This means that aggregate and marginal tax rates reverse their order: aggregate rates are higher in the US, but marginal rates are lower. It is possible that some vital information is lost in the aggregation process, which ultimately has crippled the authors' approach.

It is important to stress that the results do not indicate that real-world differences in capital income tax are insignificant, or that they cannot account for growth rate differences.

chapters 1 to 8

10 Will government policy magnify capital flow volatility?

GIUSEPPE BERTOLA and ALLAN DRAZEN

1 Motivation and overview

In 1991–2 there has been a significant change in capital inflows into Latin America. In the mid-1980s capital flows into the 10 countries that make up South America averaged 8 billion dollars a year; they rose to 20 billion dollars in 1990 and to 40 billion dollars in 1991. Furthermore, capital inflow into Latin America has been highly volatile over this period. What lies behind these changes?

One line of argument relates recent capital inflows into Latin America to what has been happening in the United States, specifically the sharp drop in interest rates and the sluggish level of economic activity. This point of view is well represented in a recent paper by Calvo, Leiderman, and Reinhart (1992). Taking the change in officially-held foreign exchange reserves as a proxy for capital flows, they show, first of all, that the inflow was spread across several countries in Latin America. Using principal-components analysis, they demonstrate that there has been a common factor in the inflow into all of these countries, and that the first principal component of various United States macroeconomic time series (including a measure of economic activity, various interest rates, and financial returns data) is correlated to Latin American capital inflows and real exchange rates. Put in simple terms, the drop in short-term interest rates in the United States since mid-1991 combined with the slowdown in economic activity led investors to shift their focus Southward.

Though this line of argument has much merit, two types of criticisms can be levelled against it. First, given the nature of investment decisions, a perspective of longer than a year or two is needed. Second, external factors are clearly important, but factors internal to the region (such as the sharp change in government attitudes with increased reliance on free markets) have played a role as well, and perhaps a crucial one.

First, consider the nature of investment decisions. It is generally agreed

that a long-run perspective is needed to understand investment dynamics in a macroeconomic context. Accumulation of physical capital and financial capital flows need to be analysed in terms of their driving processes' stochastic properties rather than in terms of current events only. One must consider the interactions of stochastic shocks that exhibit persistence, as well as irreversibility of investment and adjustment costs that imply that investment decisions should be forward-looking. Such features should characterise any model of investment, and suggest that modelling fluctuations require a view of longer that a year or two.

In terms of capital flows, explaining the volatility of returns to country-specific investment is the key to understanding the dynamic features of capital flows, leading one to ask what macroeconomic features may underlie such volatility. In so doing, we are motivated by recent Latin American experience. There is widespread agreement that the capital inflow is a regional phenomenon, rather than being limited to a few countries (the Calvo–Leiderman–Reinhart paper makes a strong case for this). There is far less agreement, however, on the view that economic developments in the United States were the primary motivating factor. There is mixed evidence on whether inflows of similar magnitude have taken place into other regions of the world, as the Calvo–Leiderman–Reinhart hypothesis would suggest. Moreover, if low US interest rates were a key factor, why did we observe a similar massive inflow into Latin America in the late 1970s and early 1980s, when US interest rates were very high? (We return below to an explanation of these episodes in terms of interest rate differentials.)

An alternative point of view is that the capital inflow represents the response to events within Latin America, rather than outside the region. More specifically, we suggest that variability of government policies may be responsible for the volatility of capital inflows. In viewing the inflow as a regional phenomenon, we think of the 'country' under consideration as a Latin American aggregate, meaning that investment flows are highly correlated across neighbouring countries in a region. There are a number of reasons why this is likely to be the case. Foremost in our minds is the view that outsiders perceive there to be unobserved shocks which are common to neighbouring countries. That is, if there is a positive shock to economic activity and the profitability of investment in one country, it is believed there is a component to the shock which is common to the region, though not to countries outside the region. Secondly, there will be spillovers of observed activity across borders, both on the supply and on the demand side. Finally, competition for funds in the world capital markets will lead countries to adopt similar policies with respect to foreign investment. That is, in order to remain attractive to foreign

investors who believe there are regional factors, a country will be led to liberalise when its neighbours do.

We are currently involved in a research project whose aim is to study investment behaviour in a dynamic optimising model in which supply and demand shocks interact with government policies. In a framework where primitive productivity shocks can induce persistent effects on investment and capital flows, we argue that expected government policies and other institutional characteristics of the economy can *magnify* the effects of these shocks. The mathematical development of these points is somewhat complex. We eschew formalities in this chapter, and simply outline some of our perspective's main insights in a non-technical, but nonetheless rigorous way.

When technological productivity shocks are the primary cause of volatility, they may of course be magnified by market structure and increasing returns at the local level (due to strategic complementarities, infrastructure, thick markets, threshold effects, etc.). Such effects are not unique to Latin America, however, and technological shocks, even when magnified by these effects, may not explain why the volatility of capital flows is so high in Latin America relative to other regions.

The focus of our research is therefore on how government policy can magnify the effects of technology shocks. There are a number of possible mechanisms. First, the expectation that the government may 'waffle' between the imposition and liberalisation of capital account restrictions will mean that realisable returns to investment will similarly fluctuate. If capital controls are tightened in bad times and relaxed in good times, as would seem to characterise the policy of many Latin American governments, the effect of productivity shocks will be magnified. Second, there may be a positive feedback between capital movements and fiscal policy, a sort of 'dynamic Laffer curve'. Specifically, a given level of expenditure implies higher tax rates in bad times for a given tax base; these higher tax rates, however, discourage capital inflow, thus lowering the tax base and magnifying the tax consequences of an adverse shock. Finally, government expenditures and transfers can also have a magnifying effect in at least two ways. On the one hand, public investment in infrastructure is often procyclical; to the extent that private investment and public infrastructure investment are complements in production, magnification of productivity shocks will result. On the other hand, bad times may increase political pressure for redistribution of income flows towards domestic residents with no access to the international capital market. Such redistributive policies appear especially descriptive of many Latin American governments, and need to be financed by increased taxes on capital, the *ex ante* internationally mobile factor of production.

The plan of the chapter is as follows. In section 2 we discuss our basic approach, which is focused on a stochastic production structure (but with no 'magnification' effects from government policy), and illustrate it with a simple model. We show how the stochastic nature of production leads to variability in asset returns, asset prices, and capital inflows. In section 3, we consider what determines the extent of fluctuations in private investment incentives and hence fluctuations in asset prices and capital inflows. We then proceed to sketch ways in which such volatility might be endogenous to the country's economic structure. In section 4, we consider the mechanisms set out above by which government policy will *magnify* fluctuations due to stochastic productivity shocks. Section 5 presents conclusions.

2 A basic model

Our goal is to show how fluctuations in underlying determinants of productivity (or of any other stochastic fundamental, such as demand conditions) can induce variability in patterns of investment and capital flows which looks quite different from the underlying driving process. Magnification of underlying variability through government intervention is our primary, though not our only, interest. Our research strategy is to begin with a very basic stochastic model. Of course, such a model should be viewed as representative of a much wider class of models. We analyse how capital flows into a country are affected by uncertainty as to local investment profitability. Our modelling of uncertainty is kept as simple as possible (a two-state Markov chain) to focus on the economics of the interaction between international supply of funds and local technological, market, and policy developments.

Consider an economy that produces a single good, where production is represented by a Cobb–Douglas production function,

$$Y(t) = A(t)L(t)^{\alpha}K(t)^{1-\alpha}, \tag{1}$$

where $Y(t)$ is output at time t; $A(t)$ is a productivity indicator; $L(t)$ denotes labour (or land), which is internationally immobile; and $K(t)$ is the installed stock of capital.

The economy's productivity grows exponentially (and exogenously) over time, but is also subject to equally exogenous fluctuations. Specifically, we write

$$A(t) = a(t)e^{\theta t}, \tag{2}$$

where the trend parameter θ indexes technological progress. To model stochastic productivity fluctuations, we let the scale parameter a follow a two-state Markov process: $a(t) = a_g$ in a (country-specific) good state, but

$a(t) = a_b < a_g$ in a (country-specific) bad state at time t, and transitions between the two states occur with constant probability intensity δ in continuous time.

The economy is open to international trade, but we abstract from issues of exchange rate determination by letting the single produced good be identical to what is produced abroad. Thus, only intertemporal trade has a role in our model, and we focus on the consumption and investment choices of domestic and foreign residents. The production flow can be either consumed (locally or abroad), or invested. Physical investment translates one-to-one into an increase of the installed capital stock[1] and is irreversible: when local business conditions deteriorate, the physical capital stock installed in the country cannot decrease. We assume perfect mobility of financial capital, however, and consider a simple characterisation of capital market equilibrium relationships.

Ruling out irrational bubbles, asset values depend on the current value and expected dynamics of dividends accruing to each unit of homogeneous capital. We denote by γ the share of the country's production which is paid as compensation for the services of the installed capital stock and, for simplicity, we take it to be constant within each productivity state. Denoting capital's income share in good times and bad times by γ_g and γ_b respectively and employment by L_g and L_b,[2] the dividend flow accruing to each unit of capital is

$$\gamma_i \frac{Y(t)}{K(t)} = \gamma_i e^{\theta t} a_i L_i^{\alpha} K(t)^{-\alpha} \tag{3}$$

in state i, $i = g,b$. To simplify notation, we define the profitability indicator

$$\eta_i(t) \equiv \gamma_i a_i L_i^{\alpha}, \tag{4}$$

and rewrite the dividends expression in (3) as

$$\gamma_i \frac{Y(t)}{K(t)} = \eta_i e^{\theta t} K(t)^{-\alpha}. \tag{5}$$

For the purpose of interpreting the results of this section, it may be useful to consider as a baseline the case of competitive decentralisation (with no taxes or subsidies), and constant employment. Under Cobb–Douglas production, the competitive factor share of capital would be state-independent and equal to $(1 - \alpha)$. The dividends process thus responds one-for-one to changes in the productivity indicator in (2) and is a decreasing function of the installed capital stock with elasticity α. In (3), however, both capital's income share γ and employment L are indexed by state i. Inasmuch as they vary across states, the dynamics of the profitabi-

lity index η in (5) differ from those of the primitive technological index a. In our working paper (1993), we consider how such state-dependency may magnify the volatility of capital income, and of capital-flows' responses to the primitive shocks as indexed by a. We do not develop such insights formally in this chapter, but simply discuss the qualitative insights afforded by this and similar models.

To examine how stochastic productivity affects macroeconomic variables, we want to relate realisations of the profitability indices η_g and η_b to investment decisions, asset prices, and capital flows. To do so, consider the no-arbitrage relationships required by financial market equilibrium. They require that the asset value of capital in each state at each point in time (which we denote $q_g(t)$ and $q_b(t)$) must be such that current dividends and expected capital gains per unit time yield a return r on the asset's value, where r is the rate of discount applied by well-diversified global investors to income flows from the country under consideration. (A formal, mathematical derivation of these equations, and of the results that follow, can be found in our working paper.) These equations may be thought of as yielding relations from the productivity indicators η_g and η_b to the asset prices in the two states and the stock of capital $K(t)$.

We assume that parameters are such that investment is positive in this country in good times, that is, when profitability is indexed by η_g. Thus, the good-time value of capital is fixed at the unitary output and consumption price of investment in our single-output-good model, for any discrepancy between the value of installed capital and the unit cost of investment would allow arbitrage opportunities between installation of new capital on the one hand, and financial claims to the existing stock on the other. We further assume that investment is irreversible. Hence when bad times (as indexed by η_b) first hit, the irreversibility constraint is binding and the currently installed capital stock $K(t)$ will be constant.

These assumptions imply the following characteristics of the paths. In bad times (that is, times during which $\eta = \eta_b$) the irreversibility constraint may bite, to imply that the unit value of capital will be strictly less than the current cost of installation ($q_b(t) \leq 1$). As dividends grow exponentially while the bad state persists, the unit value will not be constant over time, but will be rising monotonically to unity. If bad times persist long enough, productivity growth at rate 0 will eventually make investment profitable even when $\eta = \eta_b$. Whenever there is positive investment, the value of installed capital must equal its installation cost ($q_b(t) \leq 1$).

In good times ($\eta = \eta_g$), the value of installed capital equals its installation cost ($q_g(t) = 1$), and capital grows exponentially. If the good state were perceived as permanent ($\delta = 0$), the equation determining the rate of growth of capital would reflect the equality of capital's current marginal

revenue product to its user cost r. With $\delta > 0$ and $\eta_b < \eta_g$, investors realise that times will eventually turn bad, and that the downturn may in fact occur in the immediate future. With investment irreversibility, capital accumulation in good times must then reflect the fact that if and when a negative productivity shock hits the economy it will be impossible to recoup the installation cost of existing units of capital.

3 Capital accumulation and capital flows

The solution of the model has been a straightforward logical structure (see our working paper for derivations and details). The equations of the model determine $K(t)$ (and $q(t) = 1$) when the irreversibility constraint is not binding, and determine $q(t)$ when binding irreversibility constraints yield a constant K. The top panel of Figure 10.1 displays a realisation of the η Markov chain; the other panels illustrate the dynamics of the capital stock, of output, of the unit value of the country's capital stock, and of realised returns on holdings of country-specific capital.

Whenever the irreversibility constraint is not binding, the country's capital stock increases so as to keep the value of capital at unity in the face of productivity growth: as in the steady state of a Solow (1956) model, capital grows at rate $0/a$ if 0 is the exponential rate of growth of disembodied productivity and/or population. If the country is hit by a negative profitability shock, however, the value of installed capital drops below unity, the irreversibility constraint bites, and the stock of capital ceases to grow. If 'bad times' persist long enough that $q_b(t)$ reaches unity, the irreversibility constraint ceases to bind and investment resumes, again at rate $0/a$. As soon as profitability conditions are improved by the next Poisson shock, the capital level jumps to prevent q_g from exceeding unity, and investment proceeds at rate 0 whether or not it was ongoing in the bad state. The 'good-' and 'bad'-time behaviour of the various series plotted in Figure 10.1 is not as sharply defined in real life as it is in the model, but the latter's implications appear qualitatively realistic. Output growth is slower when investment is not taking place, though positive within each state (explicit treatment of depreciation would of course imply slower and possibly negative output growth in bad times). When good news arrives and profitability improves, both output growth and investment spike upwards. The value of the country's installed capital stock, or its stock market's value, jumps upwards as the quantity of capital increases; a spike in the unit value of installed capital may or may not accompany the investment boom, depending on how long the previous depression lasted.

To discuss the *financial* capital-flow counterpart to the capital-accumu-

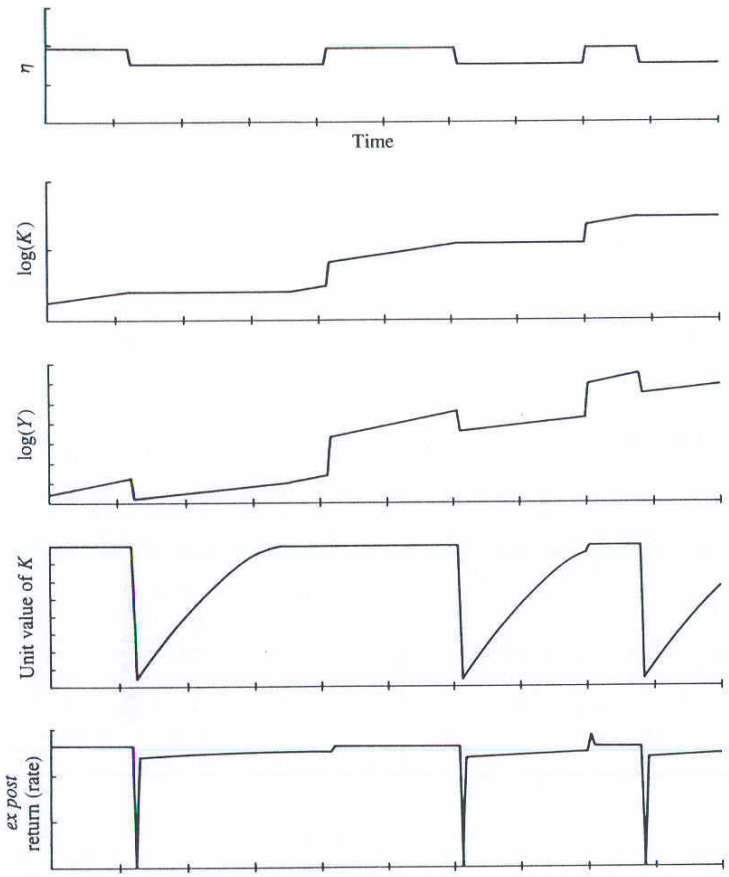

Figure 10.1 Sample paths of irreversible capital accumulation

lation dynamics, one can combine the essentially microeconomic aspects of our investment model with equally simple models of saving and consumption decisions in a small open-economy setting. When individuals can borrow and lend at the world risk-free rate and the income stream is subject to stochastic fluctuations, consumption–saving decisions are not easy to model, since they will depend on the specific stochastic process followed by income. Some special cases, however, may provide some insight. Consider the extreme case in which domestic residents have no access to world capital markets, so that they would simply consume

their current income at each point in time.[3] In this case, domestic consumption responds one-for-one to GNP. Since the investment model above is solved under the assumption that financial capital is internationally mobile, we should think of all claims to the installed capital stock as being owned by non-residents. Income flows from this capital, which would appear as a deficit item in the current account, would equal $\gamma Y(t)$. Periods of high investment would correspond to capital inflows and balance of payments surpluses, periods of low or zero investment as balance of payments deficits.

However, standard residency-based definitions of capital flows may be quite misleading for interpreting accounting data from LDCs, and especially Latin American countries. When some or all capital flows take the form of unrecorded and often illegal 'capital flight', official data measure only very imperfectly the amount and dynamics of local residents' net foreign assets. Even at a theoretical level, it is not quite clear that those Latin American citizens who hold much of their wealth in the United States are 'resident' in any economic sense. It may then be useful to consider a less standard definition of capital flows, defined in terms of resource flows in and out of the country regardless of their owners' domestic of foreign residency. We can say that a country experiences positive capital inflows whenever the sum of domestic consumption and domestic investment exceeds domestic production in (1). We could then consider the dynamics of capital flows $F(t)$ defined by

$$F(t) = C(t) + \dot{K}(t) - Y(t). \tag{6}$$

In the extreme case where all local residents are liquidity constrained, domestic consumption coincides with GNP, and capital flows correspond to investment by foreigners. More realistically, in a typical Latin American country, some local residents may consume current income, while others smooth consumption through access to the world capital market. When the relevant transactions occur via overinvoicing of exports and other unofficial channels, recorded capital flows will reflect only imperfectly the investment decisions of local and foreign residents. They might instead be closely related to $F(t)$ in (6), with domestic consumption a weighted average of that of consumption-'smoothers' and 'rule-of-thumb' consumers. In any case, capital flows would be closely related to the capital accumulation process illustrated in Figure 10.1.

Figure 10.1 also plots a series of realised returns on holdings of country-specific capital (returns per infinitesimal unit of time spike to plus or minus infinity upon a state transition, and Figure 10.1 plots their counterpart over finite intervals of time). It is important to note that the relationship between stock market rates of return and investment flows is consist-

ent with the evidence in Calvo, Leiderman and Reinhart (1992). First, the country is the recipient of ongoing positive capital flows in 'good times', when the realised rate of return is inclusive of a 'crash' premium which realises upon state transition. Second, upon a transition from bad to good times there is a step capital inflow, and the return on the country's asset includes the realisation of step capital gains on q. Such relationships follow immediately from the assumption of capital market equilibrium in a stochastic context, of course, and there is no sense in which high rates of return *cause* capital flows. The two phenomena are jointly and endogenously derived from underlying profitability dynamics.

The caution against taking high rate of return differentials as causing a capital inflow when both reflect underlying shocks is strengthened when one realises that large flows of capital into the stock market may induce a run-up of stock prices. Such autonomous capital inflows would show up as a rate-of-return differential if rates of return are measured inclusive of realised capital gains, so that causation would run from capital flows to return differentials, not vice versa. This may be descriptive of the Latin American experience in the late 1970s.

The above model illustrates the role of a primitive stochastic component in the production process in inducing fluctuations in key variables. We purposely kept the stochastic specification as simple as possible, by focusing on a two-state process for the country's productivity and capital's profitability. The key characteristics of the model are: forward-looking behaviour in physical investment (which we rationalise in terms of irreversibility but, of course, may reflect a variety of other realistic adjustment costs); and perfect flows of financial capital in the presence of local sources of uncertainty. Other features are admittedly simple, but more sophisticated modelling would not change the basic message.

The point that future expected business conditions matter for current investment is familiar from, e.g., Bernanke (1983), Dixit (1991), and much other recent work on investment dynamics under irreversibility. Of course, very similar if less dramatic insights could be obtained from any model where investment and disinvestment entail adjustment costs (with irreversibility representing the extreme case of prohibitive 'adjustment' costs for disinvestment). An explicitly dynamic framework makes it possible to go beyond consideration of currently unconstrained investment decision, however. Quite clearly, the counterpart of restrained investment in good times is an excess of installed capital in bad times, when the irreversibility constraint bites. Rational investors behave so as to keep realised returns on country-specific investment as close as possible to the required rate of return (r in the model). A supernormal return in good times (and the attendant restrained investment, given decreasing

returns to capital) has a counterpart in lower-than-normal returns in bad times, and irreversibility *per se* deters capital accumulation in an average sense. Rather, realistic irreversibilities and other adjustment costs affect the *dynamics* of capital accumulation, which are reflected in the dynamics of (unconstrained) flows of financial capital.

The model could be extended in several ways. We could consider demand-side shocks, for example in an analogous two-state framework. There could also be magnification from endogenous labour supply decisions or 'thick-market' externalities. It would be hard, however, to argue that technological uncertainty or 'thick-market phenomena' are especially important for capital profitability in specific countries, or indeed in LDCs as a whole. Even a simple look at the data makes it apparent that Latin American countries feature much more drastic swings in savings, investment, and capital flows than East Asian or sub-Saharan LDCs. Though the level of technological uncertainty, for example, may differ across countries, it is difficult to believe that it is sufficiently higher in Latin America than in the rest of the world to explain the high volatility of capital flows relative to other countries. One must therefore look at something other than primitive technological uncertainty to see what may distinguish Latin America from other regions in the world. As indicated in the introduction, our focus is on the role of government policy in magnifying technological shocks. In section 4, we go on to highlight the role of government policy variables, and argue that they should be regarded as crucial in the Latin American context.

4 The role of government policy

Frequent changes in political regime and significant shifts in government policy are an often-noted characteristic of the economic policymaking environment in Latin America. Argentina and Brazil, for example, are often given as examples of countries which have been hampered by frequent sharp policy shifts (for example in inflation stabilisation or balance of payments policy). The East Asian 'dragons', by contrast, are notable for a high degree of policy stability (Larrain and Vergara, 1991). The mid- and late 1980s have witnessed another significant shift in policy in Latin America. Several countries in the region have moved sharply towards a much less interventionist stance and far greater reliance on the market; others have taken less drastic steps but have still moved along with the trend to free-market economics. The purpose of this section is informally to investigate the extent to which government policy decisions may help explain volatility of capital flows. More specifically, we are interested in how volatility in policy can *magnify* the volatility of fluc-

tuations in investment profitability and investment, and we will discuss a number of possible mechanisms.

In arguing that variability in government policy may be what distinguishes Latin America from other regions in accounting for the variability of investment, we are *not* arguing that no other country exhibits similar instability of policy. The crucial point here is *magnification*: government policy can magnify the ups and downs due to technological shocks, but cannot induce a significant and sustained investment boom and capital inflow if the technological conditions are not right. That is, a region characterised by political instability need not experience volatility in investment opportunities and capital inflows if the underlying technological developments are uniformly unfavourable. As indicated in the introduction, our goal is to explain volatility of capital flows and not a uniformly low level. It is now well known that expectations of future economic conditions become especially important in investment decisions when investment is irreversible (see, e.g., Bernanke, 1983). In the case of foreign investment, this especially means conditions under which profits may be repatriated. Hence expectations of future restrictions are crucial. In countries with a history of capital controls, foreign investors will not automatically assume that the capital account will be open in the future simply because it is open today. (Van Wijnbergen, 1985 and Rodrik, 1989, discuss how uncertainty about capital account policy will affect investment incentives from abroad. Drazen, 1992, discusses how expectations of possible future trade restrictions induced low volatility in importation of consumer durables in Israel in the 1980s.) The link we see to primitive technological uncertainty is via the response of policy to economic conditions. Unlike East Asia, in Latin America a deterioration of economic conditions often leads to a major change in the direction of economic policy (see, for example, Kiguel, 1989). The imposition of restrictions on both current and capital account transactions is a common response to the balance of payments problems that often accompany an economic slowdown. Hence, a drop in productivity could bring with it the expectation that capital account policy will soon become less favourable to foreign investment, especially if the lower level of economic activity is expected to persist. Similarly, an increase of productivity may bring with it the expectation of liberalisation if the high-activity state is similarly viewed as persistent. This policy response would itself further dampen capital inflow when times turn bad and further increase capital inflow when times turn good. Hence the sort of endogenous trade policy response to economic fluctuations which often characterises Latin American governments may magnify underlying volatility of production.

The second mechanism we consider concerns how the tax system may

magnify the effect of technological shocks. Our basic idea is that fiscal systems in Latin America are often characterised by a positive feedback between the tax base and the tax rate. More specifically, there is a positive feedback loop between capital inflows and the tax rate on capital. A technological shock which lowers the tax base will induce an increase in the tax rate on capital, thus reducing capital inflows and further eroding the tax base and inducing a further increase in the tax rate. We term this effect the 'dynamic Laffer curve'. For such a feedback loop to be present, shocks to productivity must be met by tax changes rather than by changes in government expenditure or by changes in the deficit (as a tax-smoothing model would suggest).[4]

The failure of governments to respond to supply shocks by cutting government expenditure so as to keep tax rates and the deficit unchanged is a realistic description of how the world works. Certain aspects of IMF stabilisation programmes may also work in this direction: their primary focus on restraining public sector borrowing requirements may sometimes generate swings in tax rates of the type we consider. It certainly seems descriptive of many Latin American countries in which expenditure programmes are extremely difficult to cut. The difficulty in cutting government expenditures when the size of the pie has decreased may reflect a war of attrition over how to divide the burden of the cut, as in Alesina and Drazen (1991).

It is harder to argue that supply shocks which are perceived as not being permanent are *not* fully absorbed in the deficit, that is, that full smoothing of tax rates does not occur. Latin American countries in general have been far from averse to deficits. One argument concerns the implications of tax smoothing in a stochastic framework. Since η is stochastic and could stay low or high for a long period of time, keeping tax rates constant and meeting fiscal requirements (higher expenditures or shrinkage of the tax base) by issuing debt would require state-contingent instruments. In their absence, the intertemporal budget constraint would risk being violated by perfect smoothing of tax rates.

An empirically more relevant argument for the dynamic Laffer effect in Latin America may be the change in the composition of taxes in response to an adverse supply shock. An Alesina–Drazen-type argument suggests that it may also be difficult to get agreement on changing *certain* types of taxes in an economy, namely those falling on domestic interest groups with significant political clout. This suggests that other types of taxes, those falling more heavily on nonresidents, would be disproportionately affected by a productivity shock. That is, if the political system is such that fiscal decisions heavily reflect interest group pressure, tax rates on foreign-source capital might be expected to rise sharply in response to a

negative productivity shock, even when overall government spending is fixed over the cycle.

Finally, we consider how variable government expenditure and transfers can induce a similar magnification of primitive technological uncertainty to that discussed in section 3. We discuss two specific mechanisms: public investment and redistribution of income towards domestic residents. The public investment channel is straightforward and flows from the provision of infrastructure discussed by Barro (1990), among others, leading to public and private investment being complementary. That the correlation between public and private investment is strong and positive is quite apparent from both Latin American and East Asian data. If publicly supplied infrastructure makes private investment more profitable, an increase in public investment will encourage capital inflow. The link to production volatility comes from the sensitivity of public investment expenditure to economic activity.

The possibility that income redistribution policies may magnify technological uncertainty may be especially relevant to Latin America, where governments seem to be prone to intervene in the income-distribution process. Intervention to smooth consumption of domestic residents over the cycle seems quite benign, but we will show that it can have the effect of magnifying productivity shocks. To see why, suppose there exists a class of agents who do not have access to international capital markets and therefore simply consume a state-dependent fraction of domestic production. In the absence of redistributive activity, the consumption of 'local' factors of production would be procyclical, responding one-for-one to technological shocks. If the government wishes to smooth the consumption of such factors' owners over the cycle, it will intervene with *countercyclical* transfers, financed by taxes on agents with access to international capital markets. Hence, to the extent that the tax-transfer programme smooths consumption of the first class of agents, it must *unsmooth* income flows of the second-class, that is, makes its income flows more procyclical. In other words, it must magnify the effect of variability in a on capital's profitability as indexed by η.

5 Conclusions

The phenomenon of high volatility of capital flows into Latin America has rightfully generated a good deal of attention and interest. One line of explanation is that it reflects developments outside the region; a second, that it reflects developments within the region. We hold with those who favour the second line of argument. More specifically, we believe that the volatility of capital flows into Latin America reflects the vagaries of

government policies. Moreover, we argue that the nature of investment decisions requires focusing on horizons of longer than 1 year, as some explanations of the recent Latin American experience have done.

Our discussion of the specific application to Latin America was simply meant to support in a way we think is empirically relevant the basic argument that imperfect smoothing of taxes may generate magnifying effects of fiscal policy. We do not claim to have proved the crucial role of government policy. Instead, our methodology has been to examine a simple representative model in which stochastic swings in the underlying profitability of local investment interact with forward-looking investment behaviour (due to irreversibilities) to yield volatility of capital inflows. We take the model to be representative in that any model of investment under uncertainty should have these two features, and any model with these two features will yield the basic patterns our model exhibited. Many substantive issues can be addressed by our formal model, and we have focused our analysis on realistic mechanisms by which government policy responses would *magnify* the effects of underlying technological uncertainty. All of these mechanisms need to be explored in greater detail. This chapter is meant to suggest how fruitful such an exploration may possibly be in explaining the volatility of capital flows.

NOTES

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1 We disregard depreciation, but its role would be quite similar to that of technical progress, as indexed by θ.

2 A constant growth rate of labour supply could be included in the exponential term, since technical progress could be seen as labour-augmenting.

3 Similar, though less extreme, assumptions are considered and rationalised by Gertler and Rogoff (1990) and by Barro, Mankiw and Sala-i-Martin (1992).

4 It may seem strange that an income-based tax system would magnify rather than dampen fluctuations, given the basic textbook story of the tax system as an automatic stabiliser. In the automatic stabiliser story, tax rates stay constant (or even fall in a progressive tax system) in response to a shock, with the deficit taking up the slack. Here, if the deficit stays constant, tax rates must 'take up the slack', with tax rates moving *countercyclically*.

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Discussion

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The analysis of capital flows and investment incentives should take into account the irreversible nature of investment in physical capital. Starting from this consideration, Bertola and Drazen provide in Chapter 10 a first 'building block' towards the construction of a fully-fledged model that would allow one to analyse the interaction between irreversible investment decisions, government policy and exogenous productivity shocks.

I think the chapter addresses very interesting issues in a clear and systematic way, although much work remains to be done before the authors' claims can be confronted with empirical data. The model sketched in this chapter derives the dynamic behaviour of investment in the presence of productivity growth and stochastic shocks, for a given distribution of returns between labour and capital, but it does not 'endogenise' these shares analytically nor does it formally relate them to policy variables. The discussion the authors provide is very stimulating, and it highlights many potential insights one could derive from a fuller model specification. My comments include a brief summary of the chapter and a discussion of some of the policy issues it raises.

1 The structure of the model

A small open economy produces a single good, that can either be consumed or invested in physical capital. Investment is irreversible (although the model could easily accommodate capital depreciation). The factors of production are labour and capital, and the production function is Cobb–Douglas. There is deterministic productivity growth and two possible states of the world, 'good' and 'bad', that alternate stochastically. The *share* of capital in total output is assumed to be state-dependent and exogenous; labour is inelastically supplied and constant. When the economy is in a good state, investment is always positive, so that the price of investment (present discounted value of future income streams) equals the unit consumption price of the single good. When the economy is facing bad times the irreversibility constraint may be binding, so that a unit of investment may have a value smaller than 1. In this case, there is no investment. However, even if bad times persist, the exogenous productivity growth rate will eventually stimulate resumption of investment. Of course, investment would be stimulated should times change from bad to good.

Once the pattern of investment returns is determined as a function of the stochastic structure (productivity shocks) and the exogenous state-dependent shares accruing to capital and labour, the authors proceed to relate the volatility of returns to the cyclical behaviour of income distribution. In order to derive implications for the behaviour of capital flows, they redefine the latter as the difference between income and absorption, regardless of the ownership pattern of capital.

2 Regional factors and policy issues

A first observation concerns the modelling strategy. The framework used by the authors assumes that capital inflows finance investment in the form

of physical capital. One would also need to account for the possibility that some of the volatility in capital flows is due to 'hot money' that can be 'disinvested' more easily.

Bertola and Drazen argue that it is necessary to understand the volatility of returns to country-specific investment in order to explain capital flows. They are in favour of a 'regional' explanation for the capital inflows in Latin America. However, they do not provide any supporting evidence and, from a theoretical standpoint, their 'regional explanation' is assumed rather than derived. For both these reasons, the comparison with the empirical paper of Calvo, Leiderman and Reinhart (1992) is, in my opinion, misplaced. Three factors are cited in support of the authors' view that capital inflows are primarily motivated by 'region-specific' events:

(1) outsiders perceive that there are unobserved shocks common to neighbouring countries
(2) there are spillover effects, both on the demand and on the supply side, between countries
(3) competition for funds leads countries to adopt similar policies.

Of course, all these points are debatable: for example, some productivity shocks (like oil-shocks) have obviously asymmetric effects on different countries in Latin America. However, I will focus on the main point of the chapter: namely, that government policy can magnify the fluctuations in profitability and investment generated by productivity shocks. Bertola and Drazen mentions some features of the political system in Latin American countries, such as high policy volatility, that support their main thesis. Although I do not question the importance of political instability in explaining macro policies and investment incentives in Latin America – stressed, for example, in the NBER volume edited by Dornbusch and Edwards (1991) – it cannot be claimed that the model does indeed support the conjecture that government policy magnifies the volatility of capital flows to and from Latin American countries. Instead, the model *assumes* this view: namely, it argues that *if* government policy has certain characteristics, specified below, *then* this 'magnification' can occur. The authors' argument relies on four types of policy measures that enhance the volatility of capital flows:

(1) volatility of capital controls: in bad times the imposition of capital controls may be more likely, and this further discourages capital inflows
(2) positive feedback between capital movements and fiscal policy through the size of the tax base and through the composition of taxes (dynamic Laffer curve)

(3) procyclical government investment expenditure (a complement in production)
(4) stronger redistribution pressures in bad times.

I find argument (1) convincing. However, I have some doubt on (2), the 'dynamic Laffer curve' story. Even though cuts in government spending are difficult to achieve, I am not convinced by the (implicit) description of Latin American countries as less deficit-prone than other developing countries because of IMF-prescribed policies. Furthermore, significant cuts in spending have been achieved in stabilising Latin American countries, such as Mexico. The authors mention a 'war of attrition' situation in which spending cuts are the source of conflict. They also recognise that the source of disagreement behind a 'war of attrition' situation may be tax policy: namely, who will bear the tax burden of a stabilisation. If taxes falling on domestic interest groups are difficult to change, the *composition* of taxes may shift towards those falling more heavily on nonresidents when a negative productivity shock occurs. I am not sure, however, that taxes on foreign-source capital may be the 'residual' in a war of attrition situation. First of all, inflation seems to be a more likely candidate.[1] Second, it is not clear how much revenue the government can raise through this channel, taking into account the size of the tax base, the relative inefficiency of the tax system in several Latin American countries and the ease with which capital can be channelled abroad. Moreover, the price in terms of scaring foreign investors may be higher than the potential benefits.

Argument (3) relies on the procyclical pattern of public investment, where the latter is viewed as a complement to private investment. This seems *prima facie* reasonable: it would be interesting to study why governments cut investment to infrastructure in bad times while other forms of spending are not cut. Why would Latin American countries be more likely than others to cut public investment in 'bad' times? Government 'myopia' caused by political instability is a common explanation, justified by the fact that the political situation has been more unstable in Latin America than, say, in East Asian countries. Clearly, more research is needed to establish the relevance of this proposition.

Explanation (4) relies on income redistribution, in the form of policies that 'insure' labour income by redistributing resources towards labour in bad times. If the labour share is countercyclical, then the capital share is procyclical, implying a lower share for capital in bad times. These two effects (bad times and falling capital share) reduce investment incentives. While intuitively appealing, this explanation needs in my opinion to be grounded in some empirical evidence.

When one moves towards a fuller discussion of fiscal policy decisions, several interesting issues arise. Do these redistributive features depend on who is in power? Are 'populist' governments more likely to win elections in bad times? I find these questions to be worthwhile research topics in their own right. From a theoretical point of view, an effort in modelling endogenous fiscal policy formation under political constraints such as those stressed by Bertola and Drazen would complement their effort on modelling the private investment side. Of course, the authors' case would be strengthened if they could provide some tangible evidence on some of their claims: for example, if they could show that Latin American governments in bad times tend to tax capital more heavily.

Summing up, I believe that the research project initiated by Bertola and Drazen is interesting and important. I also find some of their insights concerning the role of government policy volatility in shaping investment incentives to be on the mark. However, a project that intends to address the issues raised by the authors should model explicitly policy decisions as carefully as investment decisions. Even more importantly, these insights cannot be meaningfully applied to the experience of Latin American countries without considering any empirical evidence.

NOTES

The first draft of these comments were written while I was affiliated with the Centre for Economic Performance of the London School of Economics. I am grateful to José De Gregorio and Enrique Mendoza for comments and suggestions.

1 However, one could argue that inflation may act as a deterrent to investment for a variety of reasons (reduction in the informational content of prices; optimality of waiting for the resolution of uncertainty, etc.). For a discussion and some evidence (based on Summers–Heston data) see, for example, Fischer (1993).

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The volatile nature of capital flows to and from lesser developed countries is well documented. Early manifestations of this phenomenon can be found in the primitive international capital markets of late medieval Europe, where developed nations, such as Florence, invested in lesser developed countries, such as England. The most intensively-studied cases are those related to Latin America and associated with the emergence of modern capital markets in the 1870s. Indeed, as Bertola and Drazen themselves point out, they are addressing a widespread empirical phenomenon that merits a theoretical treatment.

As an economic historian I must welcome a model that claims to offer a theoretical treatment of such an important phenomenon: it allows the historian to structure his analysis, focus on the relevant historical data, relate the various variables in a consistent and logical manner and test alternative hypotheses. On the other hand, before embracing any new theoretical development, I must question the relevance of the model for the study of historical episodes, its level of generality and whether it provides any additional insights, not already offered by existing models or discussions. In this Discussion I shall try to carry out an initial assessment of this new model from the perspective of an economic historian.

Before turning to the discussion of the model in historical perspective I shall briefly outline its major arguments. The model assumes a stochastic Cobb–Douglas production function whereby productivity is the stochastic element which in each period can take on one of two possible states – a good state and a bad state. The profitability of investment can therefore belong to either of the two states. Using a no-arbitrage equation for both states and assuming nonreversibility the model can be used to derive an implicit definition of the capital stock. The authors use a simple consumption function. They define net capital flows according to standard national accounting conventions, as the difference between aggregate domestic expenditure and output. This definition allows them to argue that given their characterisation of the production function, all capital flow fluctuations around their mean would be driven by productivity developments. In the concluding sections of the chapter the authors discuss how government policies in unstable regimes can *magnify* technology shocks by resorting to higher tax rates on capital or to the taxing of foreigners rather than of domestic interest groups. To do justice to the

chapter, it also offers additional insights into issues such as the volatility of returns to investment and capital flows, simulations of the model and much more.

The main points an economic historian or any policy-minded economist can draw from this chapter are (1) that capital flows are driven by supply-side productivity shocks, and (2), which follows from (1), that government's role is secondary to that of the supply side and serves mainly, in the Latin American case, to exacerbate the already adverse effects of the technology shock. How do these main points compare with previous explanations of the capital flow phenomenon? I will not even attempt to provide an exhaustive list of these cases but merely give examples that, I hope, will serve to highlight the strengths and weaknesses of this new approach.

The foreign debt crisis of the 1980s generated – apart from discussions on solutions and remedies and other theoretical issues related to creditor–debtor mechanisms' design – a large measure of discussion on the roots of the problem. How are debt defaults related to the issue at hand? First, even though Bertola and Drazen focus on the relationship between capital flows and the stock of capital, an equally important relationship seems to be tucked under the carpet. Chapter 10 ignores the short- and long-run relationships between capital flows and the foreign debt (the stock). Second, the defaults literature emphasises the role of liquidity crises initiated by a decline in capital flows.

This literature (such as Cardoso and Dornbusch, 1989) points to three main culprits who are responsible for the drying up of capital flows, (1) domestic fiscal crisis that undermines confidence of international investors, (2) a deterioration of the terms of trade, and (3) a decline in available savings in the investing countries. Out of these three causes only (2), the terms of trade, could be considered a supply-side shock that is similar to a technological shock, albeit more appropriate for discussing primary rather than manufactured goods. Bertola and Drazen argue quite convincingly that external reasons emanating in the investing country are of secondary importance, so that leaves us with argument (1) – domestic fiscal crisis.

The discussion of Latin American foreign investment crises, namely those of Argentina and Brazil, focus primarily on the underlying political and fiscal chaos prevailing in these countries at the time capital flows dried up. Contemporary accounts emanating from the lending country – England – are concerned more with the inflationary finance (money creation) of fiscal deficit than with falling coffee prices or the terms of trade. The restructuring of the repayment schedule and the resumption of foreign investment are almost always linked to austerity plans and fiscal

responsibility. It thus seems that in historical perspective, what could be termed as demand-side causes have figured prominently as explanations for the variability of capital flows.

Another equally important set of models is invoked to explain yet other episodes of capital-flow variability. The models I am referring to are the portfolio capital flows theories that invoke the same no-arbitrage arguments used in this chapter. In these models exchange rate uncertainty figures prominently as a source affecting the profitability of foreign investment. In a study of tsarist Russia, Gregory (1979) established that the adoption of the gold standard by Russia in 1896 was correlated with positive and large (three times pre-gold standard levels) capital flows. One can easily relate the Russian experience with that of Brazil or Argentina by arguing that fiscal stability is a necessary condition for a successful commitment to an external constraint such as the gold standard imposed. The fiscal crisis and political weakness of Latin American countries imposed, at times, great exchange rates risks which affected the profitability of foreign investment.

In fairness, I must add that those papers dealing with Argentina seem to include sentences such as the decline in net profits from railroads and other investments prior to the deterioration in the balance of payments and collapse of foreign lending. However, these assertions are not fully developed as the discussion then heads toward budget deficits and balance of payments crisis.

A brief and incomplete survey of some episodes that exhibited capital-flow volatility has shown that existing treatments emphasise domestic demand-side arguments as an explanation for capital flow volatility – fiscal crisis and exchange rate uncertainty are the driving forces behind reduced expected profitability of foreign investment. There is a way to resolve the apparent dichotomy between this and existing treatments of the sources of capital flow. The authors should try to incorporate exchange rate risks explicitly in the no-arbitrage equation and to explicitly incorporate the government deficit in the resources flow equation.

In the current version of the model the authors use the equation:

$$F = \dot{K} + C - Y \tag{1}$$

to define net capital flows as equal to domestic resources minus domstic uses.

Since $Y = C + S$ we can write the equation as:

$$F = \dot{K} - S$$

or in a more standard notation:

$$IM - EX = I - S. \quad (2)$$

The last equation ignores the government sector. We should write domestic savings as the sum of private and public sector savings:

$$S = Sp + Sg. \quad \text{where} \quad Sg = G - T.$$

Substituting S in (2) we get:

$$IM - EX = I - Sp - (G - T) \text{ or} \quad (3)$$

$$F = \dot{K} + C + G - Y. \quad (4)$$

The current absence of government deficit from the model has to be defended, because its exclusion both assumes *ex ante* the results the authors would like to establish and plays down the role of government policy that is, after all, the underlying motivation for the chapter. Once both elements are included, a fair horse-race can be run between the supply-side and demand-side theories.

To conclude, I found two problems with the chapter: (1) It ignores, *ex ante*, demand-side explanations that figure prominently in the literature, and (2) it ignores the feedback between the flows and the stock (the foreign debt). Nevertheless, I have benefited from reading this chapter. In particular, it directs the attention of the economic historian and policy-oriented economist to the fundamentals, i.e., the supply-side shocks that could have initiated the capital flow crisis faced by lesser developing countries. The role of political instability and fiscal crisis would then be indeed in magnifying the effects of this initial shocks. This assertion has to be tested against the alternative which puts the blame on the demand side. I am sure that the debate that this chapter will generate would help us better to understand the process and to describe better remedies for those countries faced with capital-flow volatility.

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Part Four
Policy perspectives