not; some had large foreign currency debt, others not. They also reacted in different ways, most relying on some fiscal expansion and some monetary easing, some using reserves to maintain the exchange rate, others instead letting it adjust. The model we provide is little more than a place holder, but a useful way to discuss the various channels and the potential role of policy, and to organize the empirical work.

We then turn to the empirical evidence, through both econometrics and case studies.

We start with simple cross-country specifications, linking unexpected growth over the two quarters to various trade and financial variables. With at most twenty nine observations in each regression, there is only so much econometrics can tell us. But the role of both factors comes out clearly. The most significantly robust variable is short-term external debt, suggesting a central role for the financial channel. Trade variables also clearly matter, although the relation is not as tight as one might have expected. Starting from this simple specification, we explore a number of issues, such as the role of reserves. Surprisingly, we find little econometric evidence in support of the hypothesis that high reserves limited the decline in output in the crisis.

We finally turn to case studies. We look at Latvia, Russia, and Chile. Latvia was primarily affected by a financial shock, Chile mostly by a sharp decrease in the terms of trade, Russia by both strong financial and terms of trade shocks. Latvia and Russia suffered large declines in output. The effect on Chile was milder. Together, the country studies give a better understanding of the ways in which initial conditions, together with the specific structure of the financial sector, the specific nature of the capital flows, and the specific policy actions, shaped the effects of the crisis in each country.

1 A model

To organize thoughts, we start with a standard short-run open-economy model, modified however in two important ways. First, to capture the effects of shifts

in capital flows, we allow for imperfect capital mobility. Second, we allow for potentially contractionary effects of a depreciation, coming from foreign currency debt exposure.

The model is shamelessly ad-hoc, static, and with little role for expectations.³ Our excuse for the ad-hoc nature of the model is that micro foundations for all the complex mechanisms we want to capture are surely not available yet, and they would make for a complicated model. Our excuse for the lack of dynamics is that we focus on the impact effects of the shocks, rather than on their dynamic effects. Our excuse for ignoring expectations is that the direct effect of lower exports and lower capital flows probably dominated expectational effects, but this excuse is admittedly poor; as we shall see, an initial quasi peg, coupled with anticipations of a future depreciation initially aggravated capital outflows in Russia in the fall of 2008, making the crisis worse.

The model is composed of two relations, one characterizing balance of payments equilibrium, the other goods market equilibrium.

Balance of payments equilibrium

Balance of payments equilibrium requires that the trade deficit be financed either by net capital flows or by a change in reserves.

Take capital flows first. Consider three different interest rates:

- The policy (riskless) interest rate, denoted by r (given our focus on the short run, we assume constant domestic and foreign price levels, thus zero domestic and foreign inflation, and so we make no distinction between nominal and real interest rates).
- The interest rate at which domestic borrowers (firms, people, and the government; we make no distinction between them in the model) can borrow, denoted by \hat{r} . Assume that $\hat{r} = r + x$, where x is the risk premium required by domestic lenders.

Think of the United States as the foreign country, and thus the dollar as the foreign currency. We assume that the exchange rate is expected to be constant, so \hat{r} is also the domestic dollar rate.⁴

3. A model in the same spirit as ours, but with more explicit micro foundations and a tighter scope, is developed in Cespedes et al (2004).

4. If the exchange rate was expected to change, then the domestic dollar rate would be given

- The U.S. dollar rate, i.e. the rate at which foreign investors can lend to foreign borrowers abroad, denoted r^* . $\hat{r} - r^*$ is usually referred to as the EMBI (“emerging market bond index”) spread.

Assume that all foreign borrowing is in dollars, so foreign investors have the choice between foreign and domestic dollar assets. Let D be debt vis-à-vis the rest of the world, expressed in dollars. Assume then that net capital inflows, expressed in dollars, denoted by F (capital inflows minus capital outflows and interest payments on the debt), are given by:

$$F = F(\hat{r} - r^* - (1 + \theta)x, D) \quad \delta F / \delta(\hat{r} - r^* - (1 + \theta)x) > 0, \quad \delta F / \delta D < 0, \quad \theta > 0$$

Net capital inflows depend on the EMBI spread, adjusted for a risk premium.

The assumption that θ is positive captures the home bias of foreign investors, who are assumed to be the marginal investors.⁵ When risk increases, foreign investors, if they are to maintain the same level of capital flows, require a larger increase in the premium than domestic investors.

Net capital inflows also depend, negatively, on foreign debt. To think about the dependence of F on D , assume for example that a proportion a of the debt is short-term debt, i.e. debt due this period, and that the rollover rate is given by b . Then, in the absence of other inflows, net capital flows are given by $-(a(1 - b) + \hat{r})D$. Thus, the higher the debt, or the higher the proportion of short-term debt, or the lower the rollover rate, the larger net capital outflows.

Using the relation between \hat{r} and r , net capital flows are given by:

$$F = F(r - r^* - \theta x, D) \tag{1}$$

by \hat{r} plus expected depreciation. This, in turn, would introduce a dependence of net flows, introduced below, to the expected change in the exchange rate.

5. As we shall see from the country studies later, the increase in capital outflows by foreigners was sometimes offset by a symmetric increase in capital inflows by domestic residents (such as in Chile), and sometimes instead reinforced by an increase in capital outflows by domestic residents (such as in Russia). The case where the increase in capital outflows was more than offset by the increase in capital inflows can be captured in our model by assuming a negative value for θ . But to dig deeper would require introducing explicitly and separately gross flows by domestic and foreign investors, each group with its own perception of risk at home and abroad.

For a given policy rate and a given U.S. dollar rate, an increase in perceived risk, or an increase in home bias, reduce net capital flows.

Turn to net exports. Normalize both the domestic and the foreign price levels, which we have assumed to be constant, to equal one. Let e be the nominal exchange rate, defined as the price of domestic currency in terms of dollars, or equivalently, given our normalization, the price of domestic goods in terms of U.S. goods. An increase in e represents a (nominal and real) appreciation. Assume that net exports, in terms of domestic goods, are given by

$$NX = NX(e, Y, Y^*), \quad \delta NX / \delta Y < 0, \quad \delta NX / \delta Y^* > 0$$

A decrease in activity leads to a decrease in imports, and an improvement in net exports; a decrease in foreign activity leads to a decrease in exports, and thus a decrease in net exports. While the Marshall-Lerner condition (ML condition in what follows) is likely to hold over the medium run, it may well not hold over the short run (we are looking at the quarter of the shock, and the quarter just following the shock)⁶; thus we do not sign the effect of a depreciation on net exports.

In a number of commodity exporting countries, the adverse trade effects of the crisis took the form of large decreases in commodity prices rather than a sharp decrease in exports; for our purposes, these shocks have similar effects. Thus, we do not introduce terms of trade shocks formally in the model.

Let R be the level of foreign reserves, expressed in dollars, equivalently in terms of foreign goods. The balance of payments equilibrium condition is thus given by:

$$F(r - r^* - \theta x, D) + e NX(e, Y, Y^*) = \Delta R \quad (2)$$

A trade deficit must be financed either through net capital inflows or through a decrease in reserves.

6. The Marshall-Lerner condition is the condition that, given domestic and foreign output, a depreciation improves the trade balance.

Goods market equilibrium

Assume that equilibrium in the goods market is given by:

$$Y = A(Y, r + x, D/e) + G + NX(e, Y, Y^*), \quad (3)$$

where A is domestic private demand, and G is government spending. A depends positively on income Y , negatively on the domestic borrowing rate $r + x$, and negatively on foreign debt expressed in terms of domestic goods, D/e . This last term captures foreign currency exposure and balance sheet effects: The higher the foreign debt (which we have assumed to be dollar debt), the larger the increase in the real value of debt from a depreciation, and the stronger the adverse effect on output.

Note that the net effect of the exchange rate on demand is ambiguous. A depreciation may or may not increase net exports, depending on whether the ML condition holds. A depreciation decreases domestic demand, through balance sheet effects. If the ML condition holds, and the balance sheet effect is weak, the net effect of a depreciation is to increase demand. But, if either the ML condition fails, or the ML condition holds but is dominated by the balance sheet effect, the net effect of a depreciation is to decrease demand. A depreciation is contractionary.

Equilibrium and the effects of adverse financial and trade shocks

It is easiest to characterize the equilibrium graphically in the exchange rate–output space, and we do so in Figure 3. There are three possible configurations, depending on whether the ML condition is satisfied (this determines the slope of the balance of payments relation, BP), and whether, even if the ML condition is satisfied, the net effect of a depreciation is expansionary or contractionary (this determines the slope of the goods market relation, IS). We draw the BP and the IS relations in Figure 3 under the assumptions that the ML condition is satisfied, but that the net effect of a depreciation is contractionary. We discuss the implications of the other cases in the text later.

For given exogenous variables, the balance of payments equation implies a negative relation between the exchange rate, e , and output, Y . As capital flows depend neither on e nor on Y , and for unchanged reserves ($\Delta R = 0$), the

BP relation implies that the trade balance must remain constant. Under the assumption that the ML condition is satisfied, the BP relation is downward sloping: An increase in output, which leads to a deterioration of the trade balance, must be offset by a depreciation, which improves the trade balance.⁷

For given exogenous variables, the goods market equilibrium equation implies a positive relation between the exchange rate e and output Y . Under our assumption that the positive effect of a depreciation on net exports is dominated by the adverse balance sheet on private domestic demand, a depreciation leads to a decrease in output. The IS relation is upward sloping. The larger is foreign debt, the stronger is the balance sheet effect, the stronger is the adverse effect of a depreciation on output, thus the flatter is the IS curve.

Figure 3. Equilibrium Output and Exchange Rate

Equilibrium is given by point A in Figure 3. Having characterized the equilibrium, we can now look at the effects of different shocks and the role of policy.

We can think of countries during the crisis as being affected through two main channels: A financial channel, either through an increase in the financial home bias of foreign investors, θ , or through an increase in perceived risk x , or both; a trade channel, through a sharp decrease in foreign output, Y^* , and thus a decrease in exports. Consider them in turn.

Consider first an *increase in home bias*. This was clearly a central factor in the crisis, as the need for liquidity led many investors and financial institutions in advanced countries to reduce their foreign lending. The effect of an increase in θ is shown in Figure 4. For a given policy rate and unchanged reserves, net capital flows decrease, and so must the trade balance. This requires a decrease in output at a given exchange rate, and so, the BP relation shifts to the left. The IS relation remains unchanged. The new equilibrium is at point A' . The exchange rate depreciates, and output decreases. The stronger is the balance sheet effect, the flatter is the IS, and thus the larger is the decrease in output.

Consider next an *increase in perceived risk*, surely another important factor in the crisis.⁸ Indeed, in many cases, it is difficult to separate how much of the outflows was due to increased home bias, and how much was due to increases in

7. Differentiation is carried out around a zero initial trade balance.

8. See for example Kannan and Koehler-Geib (2009).

perceived risk. The analysis is very similar to that of an increase in home bias, with one difference. The difference is that, while an increase in home bias affects directly only net capital flows, an increase in perceived risk directly affects both net capital flows and domestic demand: A higher risk premium increases the domestic borrowing rate, leading to a decrease in domestic demand, and through that channel, a decrease in output. Thus, both the IS and the BP relations shift to the left, and the equilibrium moves from point A to point A". Output unambiguously decreases, while the exchange rate may appreciate or depreciate. The higher is the level of debt, the flatter the IS, and the larger the decrease in output.

Figure 4. The effects of an increase in home bias, or an increase in perceived risk.

Finally, consider an adverse trade shock, namely a *decrease in foreign output*. Again, sharp decreases in exports (and, for commodity producers, large adverse terms of trade shocks) were a central factor in the crisis. Under our stark assumption that net flows do not depend on the exchange rate and, at this stage, the maintained assumption of unchanged policy settings, the BP relation implies that net capital flows must remain the same, and so, by implication, must net exports. At a given exchange rate, this requires a decrease in imports, and thus a decrease in output. The BP relation shifts to the left. The IS relation also shifts, and it is easy to check that, for a given exchange rate, it shifts by less than the BP relation. In Figure 5, the equilibrium moves from point A to point A'. Output is lower, and the exchange rate depreciates. Again here, the higher is the debt level, the flatter the IS relation, and the larger the adverse effect of the trade shock on output.

Figure 5. The effects of a decrease in foreign output.

Note that both financial shocks (an increase in home bias or in uncertainty) force an improvement in the trade balance. Under our assumptions and no policy reaction, our model implies that trade shocks have no effect on the trade balance. More realistically, if we think that part of the trade deficit is financed through reserve decumulation, trade shocks lead to a deterioration of the trade

balance. This suggests a simple examination of the data, looking at the distribution of trade balance changes across countries. This is done in Figure 6, which plots growth over 2008:3 to 2009:1 against the change in the trade balance divided by 2007 GDP. As raw as it is, the figure suggests a dominant role of financial shocks in most countries, in particular in some Baltic countries, with trade shocks playing an important role in Venezuela, and Russia (in both cases, more through terms of trade effects than through a sharp drop in net exports).

Figure 6. Financial or Trade Shocks? Changes in the trade balance.

We have so far looked at only one of the equilibrium configurations. We briefly describe the other two.

Consider the case where the ML condition holds, so a depreciation improves the trade balance, and the balance sheet effects are weak, so a depreciation is expansionary.⁹ In this case, an increase in home bias actually *increases output*. The reason is simple: absent a policy reaction, lower capital flows force a depreciation, and the depreciation increases demand and output. This is a very standard result, but one that seems at odds with reality, probably because lower capital flows affect demand through channels other than the exchange rate. Indeed, if the adverse capital flows reflect also in part an increase in perceived risk, the effect on output becomes ambiguous: the favorable effects of the depreciation may be more than offset by the adverse effect of higher borrowing rates on domestic demand. Trade shocks, just as in the case examined above, lead to a decrease in output.

Consider last the case where the ML condition does not hold, so a devaluation leads to a deterioration of the trade balance, and the balance sheet are strong, so a devaluation is contractionary.¹⁰ In this case, all the previous results hold, but the decrease in output and the depreciation effects are even stronger. Adverse shocks can lead to very large adverse effects on output, and very large depreciations. Indeed a condition, which puts bounds on the size of the balance sheet effect and the violation of the ML condition is needed to get reasonable

9. In this case, both the IS and BP relations are both downward sloping. The IS is necessarily steeper than the BP relation.

10. In this case, both the IS and the BP relations slope up.

comparative statics.¹¹

The role and the complexity of policies

The analysis so far assumed unchanged policies. This has not been the case in reality, as one of the characteristics of this crisis was the active use of monetary and fiscal policies. The model allows us to think about the effects of interest rate and exchange rate policies—equivalently the effects of using the policy rate, or/and reserve decumulation—and fiscal policy. A full taxonomy of the effects of each policy in each of the configurations would again tax the reader. The main insights, and, in particular, a sense of the complexity of using policy in this environment, can however be given easily.¹²

Return to the case of an increase in perceived risk which, in the absence of a policy response, leads to a decrease in capital flows, a depreciation, and, we shall assume, a decrease in output (which we argued is the most likely outcome). One policy option is to increase the policy rate, thus reducing capital outflows, but also adversely affecting domestic demand. If the elasticity of flows to the domestic dollar rate is small, which appears to be the case in financial crises, the net effect is likely to decrease rather than increase output. If reserves are available, then using reserves to offset the decrease in capital flows, and sterilizing so as to leave the policy rate unchanged, can avoid the depreciation. If a depreciation is contractionary, this is a good thing. But the direct effect of higher perceived risk on the domestic borrowing rate, and thus on domestic demand, remains, and so output still declines. Thus, to maintain output, sterilized intervention must be combined with expansionary fiscal policy.

Consider next a decrease in foreign output, which, in the absence of a policy response, leads to a depreciation and a decrease in output. An increase in the policy rate, to the extent that it increases net capital flows, allows for a smaller depreciation, and thus lower adverse balance sheet effects. But a smaller depreciation also leads to lower net exports, and a higher policy rate leads to lower

11. The condition (which is always satisfied if the ML condition holds) is the following:

$$NX_e < ((A_D D / e^2) NX_Y) / (1 - A_Y)$$

Graphically, with the exchange rate on the vertical axis, and output on the horizontal axis, this requires that the slope of the (upward sloping) IS curve be less than the (upward sloping) BP curve.

12. Much of this complexity will not surprise those familiar with the earlier Latin American and Asian crises.

domestic demand. The net effect of these three forces may well be a larger decrease in output. To the extent that reserves are available, sterilized intervention avoids the adverse effect of a higher policy rate on output, but the lower net exports may still lead to a decrease in output. In that case, to maintain output, sterilized intervention needs again to be used in conjunction with fiscal policy.

If the policy implications feel complicated, it is because they are. Whether, faced with a given shock, a country is better off maintaining the exchange rate depends, among other factors, on the tools it uses, the policy rate or reserve decumulation, and the strength of the balance sheet effects it is trying to avoid, and thus the level of dollar denominated liabilities.

In this context, it is useful to note that foreign debt affects the adjustment in two ways. We have focused so far on the first, through balance sheet effects on spending. What matters there is the total amount of foreign currency denominated debt. The second is through its effects on the change in capital flows. What matters here is the amount of debt which needs to be refinanced in the short run. The effect then depends on whether, for a given financial shock—be it an increase in home bias or higher uncertainty—a higher level of initial debt leads to a larger decrease in capital flows. Such a second cross-derivative effect is indeed likely: Take the example we gave earlier showing how debt is likely to affect capital flows. Suppose, in that example, that an increase in home bias leads investors to decrease the rollover rate. In this case, the higher the debt, the higher will be the decrease in capital flows, the more drastic the required trade balance adjustment. By a similar argument, the larger the current account deficit, and thus the larger the capital flows before the crisis, the larger the required trade balance adjustment.

To summarize: The model has shown how adverse financial and trade shocks are all likely to decrease output, while having different effects on the current account balance. Combinations of reserve decumulation and fiscal expansion can help reduce the decrease in output, but how much they can be used clearly depends on the initial level of reserves and fiscal space. The model also suggests a number of interactions between initial conditions and the effects of the shocks on output. Larger foreign debt in particular, both through its implications on net capital flows and through balance sheet effects, is likely to amplify the effects of the shocks. With the model and its implications as a rough guide, we now turn to the empirical evidence.

2 Econometric Evidence

The evidence points to two main shocks, trade and financial flows. While our focus is on whether we can explain differences across countries, it is useful to start by looking at global evolutions.

Global evolutions

Figure 7 plots the evolution of the growth of the volume of world exports against the growth rate of world output, from 1996:1 to 2009:2. The scale for output growth is given on the right side, the scale for world exports on the left side.

The figure yields two conclusions: First, the parallel collapse of both output and trade during the crisis is striking. Second, the comovement in the crisis does not seem unusual however. This second conclusion has been the subject of much controversy and substantial research already. The figure indicates that, for the two quarters we are focusing on, the growth of output (at annual rates) was -6%, the growth of world exports was -30%, implying an elasticity around 5. The question is whether this elasticity is unusually large, and, if so, why. Historical evidence suggests that this elasticity has been increasing over time, rising from around 2 in the 1960s to close to 4 in the 2000s (using data up to 2005).¹³ This suggests that the response of trade to output in this crisis was higher, but not much higher than expected.

Three main hypotheses for why it was higher have been explored. The first one is trade finance constraints. The second is composition effects: the large increase in uncertainty that characterized the crisis led to a larger decrease in durables consumption and in investment than in a standard recession. Both of these components have a high import content, so that, for a given decrease in GDP, the effect on imports was larger. The third is the presence of production chains across countries, combined with inventory behavior. Uncertainty led firms to cut production and rely more on inventories of intermediate goods than in a standard recession, leading to a larger decrease in imports.¹⁴ We read the evidence is mostly supportive of the last two explanations.

Figure 7. The Collapse of Trade

13. Freund (2009), WEO 2009.

14. On trade finance, see Auboin (2009). On composition effects, see Levchenko et al (2009), and Bems et al (2009). On inventory adjustment, see Alessandria et al (2009).

The left side of Figure 8 plots the evolution of net private capital flows to various groups of emerging markets; the right side plots the change in cross border bank liabilities of various groups of emerging market countries. Both are measured in billions of dollars, from 2006:1 to 2009:2. The figure documents the sharp downturn of net flows, from large and positive before the crisis, to large and negative during the two quarters we are focusing on. It also shows the sharp difference across emerging market countries, with the brunt of the decrease affecting emerging Europe, and to a lesser extent emerging Asia.

Figure 8. The Collapse of Capital Flows

Having shown the evolution of aggregates, we now turn to the heterogeneity of country evolutions.

A benchmark specification. Growth, Trade, and Debt

In our econometric work, we focus on 29 emerging market countries. The sample is geographically diverse—covering parts of Central and Eastern Europe, Emerging Asia, Latin America, and Africa (i.e., South Africa).¹⁵

Our benchmark specification focuses on the relation of unexpected growth, i.e. the forecast error for output growth during the semester composed of 2008:4 and 2009:1 to a simple trade variable and a simple financial variable. Using the unexpected component of growth allows us to separate out the impact of the crisis from domestic trends that were already in place in countries leading up to the fourth quarter of 2008.¹⁶

15. The countries are Argentina, Brazil, Chile, China, Columbia, Croatia, the Czech Republic, Estonia, Hungary, India, Indonesia, Israel, Korea, Latvia, Lithuania, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Serbia, Slovakia, Slovenia, South Africa, Taiwan Province of China, Thailand, Turkey, and Venezuela. The sample is the union of all the countries classified as "emerging and developing" in the *World Economic Outlook (WEO)* and those classified as either *emerging markets* or *frontier markets* in the Standard and Poor Emerging Market Data Base (EMDB), for which we have quarterly GDP data and quarterly GDP IMF forecasts.

16. We have also explored the relation using two larger data sets. The first is a set of 33 emerging markets, for which quarterly data on GDP are available but forecasts are not; in that case, we used demeaned growth as the dependent variable, constructed as growth minus mean growth over 1995-2007. The second is a set of 36 countries, for which quarterly data on IP can be used to create an interpolated series for quarterly GDP. The results, which are available in an online appendix are largely similar to those presented here.

We consider two trade variables. The first captures trade exposure defined as the export share, measured as a percentage of GDP for 2007: More open countries are likely to be exposed to a larger trade shock. The second is unexpected partner growth, defined as the trade-weighted average of actual growth (using export weights) minus the corresponding forecast, scaled by the export share in GDP: For a given export share, the worse the output performance of the countries to which a country exports, the worse the trade shock.¹⁷

Figure 9 shows scatter plots of unexpected growth against the export share on the left side, and against unexpected partner growth on the right side. The fit with the export share is poor. It is stronger with partner growth. A cross country regression delivers an R^2 of 0.22, and implies that a decrease in unexpected partner growth of 1% is associated with a decrease in domestic growth of about 1.5%.

Figure 9. Growth, Export Share, and Partner Growth

We consider two financial variables, which both aim at capturing financial exposure. The first is foreign debt, or more specifically the ratio of short-term foreign debt to GDP in 2007. Short-term debt is defined as liabilities coming due in the following twelve months, including long-term debt with maturity one year or less. The second is the ratio of the current account deficit to GDP for 2007. The rationale, from our model, is that the larger the initial short-term debt, or the larger the initial current account deficit, the larger the likely adverse effects of a financial shock.¹⁸

Figure 10 shows scatter plots of growth against short-term debt on the left side, and against the current account deficit on the right side. There is a strong relation between short-term debt and growth. A cross country regression yields

17. A caveat: If exports to another country are part of a value chain, and thus later reexported, what matters is not so much the growth rate of the first importing country, but the growth rate of the eventual country of destination. That this is relevant is illustrated by the case of Taiwan, whose exports to China are largely reexported to other markets. The decrease in its exports to China in 2008:1 was 50% (at an annual rate), much larger than can be explained by the mild slowdown in growth in China during that quarter.

18. Ideally, one would want to construct a variable conceptually symmetrical to that used for trade, namely a weighted average of financial inflows into partner countries, using relative bilateral debt positions as weights, and scaling by the ratio of foreign liabilities to GDP. Relative bilateral debt positions are not available however, and so the variable cannot be constructed.

an R^2 of 0.41, and implies that an increase of ten percentage points of the ratio of debt to GDP decreases growth by 3.3% (at an annual rate). The relation remains when the Baltic states are removed from the sample. There is a relation between growth and the initial current account deficit, but it is much weaker than for short-term debt.

Figure 10. Growth, Short-term Debt, and the Current Account Deficit

Bivariate scatter plots take us only so far. Table 1, shows the results of simple cross country multivariate regressions, with unexpected growth as the dependent variable, and one of the trade and one of the financial measures as independent variables. The table yields the following conclusions:

The export share is correctly signed, but only weakly significant. Partner growth is also correctly signed and typically significant. Short-term debt is always strongly significant. When the current account deficit is introduced as the only “financial” variable, it has the predicted sign and is significant.¹⁹ When introduced in addition to short-term debt however, it is no longer significant; and when the financial variable is taken to be the sum of debt and the deficit (i.e., the short-term financing requirement), the coefficient is less negative than that on short-term debt alone.

The estimated constant (which should be equal to zero if we assumed that a country with no trade and no foreign debt would have been immune to the crisis) is negative and significant. This suggests that some of the average output decline during the crisis is not explained by right-hand side variables.

Nevertheless, these baseline regressions suggest that indeed trade and financial shocks can explain a good part of the heterogeneity. Using results from column 2, Figure 11 decomposes unexpected growth variation across countries (relative to the sample average)—similar to what is shown in Figure 2—into the sum of explained variation, due to partner growth and short-term debt, and the residual. While, in general, countries with worse outcomes had larger debt (this is especially true of the Baltic states) and a larger decline in exports, it is clear that the outcome in some countries (Turkey, or Russia for example) is largely left unexplained by the regression.

19. The use of quotes for “financial” is due to the fact that, when referring to the current account deficit here, we think of its mirror image, the financial account surplus.

We shall, in what follows, use the regression reported in column 2, with partner growth and short-term debt as the explanatory variables, as our baseline. It implies that an increase in the ratio of short-term debt to GDP of ten percentage points leads to a decrease in growth of 2.8%, a decrease in unexpected partner growth of 1% an effect of 2.72% (much smaller than in the bivariate regression). The magnitude of the short-term debt effect appears to be consistent with other studies.²⁰

Next, we explore alternative measures for both trade and financial variables, as well as the effect of institutions and policies. Given the small number of observations, one should be realistic about what can be learned. But, as we shall show, some results are suggestive and interesting.

Table 1. Growth, Trade, Short-term debt, and Current Account Deficits

Alternative Trade Measures

We explored a number of alternative or additional trade measures. The bottom line is that no variable appears strongly significant, and no specification obviously dominates our baseline regression.²¹ Here is a brief summary of results.

The trade variable we use in the baseline does not capture changes in terms of trade. For many countries however, the crisis was associated with a dramatic decline in the terms of trade. Oil prices, for example, dropped by 60% during the crisis semester, relative to the previous semester. Thus, we constructed a commodity terms of trade variable for each country, defined as the rate of change of the export-weighted commodity prices of the country, times the 2007 commodity export share in GDP, minus the rate of change of the import-weighted commodity prices of the country, times the 2007 commodity import share in GDP. The variable ranges from -26% for Venezuela to 8% for Thailand; eleven countries experience a deterioration of their terms of trade, eighteen see an improvement.²² When we added the variable to the baseline regression, the

20. See, for example, Patillo et al (2002). Their results are for the ratio of debt, rather than just short-term debt, to GDP.

21. The set of alternative regressions described in this and the next subsection are available in the online appendix.

22. A better variable would be the unexpected change in the terms of trade. Unfortunately forecasts of prices for all relevant commodities are not available. Given the random walk nature of most prices, the use of the actual rather than unexpected change in the terms of trade is unlikely to be a major issue.

coefficient came in close to zero and was not significant. The coefficients on partner growth and on short-term debt were roughly unchanged.

The earlier discussion of the response of global trade to output suggests that the composition of exports may be relevant. And, indeed, other work (Sommer 2009) has documented a striking relation among a sample of *advanced* countries between the share of high- and medium-tech manufacturing in GDP and growth during the crisis. To test whether this was the case for emerging market countries, we constructed such a share for each of the countries, relying on disaggregated data from UNIDO. Again, the coefficient was close to zero and not significant, and the other coefficients were little affected.

Using the share of exports in GDP overstates the effect of the partner growth variable on demand if exports are part of a value chain, i.e. if they are partly produced using imports as intermediate goods. One would like to measure the share of exports by the ratio of value added in exports to GDP. This variable is not available. We constructed a proxy for this share by relying on the import content of exports for the 10 largest export industries (ranked by gross value) for each country, from the Global Trade Analysis Project. The adjustment is typically largest for the small countries of emerging Europe. For example, the export share is roughly reduced by half for Hungary.²³ The results of using this adjusted partner growth measure were similar to the baseline. As expected, the coefficient is somewhat larger than that obtained using the original share, but it is not significant, and other coefficients are roughly unchanged.

The unexpected change in real exports is clearly the most direct measure of the trade shock. The reason for not using it in the baseline is that it is also likely to be partly endogenous, and thus subject to potential bias. We nevertheless ran a regression using the change in real exports (export forecasts do not exist, and thus we used the actual change rather than the unexpected change). The results are largely similar to those using unexpected partner growth.²⁴

23. This does not take care of another problem raised by value chains and discussed earlier in the context of Taiwan, namely the fact that exports to another country may then be reexported, and thus depend on growth in the ultimate rather than the initial importer country.

24. Taken literally, the coefficient on real exports, which is equal to 0.43, has the interpretation of the domestic multiplier associated with real exports, whereas the coefficient on partner growth, which is equal to 0.73, has the interpretation of the multiplier for real exports times the partner countries' average elasticity of imports to GDP.

Alternative Financial Measures

Our model suggests that both total foreign debt (through balance sheet effects) and short-term debt (through capital flows) should matter. Thus, we explored a number of alternative measures for the financial variable.

We added total foreign liabilities as a percent of GDP in 2007 as an additional explanatory variable in the baseline regression. This “financial openness” measure was not significant, and the coefficient on both short-term debt and trade were roughly unaffected.²⁵

A question which has been raised in the context of emerging Europe in particular, is whether the composition of short-term debt, and in particular the relative importance of bank debt, was an important factor in determining the effects of the crisis on output. Some have argued that, given their problems at home, foreign banks were often one of the main sources of capital outflows. Others have argued that, instead, banks played a stabilizing role in many countries. They point, for example, to the *Vienna Initiative*, in which a number of major Western banks have agreed to rollover their debt to a number of central European economies. To explore the answer, we decomposed short-term debt into short-term debt due to foreign (i.e., BIS) banks, and short-term debt due to foreign non-banks, both expressed as a ratio to GDP in 2007.²⁶ The coefficients on both types of debt are negative and significant. The coefficient on bank debt was less negative, suggesting that, other things equal, it was indeed an advantage to have a higher proportion of bank debt.

Based on the U.S. experience, one may argue that the effects of the financial shock on other countries depended on the degree of regulation of their financial system. In a provocative paper, Giannone et al (2009) have argued that, controlling for other factors, the “better” the regulation, at least as assessed by the Fraser Institute, the worse the output decline during the crisis.²⁷ Their result suggests that what was thought by some to be light, and thus good, regulation

25. These results are consistent with the results of Lane and Milesi-Ferretti (2009).

26. The decomposition is not clean. The numbers for total short term debt include not only short-term debt instruments, but also longer-term debt maturing within the year. However, the numbers for foreign bank debt, which come from a different source (BIS, as opposed to the WEO data base), include only short-term debt instruments but not longer-term debt maturing within the year that is owed to foreign banks.

27. The index, which is part of an “Index of Economic Freedom” is constructed by looking at ownership of banks (percentage of deposits held in privately owned banks), competition (the extent to which domestic banks face competition from foreign banks), extension of credit (percentage of credit extended to private sector) and presence of interest rate controls. The

before the crisis turned out to make things worse during the crisis. When we introduced this index as an additional regressor, we found it to have the same sign as that found by Giannone et al, but not to be significant.

Finally, we explored the role of net capital flows, both bank and non-bank flows, directly as right hand side variables (instead of short-term debt). These are natural variables to use, but they cannot be taken as exogenous: Worse shocks or worse institutions probably triggered larger net capital outflows. We thus used an instrumental variable approach, using indexes of foreign bank access, and indexes of capital account convertibility (both indexes again from the Fraser Institute) as instruments (in addition to partner growth, and short-term external debt): These plausibly affected growth during the crisis only through their effects on capital flows. The first-stage regressions suggested a strong negative effect of capital account convertibility on net flows: Countries that were more open financially had larger net outflows. The second-stage regressions suggested that declines in net capital flows were indeed harmful to growth, more so for changes in bank flows. But these regressions were not robust to the specific choice of instruments.

The Role of Reserves

Many countries had accumulated large reserves before the crisis, and one of the lessons many countries appear to have drawn from the crisis is they may need even more. Our model indeed suggests that reserve decumulation can indeed play a useful role in limiting the effects of trade and financial shocks on output.

Table 2. Reserves, Short-term Debt and Growth.

Column 1 of Table 2 shows that, indeed, controlling for partner growth, the ratio of reserves to short-term debt is statistically and economically significant. For reasons which will be clear below, the variable is entered in log form. The coefficient implies that a 50% increase in the ratio increases growth by 1.3%. This would suggest a relevant role for reserves. The question is, however, whether this effect comes from the denominator or the numerator, or both. To answer it, Column 2 enters the log of the ratio of short-term debt to GDP and the

highest value of the index for the countries in our sample is 9.6 for Lithuania, the lowest 6.1 for Brazil.

log of the ratio of reserves to GDP separately. The results are reasonably clear: While the coefficient on short-term debt is large and significant, the coefficient on reserves is incorrectly signed, and insignificant.

We have explored this result at some length, using different controls, conditioning or not on the exchange rate regime, and found it to be robust. While, in some specifications, the coefficient has the predicted sign, it is typically insignificant, and much smaller in absolute value than the coefficient on short term debt. The econometric evidence is obviously crude and is not the last word, but it should force a reexamination of the issue.²⁸ Anecdotal evidence suggests that, even when reserves were high, countries were reluctant to use them, for fear of using them too early, or that the use of reserves would be perceived as a signal of weakness, or that financial markets would consider the lower reserve levels inadequate.²⁹

The Role of the Exchange Rate Regime

The question of whether, other things equal, countries with fixed exchange rates did better or worse in the crisis, is clearly also an important one. Our model has shown that the theoretical answer is ambiguous, depending, for given shocks, on whether the ML condition is satisfied or violated, on the strength of balance sheet effects, and on the policies used to maintain the peg, namely the combination of policy rate increases and reserve decumulation.

We look at the evidence by dividing countries into two groups, fixed and flexible exchange rate regimes. We use the classification system used at the IMF, which is based on an assessment of de facto rather than de jure arrangements. Thus, the definition of fixed rate regimes we use covers countries with no separate legal tender (e.g., dollarization or currency unions), currency boards, narrow horizontal bands, and de facto pegs. Russia, for example, was reclassified from managed float to a (de facto) fixed rate in 2008, as it tried to stabilize the value of its currency through heavy intervention and use of its ample foreign exchange

28. The result is consistent with other studies such as Berkmen and others (2009). Ahmed and Trivedi (2010) also find that the level of reserves did not directly affect output, though larger reserves buffers resulted in a lower rise in country risk premiums and a smaller fall in exchange rates.

29. For more on the “fear of losing international reserves,” see Aizenman (2009) and Aizenman and Sun (2009).

reserves. The index is equal to 1 if the country had a fixed exchange rate regime in 2008, 0 otherwise.

Under this classification, countries with fixed exchange rates had an 18% average growth decline (14% if one excludes the Baltic states), compared to 11% for the other group. While this appears to be evidence against fixed rates, it does not control for the shocks. This is what we do in Table 3, starting from our baseline specification. Column 1 adds the exchange rate regime as a regressor. The coefficient is negative and insignificant. Its value implies that, controlling for trade and short-term debt, a country with a fixed rate regime had 0.7% lower growth, a small effect. The model also suggests an interaction term between foreign currency debt and the exchange rate. While exploring the presence of interaction terms in samples of 29 observations is surely overambitious, Column 2 introduces an additional interaction between the exchange rate and the ratio of short-term debt to GDP. The coefficient on the interaction term is negative, but insignificant. Taken at face value, it suggests that the adverse effects of short-term debt were stronger in countries with a fixed exchange rate.

Table 3. Growth and the Exchange Rate Regime

We also explored the role of fiscal policy. Many countries, for example India, reacted to the crisis with large stimuli. In most cases however, given the decision and spending lags involved, their implementation started either at or after the end of the semester we focus on. Still, we constructed a variable capturing the change in the cyclically adjusted primary balance from 2008 to 2009, as a ratio to GDP.³⁰ We found it, when added to the baseline regression, to be statistically insignificant over the initial period of the crisis. We leave it to further work to examine the effectiveness of fiscal stimulus over a longer time period.

In summary, despite the limitations of a small sample, the econometrics suggest a number of conclusions. The most statistically and economically significant variable on a consistent basis is short-term foreign debt. There is some evidence that bank debt had less of an adverse effect than non-bank debt. Short-term debt does not appear to proxy for other variables. Trade, measured by trade-weighted partner growth, also matters; its effect is economically significant, but

30. The use of an annual change is clearly not ideal. Quarterly data are only available however for a small number of countries in our sample.

not always statistically significant. Alternative measures of trade, focusing on composition effects, do not appear to do better. Of the policy dimensions, the most interesting result is the weak role of reserves. While the ratio of reserves to short-term debt is significant, its effect comes mostly from short-term debt rather than from reserves.

Econometrics however cannot capture the richness and the complexity of the crisis in each country, and, for this reason, we turn to country studies.

Country Studies

Only studies of specific countries can give a sense of how the trade and the financial channels actually operated. We look at three countries, Latvia, Russia, and Chile.

Latvia, and the Role of Banks

No country may be as emblematic of this crisis as Latvia. Output declined at an annual rate of 18% in 2008:4, and of 38% in 2009:1. (All numbers, here and below, are given at annual rates. Basic macroeconomic numbers are given in Table 4). In contrast to most other countries, growth is forecast to remain negative in 2010. The obvious question is why the output decline was so large.

Table 4. Latvia: Macroeconomic evolutions

In the case of Latvia, the right starting point is not the start of the crisis itself, but the boom which the economy went through in the 2000s— before and after EU accession in 2004. GDP growth exceeded 6% each year from 2000 to 2007, reaching or exceeding 10% each year from 2005 to 2007. Inflation, low and stable until 2005, increased to 7% by 2006, and to 14% in 2007. Asset prices boomed. Stock market capitalization increased by 32% a year from 2005 to 2007. While there is no general index for housing prices, the evidence is of very large increases as well: In Riga, housing prices increased by 385% from 2005 to 2007. The domestic currency, the lat, was pegged to the Euro, with higher inflation leading to a steady real appreciation.³¹

31. The lat was pegged to the SDR until 2005, to the euro thereafter.

The main cause of the boom was wider access to credit, largely through subsidiaries of foreign parent banks, leading to very high domestic credit growth. From 2005 to 2007, annual domestic credit growth exceeded 50%, leading to high consumption and high investment, in particular residential investment. One result was steadily larger current account deficits, reaching 24% of GDP in 2007! Capital inflows increasingly took the form of bank flows, from foreign parent banks to domestic subsidiaries. By the end of 2007, gross external debt had reached 135%, short term external debt was 52%. Foreign ownership of banks, primarily Nordic banks, was 60%. The proportion of foreign currency debt was 86%. More than two thirds of the loans were backed by real estate collateral. And reserves were only 29% of GDP.

In short, Latvia was very much exposed to foreign financial shocks. The slowdown however preceded the crisis. By early 2007, signs of overheating and of an impending bust following the boom were starting to become apparent. House prices peaked in early 2007, and then started to decline sharply. In February, S&P changed its outlook on Latvia from stable to negative. Growth decreased throughout the year, and turned large and negative in each of the first three quarters of 2008. Forecast growth for 2008:4 and 2009:1, as of April 2008, was -1.5%. For the most part, it was the (un)natural end of a boom. Financial factors also played a role: Worried about the decrease in the value of real estate collateral and the likely increase in non performing loans, Swedish banks instructed their subsidiaries to decrease credit growth. The (reported) average rate charged by banks to domestic borrowers remained stable however until September 2008, suggesting that credit tightening played a limited role in the initial slowdown.

Until September, it appeared that Latvia was headed for a long period of stagnation, perhaps similar to that of Portugal after euro entry. The crisis however led to a dramatic decrease in output. Part of it was due to trade. But, as the observation for Latvia in Figure 9 shows, the decline in GDP was much larger than could be explained by trade. The rest must be attributed to a combination of financial factors.

Despite problems at home, Nordic banks, for the most part, maintained their credit lines to subsidiaries—although this was still a sharp deceleration from earlier high rates of credit growth, and not enough to finance the large current account deficit. Broad commitments by foreign banks to maintain credit lines

were part of the IMF supported program in December 2008.³² But the same was not true of domestic banks. One of them in particular, Parex, with assets equal to 20% of GDP, and relying heavily on foreign depositors, suffered a run by foreign and then by domestic depositors. In November, the Treasury and the central bank stepped in both to guarantee some of the debt, and to provide liquidity. In the second semester, liquidity provision operations associated with just Parex amounted to \$1.1 billion, or more than 3% of GDP. Finally, worry about a possible devaluation of the lat led to a large scale shift from lat to euro deposits by domestic residents.

The reaction of the central bank to these shocks was twofold: First to avoid balance sheet effects and maintain the peg using reserves. Second, to provide liquidity to the financial system and maintain a low policy interest rate. The result was a large decrease in reserves. Numbers for the current account, the capital account, and reserves, are given in Table 5 (to keep these numbers in perspective, note that Latvian GDP was \$33 billion in 2008.) Large net outflows from domestic banks led to large decreases in reserves, only partly compensated through exceptional financing from the European Union and the IMF. In the second half of the year, the central bank lost roughly one fourth of its initial reserves. Note however the strong turnaround in the current account, from a deficit of \$1.3 billion in 2008:1 to a small surplus in 2009:1, which limited further losses in reserves. This turnaround came from a sharp drop in imports, itself reflecting the sharp drop in domestic demand.

Table 5. Latvia: The current account, capital flows, and Reserves.

This drop in domestic demand raises an important puzzle. Given that the central bank both was willing to use reserves to maintain the exchange rate, and to provide liquidity and maintain a low policy rate, why was the decrease in demand so dramatic? Why didn't banks which had relied on foreign credit fully maintain credit, by turning to the central bank for liquidity and to the foreign exchange market if they needed foreign currency? In other words, why wasn't sterilized intervention enough to prevent major effects on real activity? The answer is probably twofold.

32. These commitments were made more explicit later, in September 2009, through the so-called "Vienna agreements".

First, foreign banks gave instructions to their subsidiaries to reduce their domestic credit exposure. To the extent that the subsidiaries were limited in the amount of loans they could extend, they had no incentive to borrow at the policy (or at the interbank rate). In other words, even generous liquidity provision by the central bank would not have led to higher credit by the subsidiaries. In terms of our model, the shadow borrowing rate went up as credit was rationed. Second, doubts about banks' solvency, coming from the initial shocks, the decrease in housing prices and the associated decrease in the value of collateral, led, just as in advanced countries, to a higher interbank rate, and in turn, to higher borrowing rates. The Rigibor—the equivalent of the Libor for Latvia—went up from 6% in August to 14% in December. The average lat rate on loans by banks, went up from 10% in August to 16% in December. In terms of our earlier model, the crisis clearly increased x and thus $r + x$.

We draw two main lessons from the Latvian experience. The first concerns the complex role of banks in the transmission of financial shocks. On the one hand, foreign banks largely maintained their exposure, more so than other foreign investors and depositors. On the other, direct restrictions on credit limited the usefulness of liquidity provision by the central bank. The second, related and more general lesson, is that, even when central banks are willing to use reserves and provide liquidity, the adverse output effects of capital outflows on credit, and, in turn, on activity, can still be very large.

Russia, and the Role of Reserves

Leaving aside the Baltics, Russia is, in our sample, the country that suffered the largest output decline during the crisis. While output declined by only 9% (at annual rate) in 2008:4, it then declined by 30% in 2009:1. The question is again why.

To answer, one needs again to start long before the crisis. When the crisis came, the Russian economy had been booming for some time. Average growth was 7% from 2000 to 2007, 8% from 2005 to 2007 (Table 6 gives basic macroeconomic numbers for 2005-2007, and for each of the quarters from 2008-1 to 2009-1). The boom was due in large part to the increase in the price of oil and the associated increase in oil export revenues, and the economy showed all the trademarks of a commodity price-led boom. The boom was associated with large current account surpluses (in sharp contrast to the Baltics), running on average at 10%

of GDP from 2000 to 2007, and at 8.9% from 2005 to 2007, with large fiscal surpluses reflecting high oil revenues, and a steady decrease in public debt. In 2007, the primary fiscal balance showed a surplus of 7.4% of GDP (the primary non-oil balance showed, however, a deficit of 3.3%), and the ratio of public debt to GDP was down to less than 10%. Oil revenues were partly allocated to two stabilization funds, in order to smooth the effects of fluctuating oil prices on spending. Inflation was high but stable, around 10%. Bank credit growth was extremely high, running at an annual rate of 40% from 2000 to 2007.

Table 6. Russia: Macroeconomic evolutions.

Current account surpluses, combined with large capital inflows, led to the build up of large reserves. By December 2007, reserves (including the foreign asset positions of the two oil stabilization funds) had reached \$480 billion (for reference, GDP was \$1.3 trillion in 2007, so the ratio of reserves to GDP was 36%). Total foreign debt was \$471 billion, of which \$113 billion reflected loans to banks, \$50 billion reflected foreign deposits in banks, and \$261 billion reflected loans to households and firms. Of this debt, \$368 billion was denominated in foreign currency, and \$182b was short term debt.

With a large current account surplus, a large fiscal surplus, a smoothing mechanism against oil price fluctuations, nearly no public debt, and a ratio of reserves to short term debt nearly equal to 250%, one would have expected Russia to manage the crisis well. This was not the case.

The trade shock was severe, with the dominant channel being not so much the decrease in export volumes than the decrease in oil prices, down from 138 dollars per barrel in July 2008 to 44 dollars in early 2009. With commodity exports equal to a very large 22% of GDP, terms of trade for Russian commodity exports were down by 36% during the crisis semester, relative to the previous semester. The decline in the terms of the trade variable defined in the econometric section was the third largest one in our sample, behind Venezuela and Chile. The interesting question here is whether, given the presence of stabilization funds, the terms of trade decrease had a large adverse effect on demand. Or put another way, given that most of the oil revenues go to the state, was the decline in revenues reflected in fiscal tightening? The answer is not obvious. The increase in the fiscal deficit in 2008:4 far exceeded the decrease in oil revenues. But this increase was followed by a sharp decrease in the deficit in 2009:1,

while oil revenues were decreasing further. This would suggest a positive effect on demand in 2008:4 but a strong adverse effect in 2009:1, and thus could help explain the large decline in output in 2009:1. What complicates the answer is that the pattern of high deficits in the last quarter is a regular seasonal effect. Thus, the relevant question is whether the deficit was higher than expected, and this is too hard for us to answer. A strong fiscal stimulus program was put in place in April 2009, too late to have an effect on the period we are looking at.

The post-Lehman financial shock was not the first financial shock experienced by Russia in 2008. The first, triggered by the war with Georgia, came in August: Large portfolio withdrawals led to a 22% decline in the stock market, and gross outflows of \$20–30 billion dollars. The same happened post Lehman, and the stock market declined by 17.1% within two days, before the Russian authorities closed it for two days.

The initial reaction of the Russian central bank was twofold. First, it sought to use reserves to limit the size of the depreciation and avoid balance sheet effects. (Figure 12 shows the evolution of reserves and of the exchange rate from December 2007 to June 2009.) The second was to provide ruble liquidity to banks, through a decrease in reserve requirements, the provision of uncollateralized loans to a larger set of banks, and the provision of \$50 billion to the large state bank, VEB, to help firms repay their external debt. More exotic measures were taken as well, such that the allocation of roughly \$5 billion from the National Reserve Fund to buy shares, in order to increase the value of the collateral (often their own shares) posted by firms.

Figure 12. Russia: Reserves and the Exchange Rate. 2007:12 to 2009:6

Despite these measures, outflows continued at a high pace, and the Russian central bank steadily lost reserves, \$26 billion in September, \$72 billion in October, \$29 billion in November, \$28 billion in December. (Table 7 gives the evolution of the current account, the financial account, and reserves for 2005-2007, and for each quarter from 2008:1 to 2009:1.) Why were outflows so large? For the most part, because of the perception that the rate of loss in reserves was too high to be sustained, and thus the anticipation of a larger depreciation to come. Domestic firms paid back dollar loans. Domestic depositors shifted from ruble

to dollar accounts; the share of foreign-currency denominated bank deposits increased from 14% in September to 27% in December. Domestic banks shifted from making domestic loans to buying dollar assets, beyond what was needed to hedge the change in the currency structure of their liabilities (in view of the expected depreciation, the demand for dollar loans was obviously low). By November, the Russian central bank decided to widen the exchange rate band, and allow for faster exchange rate depreciation. The ruble was devalued by 20% in January 2009, largely ending the net outflows and reserve losses.

Table 7. Russia: The Current Account, Capital Flows, and Reserves

By then however, it was too late to avoid an output decline. Despite the provision of liquidity, doubts about solvency had increased the interbank rate from 4% in July 2008 to 16% in January 2009. Over the same period, the shift by banks from domestic loans to dollar assets was reflected in an increase in the rate charged to firms from 11% in July 2008 to 17%. Credit to households, which had grown by 3% monthly from January to September 2008, remained flat for the rest of the year, and then decreased by 1% monthly from January on. Credit to firms, which had grown by 2.6% monthly from January to September 2008, actually increased further to 3.5% from October to January—in some measure due to government pressure on state banks to increase credit, as well as a strong desire of firms to replace dollar debt with ruble debt—but then remained flat from January on, in part because firms began to repay debt assumed during the crisis, as the ruble began to appreciate.

In short, Russia was affected by two shocks, terms of trade and financial. One might have hoped that the existence of stabilization funds for oil would limit the adverse effects on demand of the decrease in oil prices. One might also have hoped that the initial high reserves and low debt positions would limit the effects of the financial shocks. This was not the case, and the story has an interesting twist: The problems did not come so much from capital outflows by foreign investors than from a shift of domestic residents—households, firms, and banks—out of ruble and into dollar assets. In this sense, Russia may be the country which most corresponds to the case considered by Obstfeld et al (2010), who argued that the right variable to which reserves should be compared is not short-term debt, but rather the total liquid assets held by domestic residents. In Russia, while, at the start of the crisis, short term debt was equal to about

\$100 billion, M2 was equal to about \$430 billion, so much closer to the number for reserves. And given the ease with which domestic residents could shift into dollar assets, this may be the reason why expecting a depreciation was rational, and the equilibrium self fulfilling.

The experience of Russia also provides an example of the dangers of pegging (or, more accurately, sharply limiting the decline in the currency) when other actors expect the policy to come to an end, and the currency to depreciate. One can question whether, *ex ante*, Russia's policy was mistaken. *Ex ante*, it was plausible that the crisis would come to an end faster, that oil prices would recover, and the amount of reserves would prove more than sufficient. Also (and this is the other side of the same coin), the controlled depreciation allowed firms to decrease their foreign currency exposure, and thus suffer smaller balance sheet effects when the depreciation actually came. One can also ask whether Fed swap lines, as were extended to countries such as Mexico, Korea, and Brazil, would have allowed Russia to credibly maintain the exchange rate, and reduce the size of capital outflows.

Chile

Like Russia, Chile depends very much on commodity exports—in this case, copper—and is financially open. Yet it suffered a relatively small decline in output, -9.8% in 2008:4 (at an annual rate), -4.3% in 2009:1. The question is, once again, why.

Chile entered the crisis in strong macroeconomic shape. From 2005 to 2007, growth was steady, averaging 4.5%. This performance reflected in part the strong dependence on copper, with copper exports equal to 22% of GDP in 2007, and the doubling of the price of copper between 2005 and 2007. Strong copper exports led to large trade and current account surpluses. Inflation was stable, at least until 2008 when it started to increase, leading to a steady increase in the policy interest rate from 5% in January to 8.25% in September. (Table 8 gives basic macroeconomic numbers for 2005-2007, and quarters 2008:1 to 2009:1.)

Table 8. Chile. Macroeconomic evolutions.

Balance sheets, both public and private, were strong. The effects of copper

prices on the fiscal balance, and thus on aggregate demand, were smoothed by a fiscal rule setting annual spending in line with medium term revenues, including copper revenues, under a conservative price assumption. The surplus was accumulated in a stabilization fund. By 2007, the fund had accumulated \$16 billion (for reference, GDP was equal to \$171 billion). Public debt, including debt of public enterprises, was a low 24% of GDP. For 2007, the primary balance showed a surplus of 8.8%, 0.2% excluding mining. Private foreign debt was 55%, mostly by individuals and firms, rather than banks. The banking sector was highly regulated and strong, reflecting the lessons of earlier banking crises. Subsidiaries of foreign banks accounted for roughly half of the total. Central bank reserves were equal to \$24 billion, roughly 75% of short term debt (from April 2008, in the face of higher global risk, the central bank started a reserve accumulation program. By the time it ended in September, it had accumulated an additional \$5.75 billion.)

The main effect of the crisis was through the trade channel. The crisis was associated with a decrease in exports, but more importantly, with a sharp decline in the price of copper. The decline in the terms of trade measure we introduced earlier in the econometrics section was the second largest one of the countries in our sample (after Venezuela), marginally larger than in Russia. Given the fiscal rule, the effect on disposable income and demand was however limited, with the decrease showing up in a sharp decrease in accumulation of the stabilization fund, down from \$3 billion in 2008:1 to \$1 billion in 2008:4. In 2009:1, the government put in place an additional fiscal stimulus program of \$4 billion, increasing later in the year by another \$4b.

Table 9. Chile: The Current Account, Capital Flows, and Reserves

On the financial side, what is most striking are that net capital flows were positive in both 2008:4 and 2009:1! (Table 9 gives the evolution of the current account, the financial account, and reserves for 2005-2007, and for each quarter from 2008:1 to 2009:1.) Thus, despite a sharp decrease in the current account balance, the decrease in reserves was small, \$1.0 billion in 2008:4, followed by an increase of \$0.5 billion in 2009:1. This small change in reserves was associated with a moderate depreciation, with the real exchange rate index decreasing from 102 in 2008:2 to 85 in 2008:4, followed by an increase to 91 in 2009:1.

Behind this evolution of reserves and the exchange rate were probably two main factors:

First, the decision by the central bank to allow the exchange rate to adjust rather than to use the policy rate or to rely on reserve decumulation. Only in January 2009, after inflation had substantially declined, was the policy rate decreased, by 600 basis points between January and March 2009. Starting at the end of September, some dollar liquidity was made available to banks by the central bank, but at a fairly large spread (300 basis points initially) over Libor.

Second, the behavior of gross capital flows. Gross outflows were only marginally higher during the two quarters of the crisis. And, interestingly, gross inflows increased even more. These inflows came not only from the repatriation of funds by pension funds, but, to a larger extent, from net inflows by firms and households. This is in sharp contrast to what happened, for example, in Russia, where capital outflows by foreign investors led to capital outflows by domestic residents. How much was due to the decision to let the exchange rate depreciate (as opposed to a peg and the anticipation by investors of a future devaluation in Russia), and how much was due to the perception of Chile as a relatively safe financial haven, is difficult to assess. The result, in any case, was only a small loss in reserves, and a moderate depreciation.

Still, the trade shocks and the financial crisis had some effect on the real economy. The stock market went down by 15% from September to December—a small decrease relative to other emerging market country stock markets. And, while there was little increase in the interbank rate relative to the policy rate, there was an increase in lending rates, by roughly 5% from September to December, at a time when, in addition, inflation was decreasing, implying a larger increase in real interest rates.

The overall result was a decrease in demand, and in output, but on a more limited scale than in many other countries. The fiscal rule, the framework for smoothing the effect of copper revenues, a strong financial sector, limited foreign currency exposure, and the decision to let the exchange rate depreciate early, probably all played a role in the outcome.

Conclusions

One can read the three sections as first building the bone structure and progressively adding the flesh.

The model allowed us to identify and discuss the effects of the main two shocks that affected emerging market countries during the crisis, a sharp decrease in exports (together with a sharp decrease in the terms of trade for commodity producers), and a sharp increase in capital outflows. It showed the dependence of the unexpected output losses on initial conditions, in particular on foreign debt. It showed the complexity of using policy in this environment, and the effects of using the policy interest rate, the exchange rate, reserve decumulation, and fiscal policy.

The econometrics provided a first pass at the data. Despite the limitations inherent in using a cross section data set with only 29 observations, they provided strong evidence for the trade and the financial channels. Differential effects of the shocks, coming from different trade and financial exposures, and different growth performances of partners in trade, explain a large portion of the heterogeneity of growth performances across countries during the crisis. When it comes to policy, our most interesting findings are two “non-results.” Countries with fixed exchange rate regimes fared, on average, much worse. However, controlling for other factors, in particular short-term debt, the direct effect of fixed exchange rates largely disappears. This is consistent with the ambiguous effect of exchange rates in our model—depending on the strength of expenditure switching and balance sheet effects. On international reserve holdings, we did not find compelling econometric evidence that they were important buffers to the crisis.

The case studies give a better sense of the many factors that shaped the effects of the crisis in each country, and just cannot be captured by econometrics. The comparison between Russia and Chile is perhaps the most interesting. Both countries are large commodity producers, and both were hit by a large adverse trade shock. Both countries were financially open. Russia had larger reserves relative to short term debt than Chile. Yet, Chile was much less affected by the crisis than Russia. The proximate reasons for Chile’s relative success are probably twofold. First, more effective use of the fiscal stabilization mechanisms in Chile than in Russia. Second, small capital outflows by foreigners and more than offsetting capital inflows by domestic residents in Chile, versus larger cap-

ital outflows by foreigners and capital outflows by domestic residents in Russia. The deeper reasons for these different capital flows were probably more confidence in the macro-financial structure in Chile than in Russia, and the decision to let the exchange rate depreciate early in Chile versus Russia's initial decision, eventually abandoned, to maintain the parity, giving rise to speculative outflows.

Appendix. Countries and Country Symbol

Argentina ARG, Brazil BRA, Chile CHL, China CHN, Colombia COL, Croatia HRV, Czech Republic CZE, Estonia EST, Hungary HUN, India IND, Indonesia IDN, Israel ISR, Korea KOR, Latvia LVA, Lithuania LTU, Malaysia MYS, Mexico MEX, Peru PER, Poland POL, Philippines PHL, Russia RUS, Serbia, Republic of SER, Slovak Republic SVK, Slovenia SVN, South Africa ZAF, Thailand THA, Turkey TUR, Venezuela VEN, Taiwan, Province of China TWN.

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