Comments

José De Gregorio: This is a very interesting paper that makes useful empirical points about trade and growth; it also leaves the reader thinking about important related issues that should lead to further work in the area.[1] I like the paper and look forward to reading additional research on the subject.

As Eduardo Cavallo argues, there seems to be broad agreement that more open economies grow faster. At the same time, higher output volatility reduces output growth.[2] The development literature assumes that more open economies suffer more from terms-of-trade volatility, and thus exhibit larger output fluctuations, than more closed economies. This effect, if true, could offset the positive impact of trade on growth. Cavallo takes this issue seriously and examines directly the effects of openness on volatility. He finds that trade openness reduces output volatility as long as the terms-of-trade volatility is not too large. This is good news for proponents of openness, since both international trade and reduced output volatility foster growth.

Cavallo's findings coincide exactly with the Chilean experience of increased openness and greater stability. I describe the Chilean case below. I also comment on the mechanism for rationalizing these results. According to the author, the channel is financial deepening, but—while I do not disagree with the statement and I find the author's evidence persuasive—I think there is much more to it than that.
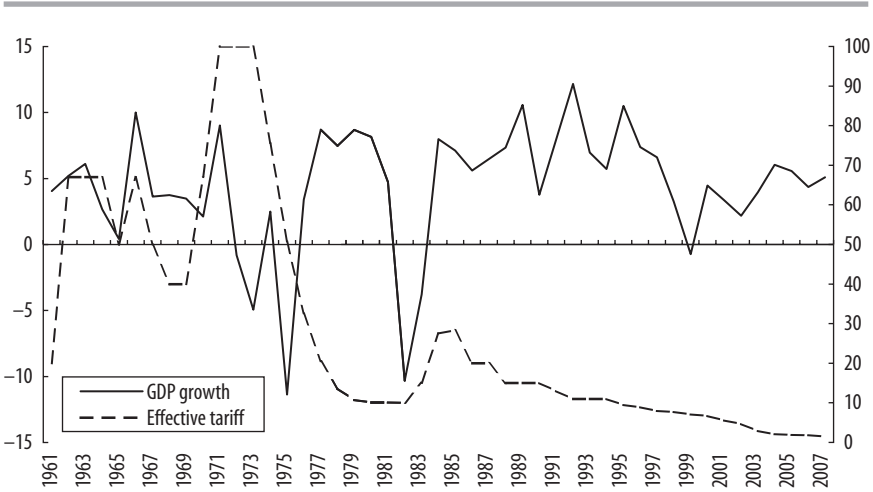
A Case Study: Chile

Chile has increased openness substantially and stabilized its business cycle. At the beginning of the 1990s, the effective tariff rate was around 15 percent;

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1. In preparing these comments, I greatly benefited from discussions with Roberto Alvarez and Andrea Tokman.
2. Ramey and Ramey (1995).

FIGURE 6. Openness and the Business Cycle in Chile[a]

Source: Central Bank of Chile.

a. GDP growth volatility is computed as the standard deviation of GDP growth in ten-year windows. The effective tariff is the tariff weighted by trade agreements, as in Becerra (2006). After 2005, the effective tariff is estimated as the ratio of tariffs to imports.

today it is less than 2 percent.[3] This increased openness was accompanied by a significant reduction in growth volatility (figure 6). Moreover, the economy's response to changes in the price of copper, which is by far its main export, has been very limited in recent years. In past decades, Chile's economic performance was very dependent on the copper price, but this connection has almost disappeared.[4] In the first three years of this decade the copper price was the lowest since the Great Depression, and the economy grew 3.3 percent, on average. The past five years, in contrast, have witnessed record high copper prices, and the economy has grown between 4 and 5 percent (figure 7). A number of factors explain this recent economic performance, but it is generally undisputed that Chile's output level is much less correlated with developments in copper prices than when the economy was less open. The last sharp copper price decline in 1998–99 coincided with a recession in Chile, but copper did not cause the downturn since the standard channels were not at work.

3. Although the tariff for almost all goods is 6 percent, the country has signed a number of free trade agreements that reduce the effective tariff.

4. For further discussion, see De Gregorio (2006).

FIGURE 7.   **GDP Growth and the Copper Price**

Annual percent change, in 2005 U.S. dollars per pound
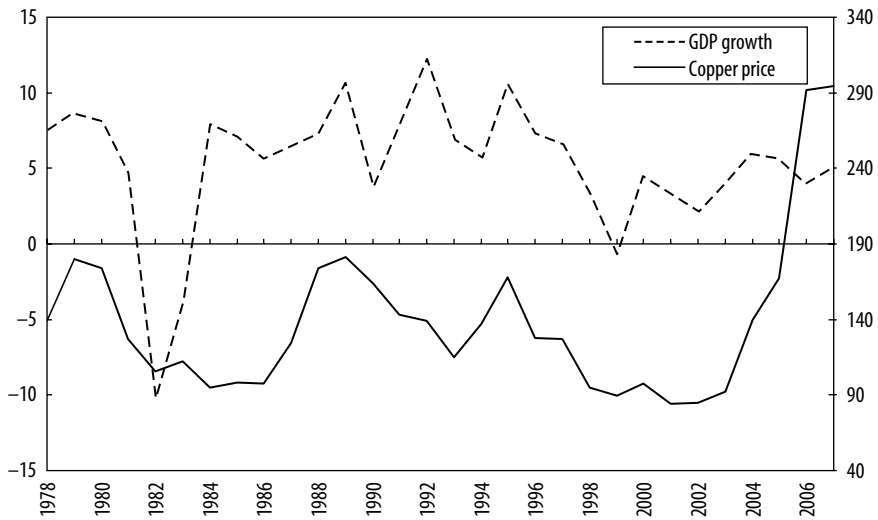
Source: Chilean Copper Commission and Central Bank of Chile.

Most explanations for the high dependence of Chile's business cycle on copper in the past are financial in origin. For example, following Calvo, one can argue that open economies are more exposed to sudden stops, which in Cavallo's framework could be avoided with financial deepening.[5] Caballero, in turn, argues that the value of collateral declines with copper price, and the resulting restriction of foreign capital leads to a downturn.[6] However, Chile has a suitable degree of financial development, which, following Cavallo's results, should reduce the impact of terms-of-trade volatility on growth. Moreover, there is no evidence that the downturn in Chile in the late 1990s was related to international financial constraints or sudden stops. The sharp reversal in the current account coincided not with a sudden stop of capital inflows, but with a sudden start of capital outflows, mainly by Chilean institutional investors.[7]

5. Calvo (2005).
6. Caballero (2002).
7. Cowan and De Gregorio (2007).

The issue of what has made the Chilean economy more resilient to the copper price is thus still open to debate. A prime candidate is macroeconomic policy. Fiscal policy is conducted based on a structural balance rule, which saves all copper revenues from prices above its estimated long-term price. All of these savings are invested in a sovereign wealth fund. In addition, monetary policy is conducted on the basis of an inflation target, and there is a flexible exchange rate regime. In my view, the latter is crucial to explaining both the apparent excessive response of the economy to copper in the late 1990s and the small response today. Indeed, fiscal policy has been conducted very conservatively for most of the years since the mid-1980s.

Summing up, Chile has become more open, but at the same time more stable. Financial development and international financial integration may have increase the economy's resilience to external shocks, but policy has also played a key role. I discuss this issue further below.

On the Channel from Openness to Volatility

A fundamental question that has yet to be resolved is whether trade openness causes stability. I agree that openness is important, and the evidence presented in this paper is very suggestive. However, openness may coincide with reforms and policies that lead to greater stability, or it may be induced by integration. Tornell, Westermann, and Martínez show that trade liberalization is typically followed by financial liberalization, and Svaleryd and Vlachos find a positive relationship between openness to trade and the development of financial markets.[8]

Cavallo follows Bulow and Rogoff to explain the relationship between openness and output volatility through the financial markets.[9] The idea is that countries that are more open to trade have increased creditworthiness because the costs of not honoring their debts are high and come in the form of trade retaliation. This appears to be a plausible explanation, although it is not the only possibility. It may be more plausible that the disciplinary effect on the conduct of policies comes through the adverse response of capital flows and risk premiums to imprudent macroeconomic policies, rather than through trade retaliation.[10] Another possibility is that the effect operates through cap-

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8. Tornell, Westermann, and Martínez (2004); Svaleryd and Vlachos (2000).
9. Bulow and Rogoff (1991).
10. Fischer (1998); Stiglitz (2000).

ital flows per se. Heathcote and Perri show that the extent of international borrowing and lending is important for reducing business cycle effects by ensuring continued access to international capital markets.[11]

The same can be said about macroeconomic policies. Trade openness may coincide with economic stabilization, and the control of inflation may be what causes output stability. Indeed, one of the main causes of the Great Moderation has been better monetary policy. The fact that the Great Moderation arrived in developing countries almost ten years after it arrived in industrial countries is evidence against the hypothesis that it was caused by some worldwide positive shock, that is, good luck.[12] In contrast, the timing differences between developing and industrial countries coincided with the timing differences in the control of inflation, which supports the idea that stability was achieved to a large extent through better monetary policy. Cavallo controls for the volatility of inflation, so openness still has a role to play.

Along similar lines, one could argue that openness has resulted in countries' adopting more realistic exchange rate policies, moving to greater degrees of flexibility. Cavallo's regressions control for real exchange rate misalignment, showing that greater misalignments generate greater output volatility, but the effects of the interaction between openness and misalignment and, more fundamentally, the causality relationship between them are still unknown.

A technical point that is relevant for the interpretation of Cavallo's results is that the identification strategy uses gravity equation estimates to instrument for trade openness. However, other potentially endogenous variables are not treated similarly, including institution quality, export concentration, and capital flows. Rodrik, Subramanian, and Trebbi, who analyze the impact of institutions and trade integration on per capita income, use IV estimates not only for openness, but also for institutions.[13]

Another example is the volatility of the terms of trade, which is assumed to be exogenous. This is a realistic assumption for small open price-taking economies, but it is hard to sustain such exogeneity in this context. Open economies could reduce their terms-of-trade vulnerability by diversifying exports. Unfortunately, this is not apparent from the data, and I suspect that it has to do with the fact that they are cross-section data (I return to this point later). The data do show that countries with higher export concentration have higher terms-of-trade volatility. In this case, an interactive term for openness

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11. Heathcote and Perri (2002).
12. De Gregorio (2008).
13. Rodrik, Subramanian, and Trebbi (2004).

and volatility could be capturing an endogenous exposition of countries to their inability to diversify their export basket, and not the exogenous exposure to terms-of-trade volatility. Moreover, IV estimates for terms-of-trade volatility that use export concentration as the exogenous instrument are flawed, as the instrument could also be endogenous, as argued earlier. Future work should incorporate panel estimations. For example, di Giovanni and Levchenko show that the impact of trade integration on output volatility has changed over time, "roughly doubling in the last thirty years."[14] The cross-section estimates are losing important dynamic implications of these potential changes over time.

Finally, although the paper makes a strong case for the positive effects of openness on stability, I am not fully convinced of the trade channel. The indirect test of this channel, by splitting the sample along financial deepening or exposure variables, does not allow for a definite empirical validation of the underlying mechanism. It also limits the number of observations of an already limited sample. It might be more informative to continue with the same method used for openness, namely, including an interaction term and dummy variables for high and low financial exposure. Another possibility is to focus on different distribution percentiles. It may be the case that the effect is not lineal. Easterly, Islam, and Stiglitz show that financial depth, measured by the ratio of private credit to GDP, affects output volatility in a nonmonotonic way: it initially tends to decrease volatility, but too much private credit ends up increasing output volatility.[15] This is something that cannot be tested with the sample splitting technique.

Conclusion

Output volatility damages economies through adverse effects on economic growth, welfare, and poverty. Although there is clear evidence that output volatility has decreased in most countries, doubts remains as to the determining factors in the moderation. Identifying the underlying elements is crucial for providing guidance in the design of economic policies that can further reduce volatility in countries and regions where instability remains high. This paper makes an interesting case that openness is a key factor for reducing volatility, but further evidence on the channels is needed.

14. Di Giovanni and Levchenko (2007).
15. Easterly, Islam, and Stiglitz (2001a).

Norman V. Loayza: Eduardo Cavallo has written a solid and provocative paper. It goes against the conventional wisdom that openness to international trade necessarily leads to external vulnerability. In assessing trade openness, the paper places it in the general context of international integration. This is the right approach because trade openness does not occur in isolation, but rather is a component—often the leading component—of a process of political, intellectual, and economic integration. Countries that open up to trade also welcome the flux of new ideas, new technologies, and new policies generated in the rest of the world.

History shows that, in the long run, internationally integrated countries become more prosperous, more just, and more stable relative to their previous experience and to other countries that choose an autarkic route. Outward integration was the reason behind the emergence of the Italian city-republics when the Renaissance overcame the obscurantism and inward-looking nature of the Middle Ages. This was also the case of the Spanish colonies in the Americas, which started to flourish when Spain—under Napoleonic invasion—could no longer exercise its monopoly power on trade routes with its colonies. When China withdrew from the world during the Ming dynasty in the 1400s, it abandoned its status as the most advanced country in the world and slowly became one of the poorest. Interestingly, in the last two decades China is regaining its former glory incredibly quickly after opening its borders to trade, finance, technology, and even political reforms (although the latter at an admittedly slower pace).

Trade openness is very often accompanied by financial openness. The interplay between these two aspects of economic integration provides the key to stability, as Cavallo emphasizes in the latter part of his paper. As figure 8 illustrates, trade openness—measured as real exports plus imports over GDP—grew from a world median of 44 percent in 1970 to 70 percent in 2000, while financial openness—proxied by the ratio of equity-based foreign liabilities to GDP—increased from a world median of 5 percent to 45 percent. When trade and financial openness occur in a balanced way—as two sides of the same coin—international integration evolves successfully toward increased growth and reduced volatility. The channels through which openness leads to economic growth are well-known: they are based on the dynamic efficiency gains brought about by competition and technology transfer. Few works investigate the reasons behind the stability effects of openness, and this is where Cavallo's contribution resides. On the one hand, openness exposes the economy to changes occurring elsewhere in the world, changes that take the form of price shocks (such as shocks to the terms of trade or interest rates) or quantity shocks (for

F I G U R E 8 . **Trends in Openness, 1970–2000**[a]

Trade openness
(percentage of GDP)

Financial openness
(percentage of GDP)
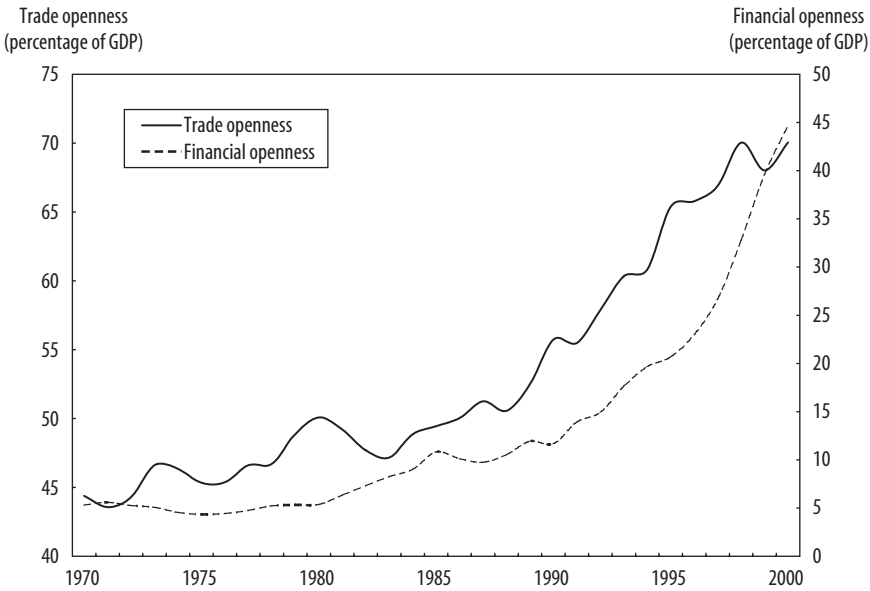
Source: Calderón, Loayza, and Schmidt-Hebbel (2008).
a. Openness measures are defined as the ratio of real exports and imports to GDP (trade) and the ratio of equity-based foreign liabilities to GDP (financial). In both cases, the lines represent world medians.

example, foreign growth or capital flows). On the other hand, openness enhances the possibility of international risk sharing through joint ventures, international lending, production diversification, and explicit insurance. More-over, the disciplining nature of international competition and formal contracts limits the risk of self-inflicted domestic policy mistakes, such as erratic fiscal, financial, and monetary policies. So, which effect dominates? Does openness enhance stability or induce volatility? Cavallo concludes in favor of a stabilizing role. More specifically, he presents evidence that larger trade openness reduces the volatility of GDP growth, provided the terms-of-trade shocks facing the country are not too large.

Cavallo provides numerous robustness checks, which clearly enhance the credibility of his results. Two issues are still missing in the analysis, however. They are both related to the specification of the regression equation he estimates. In a broader context, they have to do with a more general interpretation

of the role of openness. They are, first, the inclusion of the shock volatility itself in the regression, and, second, the consideration of openness shocks other than those given by the terms of trade. As the following results show, when these two issues are taken into account, the role of trade openness in stabilizing the economy is more nuanced.

The following exercise attempts to explain the volatility of economic growth as a function of international openness, a variety of external shocks, and domestic conditions. The objective is to consider whether the volatility effects of external shocks are amplified or reduced by the degree of trade and financial openness. The explanatory variables of interest are measures of trade and financial openness, as well as four external shocks. The first two shocks are primarily related to trade in goods and the latter two mainly related to financial transactions. Specifically, they are the corresponding standard deviations of terms-of-trade growth, foreign output growth, capital flows to the region where the country is located, and the change in the international interest rate.

Table 11 presents the results, concentrating on the interactions between the two real shocks and both trade and financial openness. I focus on the real shocks for similarity with Cavallo's paper. An interesting pattern of coefficients emerges. Larger trade openness tends to magnify the effect of both terms-of-trade and foreign-growth shocks, while larger financial openness tends to dampen this effect. Moreover, trade openness by itself carries a negative coefficient (though not significant), but only in the case of terms-of-trade shocks. The results are thus similar to what Cavallo obtains for this type of external shock. In the case of the foreign-growth shock, however, the coefficient on trade openness is positive and significant. By itself, then, trade openness would appear to be destabilizing, at least in the presence of foreign-growth shocks. Financial openness, on the other hand, carries a negative and significant coefficient in both regressions, implying that it not only dampens the effect of both shocks, but also has an independent stabilizing effect. The conclusion is that, at least in the presence of real shocks, the stabilizing effect of financial openness is necessary to counterbalance the exposure that trade openness generates. Openness is still good for stability, but only when comprehensive enough to include trade and financial integration. The challenge for future research is to explore whether this pattern of complementarity applies to all external shocks, particularly those of a financial nature that have affected so much the world economy in recent decades. Cavallo's study offers not only a significant contribution, but also a motivation for deeper work on the many angles of international integration.

T A B L E 1 1 .   **Growth Volatility and the Interaction between Openness and the Volatility of Foreign Shocks**[a]

Explanatory variable	Terms-of-trade changes (1)	Foreign growth (2)
Control variable		
Inflation volatility (Std. dev. annual log differences of CPI)	0.169**	0.169**
	(0.02)	(0.04)
Real exchange rate overvaluation (proportional index, overvaluation if > 100)	0.001**	0.001**
	(0.00)	(0.00)
Systemic banking crises (frequency of years under crises: 0–1)	0.200**	0.254**
	(0.04)	(0.06)
Openness		
Trade openness (Real exports and imports to GDP, in logs)	−0.103	0.242**
	(0.16)	(0.05)
Financial openness (stock equity-related foreign liabilities to GDP, in logs)	−0.015*	−0.036**
	(0.01)	(0.01)
Volatility of foreign shocks		
Volatility of terms-of-trade changes (Std. dev. annual log differences of terms of trade)	−0.633**	0.127**
	(0.25)	(0.02)
Volatility of foreign growth volatility (Std. dev. annual log differences of foreign growth)	0.429**	0.015
	(0.05)	(0.26)
Volatility of world real interest rate (Std. dev. annual log differences of G-7 interest rates)	0.297**	0.282**
	(0.07)	(0.08)
Volatility of regional capital inflows (Std. dev. ratio of regional capital flows to GDP)	0.200**	0.203**
	(0.03)	(0.04)
Interaction: openness and volatility of foreign shocks		
Trade openness * Volatility (foreign shock)	0.184**	0.118**
	(0.06)	(0.06)
Financial openness * Volatility (foreign shock)	−0.008**	−0.010**
	(0.00)	(0.00)
Period shifts		
1981–85 period	−0.257**	−0.241**
1986–90 period	0.069*	0.071
1991–95 period	0.227**	0.221**
1996–2000 period	0.065	0.119
Summary statistic		
No. countries	75	75
No. observations	364	364
Specification tests (*p* values)		
Sargan test	(0.48)	(0.33)
Second-order correlation	(0.26)	(0.27)

Source: Calderón, Loayza, and Schmidt-Hebbel (2008).
  *Statistically significant at the 10 percent level.
  **Statistically significant at the 5 percent level.
  a. The dependent variable is the standard deviation of growth in real GDP per capita. The regressions are estimated using a generalized method of moments (GMM) IV system estimator (Arellano and Bover 1995; Blundell and Bond 1998). The regressions include a constant and time dummies. The sample is a panel including seventy-five countries with five-year observations for the period 1970–2000. Robust standard errors are in parentheses.

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