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How OECD Policies Affected Latin America in the 1980s

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and
David Vines

Latin America's adjustment problems in the late 1980s cannot be attributed to failures of G-3 (U.S., German, and Japanese) fiscal coordination because G-3 fiscal imbalances imposed little cost on Latin America. But concerted G-3 monetary contraction in response to the second oil shock imposed heavy costs on Latin America; without it, Latin American GDP would have been 5 percent higher in the 1980s.

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This paper — a product of the International Economic Analysis and Prospects Division, International Economics Department — is part of a larger effort in the department to trace international linkages from policies in the industrial countries to growth performance in the developing countries. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact T. G. Srinivasan, room S8-023, extension 31288 (August 1992, 25 pages).

Allen, Currie, Srinivasan, and Vines assess the effects of OECD monetary and fiscal policies on Latin America by means of simulation studies using the LBS/NIESR Global Econometric Model and a new empirical model of Latin America. The Latin American model pays special attention to the supply-side determination of natural rate of output and to the effects of asset accumulation. The Latin American model and its properties are presented by both empirical simulations and by means of a simple analytical representation. This model of Latin America is used in conjunction with the Global Econometric Model to study the macroeconomic interactions between Latin America and the rest of the world.

The assumption in policy simulations is that G-3 exchange rates are forward-looking while Latin America pegs its currency to the U.S. dollar. It is postulated that Latin American fiscal policy adjustments target a baseline current account balance, in the face of external shocks. The simulation results reflect a number of important international links, which can be quantified as multiplier properties of the linked system of models.

A permanent 5 percent contraction in the U.S. money supply induces a contraction of about the same order in Latin American GDP and capital stock. This is caused by higher U.S. interest rates and diminished Latin American competitiveness in third markets, reinforcing the fall in U.S. demand.

Similarly, a combined monetary contraction in G-3 countries on a permanent footing — a contraction like the one in 1978-80 (U.S., 5.2 percent, German, 11.9 percent, and Japanese, 1.7 percent) hurts Latin America. Latin American GDP remains depressed by 4 percent and capital stock by 5 percent even after 10 years. The effects of negative income and interest rates emanating from G-3 countries are mutually reinforcing.

U.S. fiscal expansion equal to 1 percent of baseline GDP, sustained over five years, transmits negatively to Latin America, where GDP falls 0.6 percent in the short run and remains depressed by 0.3 percent even after 10 years. The negative effects of higher interest rates and diminished competitiveness dominate the positive effects (which are short-lived) of expanded U.S. demand for Latin American exports.

Similarly, G-3 fiscal spending shocks, which are gradually built up over five years, then reversed the next two years, have a mild negative effect on Latin American GDP. The G-3 fiscal shocks administered were set to their actual magnitudes relative to baseline GDP, as observed in 1980-85 (U.S. expansion of 3.5 percent but contraction in German and Japanese spending of 4.4 percent and 3.5 percent, respectively). Latin American GDP is lower than baseline GDP by 0.5 percent when the shocks peak at the end of five years, but continues to remain depressed 0.3 percent by the end of 10 years.

The simulated effects of G-3 monetary and fiscal policies, with the shocks constructed to reflect their actual sizes in the early 1980s, suggest that Latin America's adjustment problems in that period cannot be attributed to G-3 fiscal imbalances that arose because of failures of G-3 fiscal policy coordination. But concerted G-3 monetary contraction in response to the second oil shock imposed heavy costs on Latin America; without it, Latin American GDP would have been 5 percent higher in the 1980s.

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How OECD Policies Affected Latin America in the 1980s

by
Chris Allen, David Currie,
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1. INTRODUCTION

In this paper we describe a new model of the Latin American region, built for the purpose of studying North-South macroeconomic interactions. We then use it to discuss the macroeconomic transmission of global shocks to Latin America.

Section 2 of the paper presents the model and discusses its simulation properties, both empirically and by means of a simple analytical representation.

In section 3 we examine the effects of stylized global shocks on Latin America, in order to investigate the nature of the process by which such shocks are transmitted to the region from the OECD. In each case, we first briefly discuss the effects of these shocks on the world economy, as simulated by the global econometric model (GEM) developed at London Business School and the National Institute of Economic and Social Research. We then consider the implications suggested for Latin America when our regional model is connected up to GEM. The stylized shocks considered are a US monetary contraction and a US fiscal expansion.

In section 4, we consider a historical experiment. We investigate how the 1980s might have differed for Latin America if fiscal and monetary policies in the OECD had been different. In particular we ask how out-turns might have changed if the global monetary contraction of the early 1980s had been avoided, or if fiscal policies had been better coordinated across the OECD. The results shed light on the question of whether coordination failures amongst the OECD countries exacerbated the adjustment problems of Latin America in the 1980s.

The concluding Section 5 draws attention to limitations of the study, in the context of policy reactions in Latin America in the face of shocks emanating from OECD countries.

2. THE LATIN AMERICAN MODEL

This section describes the properties of our macro-econometric model of Latin America. The full specification of the model is given in Srinivasan and Vines (1990). The model is an aggregate one which covers all the principal Latin American countries with the exception of the oil producer, Venezuela. The model has been econometrically estimated using aggregate data for the region constructed from individual country data supplied by the World Bank. Its broad theoretical structure is similar to the models of the Newly Industrializing Economies, Other Asian Economies, and African Economies described in Srinivasan and Vines (1990, 1991a,b) and Allen (1991).

The model consists of roughly forty equations. It includes a fully specified income-expenditure process, a supply side, and a foreign trade sector, together with a full set of balance

of payments and government accounts. Amongst the distinctive features of the model are the determination through capital accumulation and the supply side of an endogenous natural rate of output, the presence of real balance effects on consumption, the integration of the government budget deficit and foreign exchange reserves with the money supply process, and a national intertemporal budget constraint satisfied by a government fiscal rule.

The absence of endogenous interest rates and the importance of asset accumulation in determining equilibrium make the behaviour of the full model substantially different from that of a conventional macro model of an industrialised economy. We thus explain not only the separate equations of the model but also its full simulation properties, developing a simple analytical representation to assist with this.

2.1 Short Run

Demand

There are separate demand equations for consumption, investment, export and import volumes. Real net exports add to domestic demand to determine GDP.

The consumption function contains real income with an adjustment for changes in the terms of trade and also financial wealth accumulation, which is modelled as the accumulation of money (M2).

Investment expenditure is determined by a stock adjustment process based on a neoclassical demand for capital function. The desired capital stock is a function of output and the cost of capital. Net investment is a lagged adjustment process to the desired capital stock. Gross investment includes an allowance for depreciation. The capital stock feeds directly into the supply side. The accumulation of capital makes the trade-off between output and the real exchange rate more favourable.

We have adopted a fairly conventional model of international trade. Export volumes depend on export markets (with a long-run elasticity of unity) and on relative export prices[2] (with a quite high long-run elasticity of nearly 2.5). Import volumes depend on both domestic output (with a very high income elasticity[3] of 2.57) and on the real exchange rate[4] (with a long-run elasticity of approximately 0.1). Overall the Marshall-Lerner conditions are found to hold and the reduced-form elasticity of the trade balance with respect to the real exchange rate is around 2.[5]

We have explored empirically the multiplier properties of aggregate demand determination within the model by means of partial simulations - with all prices held constant - in response to an increase in government spending. There are long cycles of multiplier-accelerator interaction with a periodicity of 11 years. The full multiplier converges to a long-run value of about 1.6.

We may represent the demand side of the model analytically by means of Equation 1 which shows the aggregate demand function, normalised on output, y. Aggregate demand is reduced by higher domestic prices relative to foreign prices measured in domestic currency, $(e + p^* - p)$; it is an increasing function of world trade, z, of government spending, g, and of real asset stocks, a ; and it also depends on investment which (abstracting here from depreciation) is equal to the rate of change of the capital stock, dk/dt. κ_1 is the Keynesian income-expenditure multiplier.

$$y = \kappa_1[z+\beta_1(e+p^*-p)+\beta_2 a+g+\dot{k}] \quad (1)$$

Supply

The supply side of the model consists of two equations: one each for prices and real wages.

Prices are a mark-up on marginal costs, which are composed of wage and import costs, and a term in the output-capital ratio.[6] A rise in output, or a fall in capital, ceteris paribus leads to an increase in the mark-up over costs. In the estimation which included the heavily import-constrained 1980s, a term in the import-output ratio was included in the equation to proxy movements in the shadow price of imports. This term has been fixed out in the reported simulations.

The wage equation is for real wages, with a small term in productivity growth. As a result of the continent's wide experience of hyper-inflationary conditions, real wages were found to be invariant to the price level, but are in the very short term negatively affected by inflationary surprises.

We have explored the supply side of the model through joint simulations of the wage and price equations. Consider a permanent increase in output supplied, with the capital stock fixed. Marginal costs rise and so prices increase. With real wage resistance, nominal wages rise along with prices. If the nominal exchange rate is fixed, domestic prices will rise relative to import prices, appreciating the real exchange rate. We find the size of this effect is large: a one per cent increase in output requires approximately a 3 percent appreciation of the real exchange rate. This aspect of the model is extremely "un-Keynesian" in that the short-run adjustment dynamics are extremely fast and are mainly completed within a year: higher output very quickly requires a higher exchange rate and the reliance which can be placed on unanticipated inflation is both small and short-lived.[7]

Taken together the wage and price equations can be solved to obtain an aggregate supply equation. Aggregate supply becomes a function of the capital stock and of price surprises, and a decreasing function of the real exchange rate (defined as the real domestic currency price of imports). We represent this supply function in Equation 2, normalising on domestic prices, p.

$$p = e+p^*+\alpha_1(\alpha_2 y-k) \quad , \quad \alpha_2>1 \tag{2}$$

An increase in the output/capital ratio, y - k, raises the price level as producer mark-up over short-run costs increase, as does an increase in import prices in domestic currency, e + p^*. But an equiproportionate increase in both output and capital will not leave the price level unchanged - it will raise prices because of the existence of a labour constraint.[8] The formulation here - even though it is "short run" - abstracts from the effects of surprise inflation, which, as noted above, were found to be very short-lived indeed.

Reduced Form

Taking equations 1 and 2 together gives short-run solutions for output and prices, conditional on the values of the asset stocks, k and a. These are

$$y = \kappa_1\kappa_2[\beta_1\alpha_1 k+z+\beta_2 a+g+\dot{k}] \tag{3}$$

and

$$p = e+p^* + \gamma_1[-k+\beta_2 a+g+\dot{k}+z] \tag{4}$$

where $\kappa_2 = 1 / [\ 1 + \kappa_1\alpha_i\alpha_2\beta_i\ ]$ is a kind of "price multiplier" and $\gamma_1 = \kappa_1\kappa_2\alpha_1\alpha_2$.

2.2 The Longer Run: Asset Accumulation Effects

Accumulation of both real and financial assets plays a key role in the full closure of the model.

Investment and Capital

Investment generates a gradual adjustment of the capital stock to a level depending on the cost of capital[9]. In the estimated model this cost of capital is taken to be the world rate of interest, r^*, although in subsequent simulation work we are introducing a risk premium related to the overhang of debt (see Allen et. al., 1991)$_{10}$. We represent the investment function as

$$\dot{k} = \phi(y-k-er^*) \tag{5}$$

Domestic Debt

The model includes a fully specified set of government accounts. Government investment follows private investment and tax revenues are endogenous. Thus we may represent the change in nominal domestic debt as[11]

$$\dot{h} = -\tau y + g - r^* s \tag{6}$$

Reserves

The model also includes a fully specified model of the balance of payments accounts. Interest and amortization payments on foreign debt are included, as well as service transactions. Changes in reserves finance changes in the basic balance of payments. Capital flight is neglected (but see the discussion of debt in Allen et al 1991). Thus, abstracting from the effect of the exchange rate on the valuation of foreign exchange reserves, the change in reserves may be written as

$$\dot{s} = z + \beta_1(e + p^* - p) - \mu y + r^* s \tag{7}$$

Money

The term in the consumption function for the real stock of domestic assets is proxied by the real money stock, whose evolution we now discuss. The nominal money supply is endogenous, and is dependent on the creation of base money. Base money in turn depends on domestic credit and foreign exchange reserves. Only a proportion of the government deficit (dh/dt) and of changes in reserves (ds/dt) are assumed to be monetized, the proportions being based on historical experience.[12] We thus write

$$\dot{a} = \eta(\dot{s} + \dot{h}) - \bar{a}\dot{p} \tag{8}$$

where the final term shows the erosion of real asset values due to inflation.[13]

2.3 Policy Framework

In simulations of the model, the nominal exchange rate is normally assumed to be pegged at baseline values against the dollar. Interest rates are therefore fixed at the US real rate of interest (but see the work on debt in Allen et al 1991) and there are no effects from domestic capital markets.

Latin America suffers from debt overhang problems and is severely constrained in its ability to borrow abroad. This implies that current account deficits lead to losses of reserves, and eventually to a curtailment of domestic spending. To simulate this constraint, we have implemented a feed-back rule for government consumption on changes in reserves. Government consumption is assumed to move so that deviations in both the change and level of reserves from base have an impact on government consumption. The feedback rule, expressed in terms of deviations from the base, is in the form:

$$\Delta g = 0.8 * \Delta s + 0.4 * s_{-1} \tag{9}$$

The coefficients on the rule are imposed, not estimated. They give a relatively rapid response in government consumption to changes in reserves.

Another possible response to debt overhang, namely default, is discussed in detail in Allen et al 1991.

2.4 Stability, Comparative Statics and Simulation Exercises

Stability

Consider our simple analytic representation of the model. For ease of exposition, we set the exogenous variables z, g, e, p^*, and r^* to zero. Using equations (6) and (7) we may then write equation (8) as

$$\dot{a} = -\eta\beta_1 p - \eta(\mu+\tau)y - \bar{a}\dot{p} \tag{10}$$

After substitution from equations (3) and (4) we may further reduce equations (5) and (10) to the following pair of differential equations in the state variables a and k.

$$\begin{aligned}\dot{a} = {} & (1+\bar{a}\kappa_1\kappa_2\alpha_1\beta_2) - \eta\kappa_1\kappa_2\alpha_1\beta_1(1+\mu+\tau)k - \eta\kappa_1\kappa_2(\beta_1\alpha_1+\mu+\tau)\beta_2 a \\ & - \eta\kappa_1\kappa_2(\beta_1\alpha_1+\mu+\tau-\bar{a}\alpha_1/\eta)\dot{k} - \bar{a}\kappa_1\kappa_2\alpha_1\dot{k}\end{aligned} \tag{11}$$

$$\dot{k}(1-\phi\kappa_1\kappa_2) = \phi[-(1-\kappa_1\kappa_2\beta_1\alpha_1)k + \kappa_1\kappa_2\beta_2 a] \tag{12}$$

Tedious manipulation reveals the following three stability conditions on asset-accumulation processes in the model.

(i) *Necessary:* $\eta > 0$

This makes sure that changes in reserves affect the money supply, so that the monetary-approach-to-the-balance-of-payments (MAB) stabilising mechanism is allowed to operate.

(ii) *Necessary:* $(1-\phi\kappa_1\kappa_2) > 0$

This ensures that multiplier-accelerator interaction is not instantaneously explosive.

(iii) *Sufficient (when combined with (i) and (ii))*: $(1 - \kappa_1\kappa_2\beta_1\alpha_1) > 0$

This ensures that the supply-side effect of a reduction in exports - which lowers output, leads to a reduction in investment, a lower capital stock, higher prices, and so again lower exports - is not so great as to lead to a cumulative collapse.

This stability analysis is important for understanding the simulation properties of the empirical model. Without the MAB mechanism the full model blows up. Multiplier accelerator interactions initially created such large cycles in the full model[14], as to lead us to consider very carefully the estimation of the investment function. And the exploration of supply-side collapse in the face of lower exports is one of the main tasks which we have set for the model: simulations show that it is significant,but not cumulatively implosive.

Comparative Statics

We consider the effects of changes in the exogenous variables g, z, p^*, and r^* on output, prices and the trade balance. (The trade balance, j, equals the first three terms of equation (7).)

In the *short-run*, we assume that both the stock of nominal financial assets and the capital stock are fixed. The short-run comparative statics results can be therefore be determined from equations (3) and (4). The results are reported in Chart 1. Two factors combine to determine the results. The first is the orthodox multiplier-accelerator mechanism, which must be positive for the model to fulfil the stability conditions. The second is the wealth effect from the erosion of the value of the financial asset stock resulting from a price rise. This term (denoted by Ω) reduces the impact of the multiplier-accelerator mechanism.

Increases in government spending and world trade both increase output by the combination of the two multipliers and raise prices. The trade balance strictly worsens for an increase in government spending as a result of higher absorption and poorer competitiveness. In a world trade shock, these effects are almost certainly outweighed by the direct improvement in the volume of exports.

Increases in world prices have short-run effects purely through the erosion of asset value by inflation. Output is reduced and prices rise by less than the full amount of the international price rise. The trade balance improves as a result of increased competitiveness and reduced absorption.

An increase in world interest rates has a negative effect on output through lowering investment demand. Prices fall purely as a result of demand effects; the capital stock is assumed constant in the short-run. The trade balance improves.

Long-run effects can be obtained from equations (11) and (12) by setting da/dt and dk/dt equal to zero in (5) and (8) to solve for k and a and then substituting for y and p in equations (3) and (4). The results are reported in Chart 2. Increases in government spending

Chart 1: Short-Run Comparative Statics

Effect of	Effect on y	Effect on p	Effect on j
g	$\frac{\kappa_1\kappa_2\Omega}{1-\kappa_1\kappa_2\phi} > 0$	$\frac{\gamma_1\Omega}{1-\kappa_1\kappa_2\phi} > 0$	$-\frac{(\beta_1\gamma_1+\mu\kappa_1\kappa_2)\Omega}{1-\kappa_1\kappa_2\phi} < 0$
z	$\frac{\kappa_1\kappa_2\Omega}{1-\kappa_1\kappa_2\phi} > 0$	$\frac{\gamma_1\Omega}{1-\kappa_1\kappa_2\phi} > 0$	$\left[\frac{1-\kappa_1\kappa_2(\phi+\mu\Omega)-\beta_1\gamma_1\Omega}{1-\kappa_1\kappa_2\phi}\right] \gtrless 0$
p*	$-\beta_2\Omega < 0$	$\Omega > 0$	$\beta_1(1-\Omega) + \frac{\mu\kappa_1\kappa_2\beta_2\Omega}{1-\kappa_1\kappa_2\phi} > 0$
r*	$-\frac{\kappa_1\kappa_2\phi e\Omega}{1-\kappa_1\kappa_2\phi} < 0$	$\frac{-\gamma_1\phi e\Omega}{1-\kappa_1\kappa_2\phi} < 0$	$\frac{(\beta_1\gamma_1+\mu\kappa_1\kappa_2)\phi e}{1-\kappa_1\kappa_2\phi} > 0$

Note: $\Omega = \frac{1-\kappa_1\kappa_2\phi}{1-\kappa_1\kappa_2\phi+\gamma_1\beta_2}$, $1 \geq \Omega > 0$

Chart 2: Long-Run Comparative Statics

Effect of	Effect on y	Effect on p	Effect on j
g	$\kappa_1\kappa_2/\beta_1\gamma_1\psi > 0$	$[1-(\mu+\tau)/\beta_1\psi\alpha_1\alpha_2]/\beta_1 \gtrless 0$	$-\left[1-\frac{\tau}{\beta_1\psi\alpha_1\alpha_2}\right] < 0$
z	$\kappa_1\kappa_2/\beta_1\gamma_1\psi > 0$	$[1-(\mu+\tau)/\beta_1\psi\alpha_1\alpha_2]/\beta_1 \gtrless 0$	$\frac{\tau}{\beta_1\psi\alpha_1\alpha_2} > 0$
p*	0	1	0
r*	$-\frac{\kappa_1\kappa_2}{\psi}(1+\beta_1\alpha_1)e < 0$	$\frac{\kappa_1\kappa_2}{\psi}\frac{(\mu+\tau)}{\beta_1}(1+\beta_1\alpha_1)e > 0$	$-\frac{\kappa_1\kappa_2}{\psi}\tau(1+\beta_1\alpha_1)e < 0$

Note: $\psi = 1 - \kappa_1\kappa_2\beta_1\alpha_1 + \kappa_1\kappa_2\left[\frac{(\mu+\tau)-\gamma_1\beta_1}{\gamma_1\beta_1}\right]$

and world trade both increase output, essentially because they inject assets into the system (see equations (6) to (8)). Prices may rise or fall, depending on what is necessary to preserve asset equilibrium (see equation (4)). If a fall is required then this can be made consistent with supply-side equilibrium even if output rises, provided the capital stock increases. Increased government expenditure clearly worsens the trade balance, but by less than proportionately because of higher tax revenues; increased world trade improves the trade balance only to the extent that tax revenues rise.

In the longer-term, the model is neutral with respect to higher world prices. Higher world interest rates depress output and raise prices (a negative supply-side shock): the trade balance deteriorates because the effects of worsened competitiveness dominate those of lower income.

Simulation Exercises

The four shocks discussed in the context of our theoretical model were performed on our empirical model of Latin America. We briefly give details of these simulations here[15]. Each of the simulations reported in this section are performed without the use of the feedback rule for government spending.

As expected a fiscal expansion raises output and prices in the short-term and worsens the trade balance. There is a long cycle of 15 years even though the model is supply constrained in the long-run. The multiplier-accelerator feedback interacts with a lagged oscillation of competitiveness, the trade balance and asset creation. In the long-run, more than 25 years, output converges towards a positive value, prices return to base, and the trade balance is negative as expected.

A world trade boom has similar initial effects on output and prices as a fiscal expansion and the trade balance improves. The qualitative signs of these outcomes remain in the long-term, although of course capital accumulation mitigates the price increase.

A world price increase has the temporary effects on output, prices and the trade balance expected from chart 1. Neutrality is achieved after about ten years.

Finally a rise in world interest rates depresses both output and prices in the short-run and improves the trade balance. The dominance of the negative supply-side effects on prices and the trade balance is already observed within about four years.

3. EFFECTS OF GLOBAL SHOCKS ON LATIN AMERICA

The empirical model of Latin America has the features of the theoretical analysis above. To illustrate its workings, we examine the effects of stylised global shocks on Latin America. This also helps to investigate the nature of the process by which these shocks are transmitted to the region.[16] The shocks and results under each simulation excercise is performed with respect to

a base scenario over 40 quarters from the first quarter of 1990 to the last quarter of 1999. In each case, we first briefly discuss the effects on the world economy, as simulated in GEM, before describing the implications for Latin America.

3.1 A US Monetary Contraction

We consider a 5 percent reduction in the US money stock. This was simulated in GEM with interest rates being given by inverting the money demand function, and with forward-looking exchange rates determined by uncovered interest parity.

The global outcome is one in which US real interest rates rise, by 8 percentage points in the first quarter; falling back rapidly to within 2 percentage points of base within one year. The US real exchange rate appreciates by 10 percent, taking three years to be back within 2.5 percent of base. US output is 2 percent below base in the first year and 3 percent in the second year, before gradually returning. US prices fall by 5 percent in the long run, achieving half of this within two years.

There is positive transmission of the shock to German and Japanese output, which both rise initially by one percent[17], but this effect disappears within a year. German and Japanese prices are initially unaffected. The commodity terms of trade fall gradually,[18] and are nearly 4 percent lower after 2 years, before recovering slowly. World trade falls significantly.

The outcome (reported in Table 1) is that Latin America faces a combined squeeze on all fronts.

(i) The rise in the dollar relative to other world currencies results in a decline of competitiveness of Latin American goods relative to their competitors.[19] The worsening in the terms of trade between commodities and manufactures worsens the Latin American terms of trade because the continent is a net exporter of commodities and a net importer of manufactures. In addition export volumes are also reduced because of the reduction in world trade.

(ii) The increase in US interest rates increases the required level of debt service payments, leading to a worsening of the current account.

(iii) The increase in US interest rates also increases the cost of capital, lowering investment and leading to a fall in the capital stock.

The effects of the squeeze work both through demand and through supply.

On the demand side, exports fall because of: the loss in competitiveness, the worsening of the terms of trade, and the fall in world trade. The fall in demand is reinforced by the restraint brought about by the current account deficit. The current account initially worsens by $7 bn, but the overhang of debt limits the ability of the region to sustain a balance of payments deficit. Therefore the government is forced to implement a reduction in government expenditure

(presumably in the form of an adjustment package). Finally investment expenditure falls significantly because of higher interest rates. The joint impact of these three demand effects is a substantial and sustained reduction in output, of more than 5 percent of GDP.

The fall in output causes a significant drop in the price level and depresses real wages. Domestic prices fall by 20 percent and real wages by 2.5 percent. Lower prices result in a recovery of competitiveness and a big depreciation in the real exchange rate. Exports slowly recover to their base values in the course of the simulation. The big fall in the price level also temporarily boosts consumption via real balance effects. But this influence is only temporary and consumption eventually falls back in line with output.

On the supply side, there is a reduction in investment coming both from higher interest rates and from lower output. Although all the global influences are short-run, their combined effects lead to a long-lasting reduction in the Latin American capital stock and therefore in continental real output.

There are thus lasting effects in Latin America of reduction in US monetary stock. The capital stock has fallen by 5 percent and output by 3.6 percent. The real wage is 2 percent lower than base and there has been a small depreciation in the real exchange rate.[20]

3.2 A US Fiscal Expansion

We consider an increase in US government expenditure equal to one per cent of GDP, sustained for five years. This was simulated in GEM with global money stocks fixed, and interest rates and exchange rates endogenous.

The outcome is that US output rises initially but falls back: the multiplier in the first year is unity but most of the increase is gone within less than two years. US (short) real interest rates initially rise by two percentage points, and then fall back quite rapidly within eighteen months. Nevertheless rates need to remain higher by half a percentage point for the full five years to crowd out the increase in government expenditure. The US real exchange rate appreciates by three percent, falling steadily back to base within five years. US prices hardly rise at all; at most over the period they are 0.1 percent above base.

There is some positive transmission of the shock abroad, both through demand effects on world trade and because of the dollar appreciation.[21] The commodity terms of trade improve initially by nearly one per cent, but fall back within two years.

The result of the US fiscal expansion is reported in Table 2. Latin America faces a mixture of expansionary and contractionary pressures, in which the latter dominate.

(i) The increase in world trade and the improvement in the commodity terms of trade lead to higher exports, but only in the first year. Subsequently the depressing effects of dollar appreciation are dominant.

(ii) The increase in US interest rates leads to a worsening of the current account and a reduction of the capital stock, in exactly the same way as with a US monetary contraction.

The implications of these effects are felt on both the demand and the supply sides.

On the demand side exports fall for reasons discussed above, but not to a very great extent. The fall in demand is reinforced by the fiscal restraint brought about by the current account deficit. Finally investment expenditure falls significantly because of higher interest rates. The joint effect of these three demand effects is a sustained reduction in output.

The fall in demand is bigger than the fall in supply and so there is a significant drop in the price level. The fall in the price level temporarily boosts consumption via real balance effects. But this influence is small. The main demand effects are those listed above.

On the supply side, there is a reduction in investment coming both from higher interest rates and from lower output. This leads to a long-lasting (if not very large) reduction in the capital stock and therefore in continental real output.

4. RE-RUNNING THE 1980s

4.1 Re-running G3 Monetary Policy in the 1980s

An important feature of the early 1980s was a marked tightening of monetary policy in all of the principal industrialized countries in the wake of the second oil shock. In contrast to the negative real interest rates in the late 1970s, real interest rates were persistently considerably higher in the 1980s compared with historical experience. In this section, we consider the effects of unwinding the 1980s tightening of monetary policy. This is an exercise that has been carried out by Masson and Helliwell (1990). Masson and Helliwell use Multimod for this exercise, and Multimod does not identify the Latin American region explicitly: rather it disaggregates only between high and low indebted countries. Our exercise has the advantage of explicitly identifying the impact on Latin America.

For comparison with the work of Masson and Helliwell, we have simulated this tightening of policy by reducing the money supply in the principal countries by the extent of the deceleration of monetary base growth between 1978-79 and 1980-81. The US money stock falls by 5.2 percent, the Japanese by 1.7 percent, and the German by 11.9 percent. These reductions are permanent and are implemented from the first simulation period.

The initial result is a significant increase in world-wide interest rates. As expected from the relative size of the tightening, German rates rise by more than US rates, which in turn rise further than Japanese rates. Hence the DM initially appreciates against the dollar, whilst the yen depreciates. Overall, the US effective exchange rate depreciates initially by 6.5 percent.

Domestic demand in all three of the principal economies contracts sharply, led by falling investment. Output also falls significantly in the US and Germany, although there are modest gains in Japan from improved competitiveness. The size of output contraction is moderated in the longer term as lower prices begin to stimulate consumption. The output effects are long-lasting, however, with growth being redistributed from the US, and especially Europe, towards Japan.

The monetary contraction also has the effect of reducing prices. Prices are forced down by approximately the size of the monetary contraction in the US and Germany. There is a modest increase in the price level in Japan.

The net effect of the monetary tightening on world trade is a substantial contraction. Commodity terms of trade worsen as a result of output contraction and the increased cost of holding stocks. Imports in all groups of developing countries contract substantially.

In Latin America, the monetary tightening has a major impact of 5-5½ percent on output in the first two years (see Table 3). Worsening terms of trade push up domestic prices, and higher interest rates impact directly on domestic investment. Investment initially falls by some 10-14 percent and consumption by 5 percent whilst net exports improve slightly. Output remains depressed throughout the decade. These results suggest that tight monetary policy among the G3 countries imposed a high output cost on Latin America in the 1980s. The scale of these effects is appreciably bigger than that reported for the highly indebted countries by Masson and Helliwell (1990) using Multimod.

4.2 Re-running G3 Fiscal Policy in the 1980s

The divergence of fiscal policies between the principal industrialized countries in the early 1980s has dominated much of the subsequent debate on international economic policy. The emergence of the large US budget deficit and the fiscal contractions in Japan and especially Germany have been blamed variously for the emergence of current account imbalances, the rise and fall of the dollar and slow growth in Europe. They have also been blamed for the rise in US interest rates and the onset of the Latin American debt crisis.

To investigate these issues, we have simulated the effects of the cumulative exogenous changes in budget balances between 1980 and 1985 of the principal industrialized economies, as reported in Helkie and Hooper (1988). The US fiscal expansion is assumed to be worth 3.5 percent of GNP, whilst the German and Japanese contractions are put at 4.4 percent and 3.5 percent of their respective GNPs. For comparison with Masson and Helliwell (1990), we have implemented these by means of changes in government expenditure. The increase is spread equally over the first five years of the simulation and reversed in the two subsequent years. Monetary policy is not assumed to accommodate the fiscal changes and the money supply is kept at base forecast values.

The impact of the fiscal expansion on interest rates is a modest but sustained divergence of interest rates between the three principal countries. Because of the sustained

nature of the interest differential, the dollar initially appreciates substantially against both yen and DM. The effective dollar exchange rate initially appreciates by 9 percent. The DM depreciates by 7 percent against the yen.

US domestic demand increases slowly along with the government expansion; roughly half of the expansion is lost through crowded out private sector consumption and investment. Likewise, German and Japanese domestic demand contracts, but by less than the extent of the fiscal contraction as private sector expenditure is crowded in. The most interesting effects are on output: US GNP has expanded by about 0.9 percent by the fifth year of the simulation, giving an implicit multiplier of about 0.25 percent. German and Japanese output actually increase in the short term as world trade expands and their competitiveness against the US improves. Subsequently their output contracts as their domestic demand declines. The US and Japanese price levels fall, whilst Germany experiences some modest import price inflation in the short run. The US current account balance worsens by some $60 billion, about half of which is directly distributed between Germany and Japan.

Overall world trade and output expand in the short run. Movements in the commodity terms of trade are modest as the impact of the expansion is outweighed by the impact of higher US interest rates. The OPEC, Asian and African groups of developing countries gain in the short run as a result of the expansion in world trade.

The impact on Latin America is initially quite small, though negative (Table 4). Higher interest rates depress investment, and exports decline, since Latin America experiences an exchange rate appreciation along with the dollar and so loses competitiveness. The deterioration in the current balance resulting from high interest rates forces a cut in government spending, and output falls further falling by ½ percent after five years.

The simulation suggests that OECD fiscal policy was mildly harmful for Latin America, and differs from that of Masson and Helliwell (1990) who found a mildly beneficial effect on their group of highly indebted countries. However, in neither case were the effects of fiscal policy found to be large: our findings agree with those of Masson and Helliwell in suggesting that tight monetary policy exerted the major negative impact on Latin America in the late 1980s.

The re-run of history that we have just described undoes both US and non-US fiscal policy, and these moved in opposite directions in the early 1980s. An alternative re-run would be to undo the US fiscal policy but leave non-US policy unchanged, on the grounds that Reaganomics represented the policy surprise and that fiscal consolidation outside the US was necessary in any event. The merits of this argument can be disputed, but we report in table 5 the consequences of undoing only US fiscal policy. The impact is somewhat more favorable[22], but the long-run effects are little different. These simulations do not overturn the view that failures of OECD monetary policy exerted the biggest influence.

This result is of significance for the debate concerning the impact of failures of G7 macroeconomic policy coordination in the 1980s on LDCs. Whereas the imbalances of fiscal policy across the G3 countries could have been avoided by alternative policies, the contraction of monetary policy could not, if G3 inflation was to be kept down. The finding that the G3 fiscal imbalances imposed little or no cost on Latin America, in contrast to tighter monetary policy, suggests that the adjustment problems of Latin America in the 1980s cannot be attributed to failures of G3 fiscal policy coordination.

5. Conclusions

The aims of the paper were set out in the Introduction and our findings have been summarized in the relevant sections. Here we note key limitations of the task.

Models such as the one discussed here need to be used as tools to research policy issues. Although the present paper usefully quantifies some channels of influence linking OECD macro policies and Latin American economic performance, it does not use this information to derive policy prescriptions. One question is whether the knowledge of the transmissions discussed in this paper should lead policy makers to respond differently depending on the source of the shock, for example, on whether they observe a contractionary shock emanating from contractionary fiscal policy or monetary policy in the OECD. A second topic which we have looked at in some detail but not touched on here, concerns the appropriate strength and structure of the feedback from external shock to fiscal adjustment which is explored in this paper. A further question that might well change the outcomes, particularly in the case of US monetary contraction where the US dollar appreciates so much, is to what extent exchange rate change has a role to play in external adjustment[23] . Related to this is the point concerning whether any nominal exchange rate peg should, even if fixed, be expressed as fixed against a trade weighted average of currencies and not, as here, fixed against the dollar. Finally, there is the issue of the extent to which the design of macroeconomic adjustment should be interconnected with decisions concerning debt rescheduling in the context of adverse external shocks.

However, there is another major concern as to how many of the issues raised above can be answered, or even really make sense, at a *regional* level ? It may be that such problems need *national* solutions, and that a broad picture of the kind painted in this paper, though unspecific about policy, is the best that one can hope for in analyzing the experience of a whole continent.

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FOOTNOTES.

1. This paper will appear in due course in the *Manchester School*. We are grateful for comments on earlier versions from Michael Artis, Vikram Nehru, Martin Weale, Steven Wright and from participants in seminars at the London Business School and Cambridge and Essex Universities. The financial support of the ESRC and the World Bank is gratefully acknowledged.

2. Export prices depend on competitors' export prices and on domestic absorption prices.

3. For a discussion of this issue see Muscatelli, Srinivasan and Vines (1990) and Krugman (1989).

4. We use a small country assumption for import prices, which we assume are fixed on international markets and not influenced by domestic developments.

5. But owing to the fast wage and price adjustment, prices move rapidly to neutralise the effects of a nominal exchange rate devaluation. (See below)

6. For reasons of data availability the equation estimated is for the consumer expenditure deflator (ced). This can be thought of as subsuming an equation for domestic output prices - marked up on wage and import costs - into an equation for ced - by taking a weighted average of domestic output prices and import prices.

7. Were the government to attempt to keep the real exchange rate fixed, this would require a continuing acceleration in inflation of around 55 percent per annum in order to force a permanent reduction in real wages.

8. Such a formulation, with a unit coefficient on import prices and a larger coefficient on output than on capital, can be derived from the two equations for wages and prices described above.

9. Equations 2 and 5 imply that, in the long run when capital has fully adjusted, prices are determined by foreign prices, the world interest rate and the level of output. Output matters because of the labour constraint.

10. It is assumed here that in the context of hyper-inflation economies in Latin America investors predict domestic real interest rates form foreign real interest rates.

11. Strictly, this equation should contain a term showing interest payments on domestic debt, h, and the simulation model does this. But that would introduce a term in h in equation 11, which we are keen to avoid for reasons of analytical tractability. Our implicit assumption is that tax rates are adjusted to keep constant the overall net tax/transfer rate.

12. These proportions are for simplicity taken to be the same in the analytical sketch of the model, but not in the actual model.

13. This ignores as a second-order effect the influence of higher prices on the rate of (nominal) asset creation.

14. Even though it is a supply-constrained model, and *not* a Keynesian demand-determined one in all but the "very-very" short run.

15. Fuller discussion and output tables from the simulations are contained in Srinivasan and Vines (1990).

16. For theoretical discussion of such transmission, see Kanbur and Vines (1987), Currie et. al. (1988), Moutos and Vines (1989), and Muscatelli and Vines (1989).

17. A standard result in a Mundell-Fleming model.

18. GEM does not contain a forward-looking model of commodity prices.

19. Latin America maintains a fixed exchange rate relative to the dollar in simulations. When US dollar appreciates, the export prices of competitors to Latin America decline in terms of US dollars and hence the loss of competitiveness for Latin American Exporters.

20. Recall that the stability analysis performed earlier showed, **inter alia**, that the interaction of demand and supply is unlikely to produce an unstable spiral of the kind where lower demand coming from the global shock leads to lower investment, lower supply, lower output and thus to yet lower demand. But why then should a nominal global shock - which does not have permanent real effects in the OECD - cause lasting real effects in Latin America? We have not identified a cause of hysteresis in the continent which would make these long-lasting effects permanent. Rather the lags in system response seem to be very long, and real effects might well die out eventually.

21. Again, positive transmission in this way is a standard Mundell-Fleming result.

22. Note that the timing of the fiscal shock in this simulation differs considerably from that reported in section 3.2. The simulation there was for a one percentage point of GNP increase in government spending sustained for five years and then reversed. The current simulation in contrast incrementally increases government spending up to a peak of 3.5 percent of GNP in the fifth year, which is then reversed over two years. The effects of the timing of the two shocks can be seen most clearly in the very different interest rate profiles in the two simulations and is also reflected in the initial jump in the dollar exchange rate.

23. Experiments with exchange rate depreciation in response to negative external shocks deprived the regional economy of a nominal anchor and produced spiralling inflation.

TABLE 1: US Monetary Contraction Simulation

Latin America
Deviation from Base

	Private Consumption %	Investment %	Government Consumption %	Exports %	Imports %	GDP %	Prices %	Wages %
1991	-5.79	-8.56	-6.54	-3.67	-6.77	-5.86	-13.21	-12.65
1992	-4.72	-17.57	-2.02	-7.78	-17.06	-5.78	-23.09	-25.20
1993	-2.14	-13.83	-9.37	-7.47	-13.55	-4.52	-20.25	-22.89
1994	.23	-8.67	-13.47	-6.81	-9.58	-2.83	-11.86	-13.90
1995	-.19	-3.23	-15.94	-6.78	-5.68	-2.90	-6.16	-7.19
1996	-1.77	-3.49	-13.35	-6.64	-6.55	-3.61	-7.03	-7.93
1997	-3.24	-5.57	-10.46	-5.68	-8.28	-4.27	-10.18	-11.53
1998	-3.63	-7.23	-7.23	-4.08	-9.15	-4.07	-11.27	-13.06
1999	-3.64	-6.30	-5.21	-2.55	-8.10	-3.55	-9.52	-11.30

	Competi-tiveness %	LIBOR % pts	Capital Stock %	Budget Deficit $mn	Current Balance $mn	Reserves $mn	Base Money $mn	M2 $mn
1991	5.16	5.41	-1.21	19484	-7087	-7087	-1891	-2459
1992	18.99	-.02	-3.55	11127	-2086	-9174	-1011	-3108
1993	13.80	-.33	-4.99	3184	-10916	-20091	-11078	-16669
1994	2.43	.16	-5.46	-4146	-18794	-38886	-30980	-52426
1995	-3.79	.43	-5.05	-6918	-25694	-64581	-58520	-114295
1996	-2.66	.34	-4.74	-3171	-23124	-87706	-82491	-190560
1997	1.06	.23	-4.79	3343	-18974	-106682	-100575	-269667
1998	2.58	.17	-5.09	7730	-14054	-120736	-112569	-342927
1999	.82	.16	-5.20	9342	-11165	-131903	-121244	-407612

TABLE 2: US Fiscal Expansion Simulation

Latin America
Deviation from base

	Private Consumption %	Investment %	Government Consumption %	Exports %	Imports %	GDP %	Prices %	Wages %
1991	- 63	-2.34	-.14	.58	-.74	-.63	-2.53	-2.41
1992	-.15	-2.00	-.35	-.45	-1.59	-.37	-3.41	-3.77
1993	.07	-.86	-1.90	-.66	-.73	-.33	-2.31	-2.57
1994	.15	-.78	-2.17	-.63	-.69	-.29	-1.46	-1.60
1995	.06	-.64	-2.20	-.50	-.52	-.32	-1.18	-1.28
1996	.05	-.69	-1.61	-.33	-.53	-.25	-1.05	-1.18
1997	-.04	-.42	-1.36	-.17	-.35	-.23	-.79	-.91
1998	-.19	-.35	-.96	-.05	-.37	-.26	-.71	-.81
1999	-.37	-.43	-.53	.04	-.47	-.31	-.89	-.99

	Competi-tiveness %	LIBOR % pts	Capital Stock %	Budget Deficit $mn	Current Balance $mn	Reserves $mn	Base Money $mn	M2 $mn
1991	.00	1.66	-.33	5374	-180	-180	1252	1628
1992	1.22	.36	-.57	2206	-509	-689	1332	2919
1993	.22	.25	-.60	455	-2905	-3594	-1451	242
1994	-.53	.27	-.62	17	-3566	-7161	-5022	-6351
1995	-.69	.31	-.61	133	-3903	-11064	-8889	-16185
1996	-.68	.30	-.62	250	-3076	-14139	-11897	-27266
1997	-.82	.27	-.58	543	-2779	-16919	-14532	-38768
1998	-.80	.24	-.53	1212	-2117	-19035	-16325	-49484
1999	-.58	.21	-.51	2123	-1305	-20340	-17063	-58256

TABLE 3: Money Re-Run Simulation

Latin America
Deviation from base

	Private Consumption %	Investment %	Government Consumption %	Exports %	Imports %	GDP %	Prices %	Wages %
1991	-5.43	-9.74	-7.85	-1.58	-6.36	-5.50	3.05	2.91
1992	-5.11	-14.09	-1.24	-5.06	-16.04	-4.95	-5.77	-7.60
1993	-3.88	-9.88	-2.65	-5.45	-12.23	-4.09	-5.96	-8.42
1994	-2.82	-7.14	-4.35	-5.43	-10.14	-3.33	-1.19	-3.23
1995	-3.19	-5.04	-6.00	-5.28	-8.19	-3.61	1.68	.26
1996	-3.71	-5.53	-5.47	-5.52	-8.87	-3.89	.92	-.55
1997	-3.99	-5.90	-5.05	-5.78	-9.32	-4.02	-.23	-1.95
1998	-3.86	-5.96	-4.52	-5.81	-9.37	-3.85	-.11	-1.97
1999	-3.71	-5.42	-4.22	-5.62	-8.74	-3.65	.94	-.84

	Competi-tiveness %	LIBOR % pts	Capital Stock %	Budget Deficit $mn	Current Balance $mn	Reserves $mn	Base Money $mn	M2 $mn
1991	7.08	6.36	-1.35	13487	-13159	-13159	-9563	-12432
1992	12.67	1.73	-3.65	12083	5558	-7601	-782	-10081
1993	9.64	1.01	-4.79	7291	-1058	-8660	102	-7217
1994	2.49	1.00	-5.16	1292	-6127	-14788	-5681	-12647
1995	-1.24	1.11	-5.07	531	-9899	-24688	-15439	-29292
1996	-.75	1.05	-5.09	363	-5172	-29861	-20515	-48024
1997	.39	0.94	-5.17	975	-2193	-32055	-22449	-64195
1998	.35	0.87	-5.26	951	57	-31999	-22139	-75580
1999	-.61	0.86	-5.23	720	389	-31610	-21559	-83125

TABLE 4: Fiscal Re-Run Simulation

Latin America
Deviation from base

	Private Consumption %	Investment %	Government Consumption %	Exports %	Imports %	GDP %	Prices %	Wages %
1991	-.06	-1.04	1.72	-.40	-.06	-.06	-7.12	-6.80
1992	.31	-1.43	-.79	-.86	-.17	-.26	-8.79	-9.04
1993	.87	-2.02	-3.51	-.12	-.34	-.18	-6.08	-6.39
1994	.94	-1.97	-5.34	1.21	.01	-.18	-1.64	-1.79
1995	.22	-2.22	-6.06	2.26	-.38	-.54	2.82	2.75
1996	-.23	.65	-5.72	1.16	-1.00	-.40	4.68	4.55
1997	-.78	1.43	-3.20	.88	-.79	-.36	2.92	2.90
1998	-1.16	-.47	.29	1.13	-1.06	-.45	.50	.37
1999	-1.04	-.68	1.75	.65	-1.08	-.32	-.11	-.39

	Competi-tiveness %	LIBOR % pts	Capital Stock %	Budget Deficit $mn	Current Balance $mn	Reserves $mn	Base Money $mn	M2 $mn
1991	-1.31	1.00	-.15	7475	706	706	2700	3509
1992	1.01	1.10	-.38	6473	-3698	-2992	727	3503
1993	.22	1.40	-.69	-833	-7776	-10769	-7272	-6900
1994	-1.25	1.81	-.91	-6027	-9444	-20214	-18325	-28853
1995	-1.61	2.36	-1.13	-6577	-6870	-27085	-26950	-56070
1996	-1.14	-0.83	-.81	-11599	-1970	-29056	-32014	-82494
1997	-.83	-1.49	-.40	-6265	5619	-23438	-28066	-96626
1998	.07	0.18	-.40	3726	13404	-10034	-13669	-88211
1999	.52	0.11	-.45	6429	12161	2125	205	-64039

TABLE 5: US Only Fiscal Expansion

Latin America
Deviation from base

	Private Consumption %	Investment %	Government Consumption %	Exports %	Imports %	GDP %	Prices %	Wages %
1991	-.09	-1.36	.71	.38	-.10	-.09	-2.88	-2.75
1992	.19	-1.65	.14	.47	-.11	-.05	-3.21	-3.36
1993	.46	-1.62	-.79	.87	.19	.03	-1.28	-1.41
1994	.42	-1.62	-1.36	1.35	.39	.00	1.16	1.16
1995	.02	-2.02	-1.37	1.62	.10	-.24	3.12	3.15
1996	-.50	1.13	-2.47	-.89	-.65	-.51	2.59	2.60
1997	-1.13	.78	-2.33	-1.89	-1.76	-.98	-.45	-.57
1998	-1.00	-2.14	-.55	-.99	-2.65	-.91	-2.38	-2.85
1999	-.42	-1.60	-.59	-.77	-1.95	-.48	-1.47	-2.00

	Competi-tiveness %	LIBOR % pts	Capital Stock %	Budget Deficit $mn	Current Balance $mn	Reserves $mn	Base Money $mn	M2 $mn
1991	-.62	1.17	-.19	4910	344	344	1653	2149
1992	-.01	1.51	-.45	5047	-701	-358	2296	4552
1993	-.97	1.81	-.67	2507	-2298	-2657	666	4184
1994	-1.98	2.13	-.83	1669	-2581	-5238	-1469	1139
1995	-2.22	2.56	-1.03	3106	-709	-5948	-1351	-926
1996	-1.24	-0.86	-.64	-2026	-3744	-9693	-5637	-8004
1997	.70	-1.60	-.38	-914	-2865	-12560	-8747	-17207
1998	2.10	0.15	-.70	2256	3937	-8623	-4209	-18016
1999	1.16	0.09	-.86	-534	1683	-6940	-2669	-16604

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