REGIONAL SHOCKS AND THE PERFORMANCE OF THE URUGUAYAN ECONOMY, 1974-1997

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1. Introduction

Uruguay's macroeconomic performance has historically been affected not only by world economic conditions but also by shocks coming from two large neighboring countries, Argentina and Brazil, even though those countries are themselves small economies in the world economy. With substantial commodity trade and tourism from neighboring countries, Uruguay found difficult to protect itself against shocks originated in the region. It is likely that this problem will become even more important in the future since the progressive establishment of MERCOSUR (*Mercado Comun del Sur*) will strengthen the economic links between these countries[1].

Because of its particular international links, it can be argued that Uruguay faces two different "rest of the world": On the one hand, the region composed by Argentina and Brazil and, on the other hand, the rest of the countries, mainly the USA and European countries. The former has been much more unstable than the latter. The purpose of this paper is to examine how the economic instability in Argentina and Brazil affected key Uruguayan variables during the period 1974- 1997, and to identify the channels through which regional shocks were transmitted to the small economy. Concern over these issues has been recently heightened in Uruguay due to the growing difficulties faced by the Brazilian stabilization program (Real plan) and the discussions of the long-run viability of the Argentinean stabilization program (Convertibility plan). We believe that isolating the effects of regional shocks is important not only for empirical considerations but also for normative issues.

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[1] MERCOSUR is a free trade agreement signed by Argentina, Brazil, Paraguay and Uruguay in 1991 (Tratado de Asunción). Following the programmed schedule of integration, trade restrictions among these countries are being progressively removed. By the year 2001, all restrictions to free trade among Southern Cone economies will be eliminated; and by the year 2005, a common external tariff will be in place.

We first derive a simple model that provides a framework to understand the transmission of regional shocks. Three key features separate our setup from the conventional "dependent economy" model: (i) We introduce a regional demand for a good which is non- traded with the world. The aggregate demand of this good (called regional good) is the sum of the domestic and the regional demand. This assumption tries to capture a fundamental aspect of the macroeconomic linkages between the Uruguayan economy and its neighbors. The physical proximity of Argentina and Brazil allows for trade in what would otherwise be nontradable goods and services. (ii) We assume sluggish adjustment of the price of the regional good, so that excess demand or supply in that market may remain in the short run. The clearing condition for the market is considered only as a steady state condition. (iii) Unlike most Salter-Swan models, we do not assume that full employment prevails at all times. Our model allows for unemployment resulting from real wage rigidity.

Although both fixed and floating exchange rate systems are analyzed, most of the attention is given to the study of fixed exchange rate regimens, since this provides a closer approximation to the managed exchange rate systems that tended to characterize most of the exchange rate policies followed by the Uruguayan monetary authorities during the period under consideration.

It is shown that, if the small economy follows a fixed exchange rate regime, and the price of the regional good is sticky in the short run, the economy reacts to a regional boom by running an initial trade surplus (assuming that the economy was in the steady state before the shock), followed by a trade deficit. If the shock is permanent, the new long run equilibrium will be one with an appreciated real exchange rate (defined as the relative price of the tradable good in terms of the regional good). In the long run the trade balance will be again in equilibrium, but its composition will change. An augmented deficit of the tradable good will be counterbalanced by a larger demand for the regional good. The model predicts inflation during the period in which the economy adjusts to the new long run equilibrium. Finally, if wage rigidity exists, the effect of the regional shock on employment will depend on the elasticities of labor in the tradable and regional sectors, the level of the actual real wage and the weight of the regional good in the consumer basket. Under reasonable assumptions for the parameters of the model, a raise in employment and also in output will be expected.

In the empirical part we provide evidence on the influence of regional shocks in the process generating Uruguay's real GDP and consumer prices measured in terms of U.S. dollar. We use near vector autorregresions (near-VARs) to study the interactions between rest of the world, regional, and Uruguayan variables. The forecast variance decomposition recommended by Sims (1980) to interpret VARs provides a natural measure of the relative importance of foreign shocks for the evolution of the domestic variables. The VAR methodology also allows us to analyze the dynamic responses of the above mentioned variables to disturbances of foreign origin (by means of impulse-response functions). Finally, we employ the innovation-accounting technique of historical decomposition to identify those periods in which the contribution of regional shocks was of special importance.

To our knowledge, there is only one paper that has tried to estimate the importance of Argentina and Brazil for the Uruguayan economy using VARs (see Favaro and Sapelli (1986)). In Favaro and Sapelli's paper, the estimated coefficients on distributed lags in a regression system that include domestic and regional variables are used to gauge the degree of regional linkages. We believe that the use of the variance decompositions, impulse response functions, and historical decompositions better measures the quantitative importance of regional shocks with regards to the evolution of the Uruguayan economy.

The results of variance decomposition indicate that the region as a whole was the main focus of external disturbances faced by Uruguay's economy during the period 1974.I - 1997.I. We find that a economic boom in the neighboring countries produces a positive and significant response of the Uruguayan output. Inflation measured in terms of U.S.dollar in Argentina also affects Uruguay's GDP, and it leads to an immediate real appreciation. The long-run effect of imported inflation from Argentina is highly significant: a 20% inflation in Argentina causes a 8% inflation in Uruguay (both measured in terms of dollar).

Historical decomposition reveals that innovations in regional variables exerted a considerable influence on Uruguay' variables in some years but not in others. The largest influence of Argentina was during the *tablita* stabilization and its latter collapse (1979-82), the hyperinflation of 1989, the Bonex plan (1990), and the Convertibility plan (1991-1996). Brazilian variables, on the other hand, affected the Uruguayan variables in 1981 (the beginning of the debt

crisis in Brazil), 1985-86 (the economic recovery and the Cruzado plan), 1989 (the Summer plan and the hyperinflation that followed), 1990 (the Collor plan), and during the Real plan (specially in 1996).

The rest of the paper is organized as follows. In the next section, we present the theoretical model. In section 3, we empirically assess the impact of regional shocks on the Uruguayan variables, and we test the main implications of our model. In section 4, we make some final remarks.

2. A Model to Understand the Transmission of Regional Shocks

In this section we build a simple two-sector model to analyze the dynamic adjustment of a small open economy to real shocks originated in a neighboring country. The model allows us to stress the importance of goods market integration in the transmission of shocks originated in the region. It is particularly valuable for the discussion of short-term macroeconomic policies.

Our analysis is closed related to Bergara, Dominioni and Licandro (1995) and Dominioni and Licandro (1995). They study this phenomenon by developing a three-good model (tradable, nontradable an regional goods) in the tradition of the Dutch Disease. In their set up a regional boom increases the price of the regional good relative to the tradable and the nontradable goods. Since at the empirical level we cannot find any meaningful statistic difference in the behavior of nontradable and regional prices, in our model we do not make the distinction between these two kind of goods.

The effects of the regional boom in the model developed here are similar to those obtained by the above mentioned authors. Our model extends their analysis by introducing dynamics considerations and by assuming the existence of rigidities in the good and labor markets.

Talvi (1994), builds an intertemporal optimizing model with tradable and regional goods to calibrate the importance of Argentina during two stabilization attempts (the *tablita* and the December 1990 plan). In Talvi's model, the price of the tradable good is fixed by the international market as it is standard in open economy models. The price of the regional good is also exogenous to the small economy (it is determined by the neighboring country). We find this latter assumption not a particularly appealing one since the price of an important set of Uruguayan goods is also influenced by domestic factors.

Unlike Talvi's model, in our set up the price of the regional good is determined by the interaction of a domestic supply and a aggregate demand composed by a domestic and a regional component.

2.1 The model

The small country produces and consumes two different goods called tradable (T) and regional (R). Production in each sector is described by a linearly homogeneous production function in capital and labor. Each sector's capital stock is fixed. Labor is homogeneous and intersectorially mobile.

As it is standard in the two-goods model, the domestic economy takes the price of the tradable good as given in terms of foreign currency. Normalizing external prices to 1, the domestic price of the tradable good is then equal to the exchange rate, E. The exchange rate is defined as the price of the rest of the world currency (say, U.S. dollar) in terms of the domestic currency. The price of the tradable good in terms of the regional good or real exchange rate is E/P_R.

The model is given by the following equations:

Demand side:

$$D_T = D_T(e,m,d) \quad e = \frac{E}{P_R} \qquad\qquad D_{T1} < 0, D_T2 > 0, D_{T3} > 0$$

$$D_R = D_R(e,m,d) \quad m = \frac{M}{E} \qquad\qquad D_{R1} > 0, D_{R2} > 0, D_{R3} > 0$$

$$\dot{D_R} = \dot{D_R}(e, \dot{e}, \dot{d}) \quad \dot{e} = \frac{\dot{E}}{\dot{P_R}} \qquad\qquad \dot{D_{R1}} > 0, \dot{D_{R2}} < 0, \dot{D_{R3}} > 0$$

Real domestic expenditure:

$$d = D_T + \frac{1}{e} D_R \qquad\qquad d_e < 0$$

Supply side:

$$S_T = S_T(w_T) \qquad w_T = \frac{W}{E} \qquad\qquad S_{TI} < 0$$

$$S_R = S_R(w_R) \qquad w_R = \frac{W}{P_R} \qquad\qquad S_{RI} > 0$$

External sector:

$$CA = S_T - D_T + \frac{1}{e}D_R^*$$

$$\dot{R} = CA \qquad\qquad\qquad (2.1)$$

$$\dot{M} = E\dot{R}$$

Mechanism of price adjustment of the regional good:

$$\frac{\dot{P_R}}{P_R} = \lambda[(D_R + D_R^*) - S_R] \qquad \lambda > 0 \qquad\qquad (2.2)$$

Domestic price index:

$$P = \alpha E + (1 - \alpha)P_R \qquad\qquad (2.3)$$

Labor market:

$$\bar{L} = L_T(w_T) + L_R(w_R) \quad L_{TI} < 0, L_{RI} < 0 \quad \textit{(flexible wage)} \qquad (2.3a)$$

$$W = \varphi P \quad \varphi > 0 \qquad\qquad \textit{(rigid wage)} \qquad (2.3b)$$

Following Rodriguez (1978) we assume that money, M, is the only store of value available to domestic residents. In this model, therefore, the stock of

real money is a measure of financial wealth or total financial assets in the economy. Domestic demand is made a function of the stock of real balances measured in terms of the tradable good, M/E, the relative price, E/P_R, and real income, y. The demand of the neighboring country depends on the domestic relative price E/P_R, the relative price in that country, E^*/P_R^* (where E^* is the bilateral exchange rate of the neighboring country vis-a-vis the rest of the world, and P_R^* is the price of a similar R good in that country measured in domestic currency) and the neighbor's real expenditure, d^*. Aggregate demand for the regional good is the sum of domestic demand, D_R, and regional demand, D_R^*. The supply of the regional good, S_R, is a function of the real wage measured in terms of the relevant good, W/P_R.

Equation (2.1) displays the current-account balance as the difference between the national production of the tradable good, S_T, and national absorption of tradables, D_T, plus the foreign demand of the regional goods, D_R^*, measured in terms of the tradable good. Under a fixed exchange rate regime, and in the absence of capital movements, the current account equals the change in the stock of international reserves held by the central bank, dR/dt. Assuming nonsterilized intervention and no other source of money creation, the money stock increases by the value of foreign exchange purchases by the central bank.

The model allows the price of the regional good to be sticky in the short run ($\lambda < \infty$). According to equation (2.2), any positive gap between demand and supply of the regional good will result in pressures on its price, P_R. Naturally, we assume a positive relationship between excess demand and the rate of inflation[2].

Finally, the model is closed with two different assumptions about the structure of the labor market. Under the flexible wage case (classical case), wages adjust to keep the labor market in equilibrium. In the rigid real wage alternative, the labor market clearing condition does not hold, and the nominal wage, W, is assumed to be indexed to the price level. The parameter _ stands

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[2] The mechanism through which an excess demand or supply is eliminated may be thought as follows. When facing a higher demand than expected, firms are forced to sell out of inventories. In order to avoid the complete depletion of their stocks, they must raise prices. They will continue doing this until inventories are recomposed. Similarly, when demand is falling, firms start accumulating stocks. They will have to lower prices to avoid the "involuntary" accumulation of inventories.

for the exogenous level of the real wage, which to make sense, is assumed greater than the value that clears the labor market. The first assumption is more appropriate for long-run adjustment, while the second for short-run adjustment.

Equations (2.3a) and (2.3b) can be solved for the product wages as a function of the relative price, e. Substituting the result in the supply equations we obtain:

$$S_T = S_T(e) \qquad S_{Te} > 0$$

$$S_R = S_R(e) \qquad S_{Re} < 0$$

In both cases, a real devaluation induces a fall in the real wage measured in terms of tradables and an increase in the real wage measured in terms of the regional good.

Under both wage assumptions the dynamic of the economy (with fixed exchange rate) can be reduced to the following two differential equations:

$$\overset{\bullet}{m} = S_T(e) - D_T(e,m,d) + \frac{1}{e}D_R^{\bullet}(e,e^{\bullet},d^{\bullet})$$

$$\frac{\overset{\bullet}{e}}{e} = \lambda(S_R(e) - D_R(e,m,d) - D_R^{\bullet}(e,\overset{\bullet}{e},\overset{\bullet}{d}))$$

The determination of internal and external balance is shown in Figures 1A and 1B. The curve RR represents combinations of m and e that satisfy the equilibrium condition for the regional good, and therefore, $dP_R/dt = de/dt = 0$. The locus RR is downward sloping because an increase in real money balances raises spending, and this creates an excess of demand. A revaluation of the real exchange rate is required in order to restore equilibrium in this market[3]. To the

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[3] The slope of the RR locus is given by:

$$\frac{dm}{de} = \frac{S_{Re} - D_{R1} - D_{R3}d_e - D^{\bullet}{}_{R1}}{D_{R2}} < 0$$

Note that the substitution (D_{R1}) and the income effect ($D_{R3}d_e$) of a real depreciation work in opposite directions on the domestic demand of the regional good. When deriving the sign of

right (left) of RR, the real exchange is two high (low), and excess demand (supply) prevails in the market. Hence, to the right of RR regional prices are increasing and the real exchange rate is appreciating, while to the left of this curve regional prices are declining and the real exchange rate is depreciating.

Now consider the locus TT (dm/dt = 0). The TT schedule depicts the set of combinations of m and e which are compatible with equilibrium in the external sector. The price effect of a real depreciation tends to improve the current account by increasing the output of tradable goods and by discouraging their consumption. In addition, a real depreciation encourages the regional demand for the nontraded (with the rest of the world) good since it becomes cheaper than similar good in the neighboring country. But a real depreciation also decreases the value of regional demand measured in terms of the tradable good. We assume that the former effect predominates, and therefore, the total effect of a devaluation on the value of regional demand is positive[4].For combinations of m and e to the left of TT there is a trade deficit and real money is falling; similarly, to the right of TT, we have a trade surplus and the money stock is increasing[5].

It can be easily shown that the system has a unique solution for m and e which is globally stable. The equilibrium is one characterized by whirling trajectories, all of which flow cyclically toward it (stable focus)[6].

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the slope of RR we have assumed that $S_{Re}-D_{R1}-D_{R3}d_e$ is less that zero, i.e., a real devaluation leads to an excess demand of regional good (assuming that the initial situation was one of equilibrium).

[4] In terms of differentials, this assumption implies that:

$$\frac{1}{e}\overset{\bullet}{D}_{R1} - \frac{1}{e^2}\overset{\bullet}{D}_R > 0$$

[5]The slope of TT is:

$$\frac{dm}{de} = \frac{S_{Te} - D_{T1} - D_{T3}d_e + (\frac{1}{e}\overset{\bullet}{D}_{R1} - \frac{1}{e^2}\overset{\bullet}{D}_R)}{D_{T2}} > 0$$

[6] Given the system:

2.2 The Adjustment Process Under a Fixed Exchange Rate Regime

Having defined the model let us now utilize it to conduct comparative static and dynamic analysis of some important issues concerning the transmission of relative price shocks originated in the region. Consider a fall in the relative price of the neighboring country, s^*, such as the relative price decline at time 0 and stays constant thereafter.

Totally differentiating the system around the equilibrium, and using Cramer's rule we obtain[7]:

$$\frac{de}{d\,e^*} > 0 \qquad \frac{dm}{d\,e^*}?$$

A real appreciation in the neighboring country leads unambiguously to a real appreciation in the domestic country. The long run effect on the stock of real money is ambiguous since during the adjustment period there are two counterbalance effects: on the one hand, the central bank accumulates reserves because of the greater foreign demand for the regional good but, on the other

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$$\dot{x} = f(x,y)$$

$$\dot{y} = g(x,y)$$

there are two sufficient condition for having a stable focus: (1) the determinant of the Jacobian valuated in the equilibrium point must be positive and, (2) the trace must be negative. It can be proved that both conditions are satisfied.

[7] These expressions respectively are:

$$\frac{de}{de^*} = \frac{-D_{R2}^{\bullet}D_{T2} - \frac{1}{e}D_{R2}D_{R2}^{\bullet}}{D_{T2}(D_{R1} + D_{R3}d_e + D_{R1}^{\bullet} - S_{Re}) - D_{R2}(D_{T1} + D_{T3}d_e - (\frac{1}{e}D_{R1}^{\bullet} - \frac{D_R^{\bullet}}{e^2}) - S_{Te})}$$

$$\frac{dm}{de^*} = \frac{D_{R2}^{\bullet}((\frac{1}{e}D_{R1} + D_{T1}) - (\frac{1}{e}S_{Re} + S_{Te})) + \frac{1}{e^2}D_R^{\bullet}}{D_{T2}(D_{R1} + D_{R3}d_e + D_{R1}^{\bullet} - S_{Re}) - D_{N2}(D_{T1} + D_{T3}d_e - (\frac{1}{e}D_{R1}^{\bullet} - \frac{1}{e^2}D_R^{\bullet}) - S_{Te})}$$

hand, it desaccumulates assets due to the larger deficit in the tradable market.

We use a phase diagram to describe the dynamic behavior of the economy. The adjustment process towards the stationary solution is portrayed in Figure 2. An increase in regional demand shifts both curves to the left. Point A denotes the initial equilibrium of the economy while point B is the new long run equilibrium that corresponds to the augmented foreign demand for the regional good. The initial effect of a rise in the regional demand is a trade surplus and an excess demand for the regional good. Because the surplus in the balance of payments is monetized the stock of money increases[8]. The larger regional demand puts upwards pressures on the price of the regional good, and the exchange rate begins to appreciate.

At point C, the trade account is in equilibrium; however there still is excess demand of the regional good, so prices continue to change. The economy starts running a trade deficit and therefore, real cash balances begin to fall. At point D, the economy reaches a partial equilibrium in the nontradable (with the rest of the world) sector. But there still are pressures to move the economy out of this partial equilibrium since the economy is running a trade deficit. As long as the external and/or the domestic sectors remain in disequilibrium, e and m will keep on changing. This process continues over time, until the economy finally converges to its stationary equilibrium at point B.

The real exchange rate in the new steady state is lower than in the old steady state. Under a fixed exchange rate regime the adjustment is totally made by the price of the regional good. Inflation will be needed to reach the new equilibrium. When there exists some stickiness in the good market the convergence is not monotonic, and the increases in regional prices are followed by short periods of deflation. The time paths of the real exchange rate and real balances in the sticky price case is shown in Figures 3A and 3B.

When the economy is following a crawling peg, the dynamic paths of the variables in the system are somehow different. To the right of the RR locus regional prices are increasing by more that the rate of deval `ion. After the economy crosses the locus RR, regional prices are rising l   ;s than the exchange rate.

It is important to note that the time paths of e and m are characterized by dumped fluctuations only if there exists some kind of price st kiness in the

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[8] Note that the stock of real money, m, cannot jump; i.e., it is a predetermined variable.

nontradable sector. The slower the speed of price adjustment in that sector (given by the parameter λ), the larger the fluctuations and the slower the convergence of the variables to the new equilibrium. When prices are fully flexible ($\lambda=\infty$), there will be no overshooting of real balances, and after an initial jump the real exchange rate will converge monotonically to the new equilibrium. The dynamic adjustment of an economy with flexible prices is shown in Figure 4. In this case P_R is allowed to jump. The economy moves initially from point A to point E where the market of the regional good clears. At point E, there still is a trade surplus, and thus, the stock of money is rising. The economy will travel along the RR locus to reach the new long run equilibrium at point B. The time paths of e and m in this case are drawn in Figures 5A and 5B.

2.3 The Adjustment Under a Floating Exchange Rate Regime

Consider now the adjustment to a favorable shock under a floating exchange rate system (see Figure 6). Since the TT and RR schedules were drawn independently of the exchange rate regime, we conclude that the long run equilibrium is the same, and it is independent of the system adopted.

The dynamic adjustment of the economy under floating exchange rate is different. In this case, the exchange rate adjusts instantaneously to clear the market for foreign currency. In other words, the current account is always in equilibrium and there is no change in the level of international reserves held by the central bank ($dR/dt = 0$). Therefore, the economy must always lie along the locus TT[9].

$$0 = S_T(e) - D_T(e,m,d) + \frac{1}{e}D_R^\bullet(e,e^\ast,d^\ast)$$

$$\frac{\overset{\bullet}{e}}{e} + \frac{\overset{\bullet}{m}}{m} = \lambda(S_R(e) - D_R(e,m,d) - D_R^\bullet(e,e^\ast,d^\ast))$$

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[9] In order to isolate the effect of a regional shock we have assumed that there is no capital mobility. If these assumption is removed, then it is not the case that the economy must always lie on the TT locus under flexible exchange rates. When capital mobility is allowed, any excess demand (supply) for tradable goods may be matched by a capital inflow (outflow) leaving the nominal exchange unchanged and without changes in international reserves.

The equations describing the adjustment of the economy under flexible exchange rates are now:

Initially, due to a higher supply of foreign currency, a nominal appreciation takes place. The appreciation will increase the real value of the stock of money, and the economy will jump to a point such as C in Figure 6. At that point, there exists an excess demand for the regional good explained by the combined effect of greater real balances (wealth effect) and a larger demand for the regional good (regional shock effect)[10]. This will put upwards pressures on the price of the regional good. Since prices cannot jump (because they are a predetermined variable), the real exchange rate will appreciate only gradually. The trade account always remains balanced. The economy will travel along T'T' until it reaches the new long run equilibrium level at point B.

During the adjustment period we will observe continuous increases in the prices (though at declining rates) of both regional and tradable goods. The upwards trend of the price of the good that is non-traded with the rest of the world is explained by the excess demand in that market. The increase in the price of the regional good induces a substitution effect towards the consumption of the tradable good and the production of the regional good. In order to keep the external sector in equilibrium a continued depreciation of the currency is needed. The devaluation reduces the demand for tradable goods through both a substitution (change in relative prices) and a spending effect (fall in real balances), and raises the production of tradable goods. The time paths of e and m under a floating exchange rate regime are drawn in Figures 7A and 7B.

Finally, the last case to be considered is when the market of the regional good clears instantaneously and the monetary authority follows a flexible exchange rate regime. In this case the adjustment is made immediately, and the economy jumps from point A to point B in Figure 6. The paths of e and m can be seen in Figures 7C and 7D.

2.4 Effects of the Regional Shock on Employment

The graphical analysis of the determination of employment and real

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[10] In footnote 1 we made a story to explain how an excess of demand (supply) for the regional good will induce a slow increase (decrease) in its price.

wages under both flexible and rigid real wages assumptions can be conducted using a simple diagram (see Figure 8A). The 45% ray OM, is inserted in the figure for reference. The line KK represents combinations of the real wage measured in terms of the tradable good, W/E, and the relative price of the regional good, P_R/E (the inverse of the real exchange rate), such as the real wage measured in terms of the consumer basket, W/P, is constant at the level of φ. Points to the left of KK represent combinations of W/E and P_R/E for which the real wage is less than φ. Similarly, to the right of KK the real wage is higher than φ.

The slope of KK is given by:

$$\frac{dz}{dw_T} = \frac{1}{(1-\alpha)\varphi} > 0 \qquad z = \frac{P_R}{E}$$

which can be greater of less than one depending on the values of the parameters α and φ.

$$\frac{dz}{dw_T} = 1 + \frac{\psi_T \varepsilon_T}{\psi_R \varepsilon_R} > 1$$

The locus CC represents combinations W/E and P_R/E that satisfy the classical assumption, i.e., the labor market clears and equation (2.3a) holds. It can be easily proved that the slope of this curve is greater than one, and it is given by[11]:

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[11] The slope is calculated around the initial values $z=w_T=1$. At this value (point F in Figure 8A) the real wage, W/P, is equal to 1 (φ=1, classical case).

where ε_i is the elasticity of labor demand in sector i, and Ψ_i is the proportion of the labor force employed in sector i.

An increase in real wages measured in terms of the tradable good, w_T, will reduce the demand for labor in the tradable sector. This requires a fall in the real exchange rate (an increase in P_R/E) by more that the increase in w_T to equilibrate the labor market. To the right of CC there is excess supply of labor, while to the left there is excess demand for labor.

Finally, the locus RR is the equilibrium in the market for the regional good. A fall in the real exchange rate will relocate demand from the regional good to the tradable good. For given m and e^* this would generate an excess supply. To clear this market the real wage measured in terms of regional good, w_R, must increase. Since $w_R=w_T e$, we conclude that the real wage measured in terms of the tradable good, w_T, must increase by more than the fall of the real exchange, in order to induce a decline in the supply of the regional good that matches the fall in aggregate demand. Formally, the slope of RR is given by[12]:

$$\frac{dz}{dw_T} = \frac{S_{R1}}{S_{R1} - D_{R1} - D_{R3}d_z - D_{R1}^*}$$

is greater that zero but less than one.

We are now ready to study the effect of a regional boom on the labor market. An increase in the regional demand for the good which is non-traded with respect to the rest of the world will shift the locus RR upwards as shown in the Figure 8A. If the real wage is flexible, as in the classical case, full employment combined with equilibrium in the market of the regional good could be obtained at point F'. In the unemployment case, real wage rigidity prevents this adjustment. If the real wage is predetermined at the value of φ, the market of the regional good would clear at point Q'. The segment F'Q' measures the distance between the real wage that would clear the labor market and the actual (exogenous) real wage. The larger this distance, the higher the rate of unemployment in the economy.

When we allow for unemployment resulting from real wage resistance, there are cases where the boom increases unemployment, and others where the boom reduces it. The effect of the regional shock on employment depends on the

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[12] Again, the slope is calculated around $z=w_T=1$.

relative size of the slopes of the KK and CC lines. Unemployment will decline if:

$$1 + \frac{\psi_T \varepsilon_T}{\psi_R \varepsilon_R} < \frac{1}{(1-\alpha)\varphi} \qquad (2.4)$$

In terms of the diagram, the line KK must be steeper than the line CC. Otherwise unemployment will increase. In Figures 8A and 8B we have drawn the two possible cases.

Another way to make this point is the following: if the boom would have raised the real wage in the classical case, as in Figure 8A, then with a rigid real wage it would reduce unemployment instead, while if it would have reduced the real wage in the flexible wage model, it would generate unemployment in the rigid wage case (see Figure 8B) [13].

From the study of expression (2.4), we can draw some conclusions regarding the effect of a regional boom on the level of employment. It will be more likely to observe a fall in the unemployment rate if: (i) the elasticity of labor demand in the tradable sector, ε_T, is low, (ii) the elasticity of labor demand in the regional sector, ε_R, is high, (iii) the participation of the labor force in the production of the tradable good, Ψ_T, is small (iv) the exogenous real wage, φ, is low, i.e., it is close to the level that clears the labor market and, (v) the weight of the tradable good in the consumer basket, α, is big.

In the extreme case in which the nominal wage is indexed to the price of the tradable good, E, the real wage in the tradable sector will be constant, while the real wage measured in terms of nontradable good will fall. Employment will undoubtedly increase (in this case, the line KK becomes a vertical line at the predeterminated value).

The dynamic adjustment of the economy studied above has also implications for the paths of employment and real wages. Note that, as the real exchange rate appreciates, aggregate demand for the regional good shrinks. Therefore, during the adjustment period the locus R'R' shifts back. The final position of the R'R' line is however always above the initial RR line since

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[13] The way of comparing the old equilibrium level of real wages to the new one in the classical case is by drawing a line from point K to the equilibrium point. If the new line is steeper than the old one, then the real wage will have decreased; similarly, if it is flatter, then the real wage will have risen.

aggregate demand for the regional good in the new steady state is larger than its pre-shock level.

2.5 Digression: Devaluation and downwards price rigidity

In this model. the impact effect of the devaluation is to reduce real cash balances and to raise the real exchange rate. If the economy is initially in the steady state. it will move in the short run to a point such as R in Figure 9, where there is excess demand of the regional good and trade surplus. Since there is no change in real variables. the long run equilibrium will not change. After the initial devaluation. the economy will start moving cyclically towards the equilibrium as we described in section 2.2. The price of the regional good will increase during the adjustment period. and the real exchange rate will move back to its initial level.

The policy of implementing a devaluation could make sense when prices are rigid downwards. and the small economy faces a desfavorable regional shock (i.e.. a fall in d^* or an increase in e^*). Consider the plausible case in which the parameter that measures the speed of price adjustment, λ, can take two different values depending on whether there exists excess demand or supply in the market for the regional good:

$$[(D_R \cdot D_R^*)-S_R] \quad 0 \qquad \lambda = \lambda_0 \qquad \lambda_0 \, large$$

$$[(D_R \cdot D_R^*)-S_R] \quad 0 \qquad \lambda = \lambda_1 \qquad \lambda_1 \, small$$

Figures 10A and 10B compares the adjustment of the economy in the case of two regional shocks that only differ in their sign. When the economy faces a favorable shock, the price of the regional good will react immediately, and markets will return to equilibrium rapidly. If the economy faces a desfavorable shock, however, the speed of adjustment will be slow, and large disequilibrium in both tradable and regional markets will be observed. Note also, that the impact on employment is greater in the case of a negative shock, since when prices are more rigid, the RR locus will shifts back more slowly after the shock.

In order to avoid the cost associated with downward price rigidities (a large trade deficit and a strong fall of the employment rate) the authorities may wish to devaluate the exchange rate. This policy is shown in Figure 11. The devaluation helps to make the needed adjustment of relative prices, decreases the pressures on the Central Bank's reserves, and alleviates the unemployment problem. If prices were flexible downwards there would be no need for a devaluation, since the regional price would make all the adjustment.

3 Empirical analysis

The purpose of this section is to quantify the importance of regional shocks in the period 1974.I - 1997.I, to identify the main channels of transmission of those shocks, and to determine the specific ways in which the Uruguayan economy reacted to changing economic conditions in the neighboring countries.

To accomplish these goals we take the following steps: First, we assess the degree of economic integration between Uruguay and its neighbors by looking at the composition of Uruguayan trade. Secondly, we demonstrate that Uruguay's neighbors suffered in the past higher volatility of nominal and real variables than OCDE economies. We, then, proceed to test some of the main implications of the model above exposed for the Uruguayan case using vector autorregressions. These implications can be summarized as follows: (i) a favorable regional shock leads to a fall in the relative price of the tradable good in terms of the regional good (i.e., an appreciation of the real exchange rate as it is defined in the model), (ii) though in the model the effects of employment is ambiguous, under reasonable assumption of the parameters for Uruguay a

regional boom will cause a decline in the unemployment rate and a raise in domestic GDP[14].

3.1 Importance of the neighboring countries in the Uruguayan trade

Table 1 reviews the direction of Uruguay's commodity exports and imports since the 60's. The structure of the commodity trade shows a significant change in terms of its country of destination. The region as a whole has become the largest trading block, accounting for by 41.0% of total exports and 45.5% of total imports in the period 1991-95[15]. Brazil has displaced the United States and the European Community as the dominant export and import market. This market alone concentrated 35% of total export and 22% of total imports in 1996. The importance of Argentina has also increased in recent years, averaging 18% of total trade in the period 1991-95.

Bilateral preferential trade agreements with Argentina and Brazil were signed in the mid-1970s[16]. They contributed to reorient Uruguay's trade flows from the European Community and the US to Brazil and Argentina. The arrangements open a regional market for Uruguay's products with limited worldwide comparative advantage such as road motor vehicles, plastic materials, paper products, rubber, and chemical products. In recent years, the sign of MERCOSUR expanded Uruguay's advantages in those markets. These preferential agreements increased Uruguay's trading ties with Brazil and Argentina, and given the lack of alternative markets for some of these products, they raised the exposure of Uruguay's economy to economic fluctuations in those countries.

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[14] In order to make this statement, the following assumptions for the parameters of the model were made: (a) the elasticity of labor demand in both sectors is the same ($e_T=e_R$), (b) the participation of the labor force in the tradable sector is less than the weight of the tradable good in the consumer price index (Y < a), (c) the (exogenous) real wage is close to the value that clears the market (_>1, but close to 1). This last assumption is based on the fact that in most of the period, the Uruguayan employment rate was at a relatively low level.

[15] Official statistics may underestimate the magnitude of the Brazil and Argentina dominance in Uruguay's foreign trade insofar as they do not include illegal trade. Smuggling was important in some years, especially before the implantation of MERCOSUR.

[16] The Convenio Argentino-Uruguayo de Cooperacion Económica (CAUCE) was signed in 1974 and the Protocolo de Expansion Comercial (PEC) was signed with Brazil in 1975.

Looking only at commodity flows may lead to underestimate the importance of Argentina since trade of services which is an important component of bilateral trade is not been considered. Tourism in Uruguay has been a significant source of foreign exchange, helping to balance the trade account. Table 2 shows the contribution of tourism receipts to foreign exchange earnings compared to the contributions from the export of goods for the 1967-94 period. It can be observed that receipts from tourism during the last years have grown to such an extent that they almost equaled the produced by exports of beef and wood, which are the two main traditional exporting products.

Tourist arrivals in 1996 were 2.3 million (a number closed to 70% of the population of the country). Such a large increase in population during the tourist season is bound to have significant impact on all other sectors of the economy, producing strong linkages effects. In contrast to commodity exports, tourists must visit the exporting country to purchase and consume tourist goods and services. As a result, some goods such as restaurant meals, transport, or even residential housing become partially tradable in the presence of tourism.

Table 3 presents the estimated share of Argentina and Brazil in a consolidated export account which includes not only commodity trade but also the item *travel* of the balance of payments[17]. It can be observed that regional exports has been booming relatively to overseas export in recent years. According to the table, the region represented more than 40% of total Uruguayan exports in the period 1979-80, in 1986, and from 1989 to present.

3.2 Argentina and Brazil: Two Unstable Economies

In order to support the claim that Uruguay faces two different rests of the world, one of them (the region) highly unstable relatively to the other, in this section we will compare the volatility of some real and nominal aggregates for Argentina, Brazil, Uruguay and some developed economies.

According to Table 4, the variability of investment, consumption and output growth was greater in the Southern Cone economies than in the G7

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[17] The consolidated share was estimated under the assumption that the proportion of foreign exchange earnings from Argentinean and Brazilian tourism is the same as the proportion of tourists coming from each country.

economies[18]. The differences are remarkable. Consumption in Argentina for example, has been four times more volatile than the average for the G7 group. Although the volatility of real variables in Brazil is not as extreme as in Argentina, it is still greater than that of the developed countries. The empirical evidence therefore supports the claim that business cycles in the region are more pronounced that those of G7 economies.

Studying the behavior of nominal variables, it can be seen that Argentina and Brazil have also been more unstable than others countries. Note that, in this case, Uruguay shares with developed economies a relative low level of nominal volatility.

Finally, another important measure of economic instability is the variability of the real exchange rate. Table 5 shows some measures of dispersion of real exchange rate of each country vis a vis the U.S.[19]. Again, Argentina ranked first in real exchange rate variability. Note that the range of variation of the RER is extremely large for this country. The variability of the Brazilian RER is intermediate, but greater than that of Uruguay. The latter has a relatively low degree of real exchange rate variability.

3.3 The Effects of Regional Shocks on the Uruguayan Economy: Some Empirical Evidence from VARs

3.3.1 Data sources and sample

The paper uses quarterly data mainly obtained from the IMF (*International Finance Statistics*), and the Central Bank of Uruguay (*Boletín Trimestral*). In addition, we employed *Macrométrica's* data base for Brazilian series, and *Carta Económica's* data base and information published by the Ministry of Finance for Argentinean series. The sample period used for the estimations was 1974:Q1 through 1997:Q1.

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[18] Because the time series we wish to study are nonstationary, we must filter the data to achieve stationarity before we can meaningfully compute statistics such as means and variances. Thus, following a common detrending procedure, we computed first differences on the logarithm of the variables.

[19] The index is calculated as $e=EP*/P$, where E is the amount of domestic currency per U.S. dollar, $P*$ is the CPI of the U.S., and P is the domestic CPI. The index was built in such a way that it equals 100 in the first quarter of 1985 for each country.

3.3.2 Selection of variables to be included in the VARs

We require a data set that includes variables characterizing economic conditions in Uruguay, in the region, and in the rest of the world. To correctly evaluate the influence of the neighboring countries on the Uruguayan economy the distinction between shocks originated outside the region (global shocks) and shocks originated inside the region (region-specific shocks) becomes relevant. Since global shocks affect the Southern Cone economies in the same way, one could argue that the high correlations observed between some variables of these economies are just the result of these common worldwide shocks giving rise to something akin to a regional business cycle. Under this hypothesis, the inclusion of the rest of the world variables into the model should dilute the explanatory power of the Argentinean and Brazilian variables on Uruguay's variables. Therefore, when considering world variables into the model we are indirectly controlling for this kind of effect, and thus, we are isolating the external disturbances that are due to the region.

We have chosen three variables to characterize world economic shocks: the three-month real interest rate to represent world credit market conditions (LIBOR rate)[20], the ratio of beef prices to oil prices to proxy the Uruguayan terms of trade[21], and the U.S. real GDP index to capture the level of current world demand.

Regarding the regional variables, we have chosen proxies for those considered in the theoretical model. Ideally, real consumption would be the most adequate variable to be included in the VARs since most of the Uruguayan's exports to Argentina and Brazil depend indirectly on the level of consumption in those countries. Unfortunately, there is no series of quarterly consumption for the case of Brazil, so we are forced to use the Brazilian industrial output.

To measure relative price shocks in the neighboring countries, we initially considered the (inverse of) the real exchange rate defined as $P/E.P^*$,

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[20] The real rate was calculated subtracting the actual inflation rate of the following three months (annualized) from the nominal rate at the beginning of each quarter.

[21] To represent the former, we take the dollar price of frozen beef at US port (CIF, CTS/LB). The latter is Saudi Arabia's oil price, also in US dollars. Beef is Uruguay's main exportable commodity (approximately 20-25 per cent of its exports) and oil is the main importable item (nearly 20 per cent of total imports).

where P is the consumer price index of home goods, E is the price in the parallel market of the U.S. dollar expressed in domestic currency, and P^* is an international price index. However, since P^* is exogenous to the small economies, we decided to consider only the ratio P/E in the analysis since it is the part of the real exchange rate that is determined endogenously in each economy. Using the P/E ratio alone has the advantage that, when taking first differences on the log of this variable to obtain stationarity, we get an approximation of the inflation rate expressed in terms of dollars, which in fact is a particular relevant variable for the Uruguayan economy.

Finally, as for the domestic variables, we focus attention on the consumer price index measured in terms of U.S. dollar and real GDP. Following the model discussed in Section 2 we would have preferred to study the behavior of employment. Unfortunately, this is not possible because in Uruguay there is no series of unemployment available to the public domain for the whole period. Thus, we will assume that an increase in the unemployment rate is always associated with a fall in output.

Increases in expenditure in the neighboring economies promote Uruguay's exports of goods and services (some of which are non-traded with the rest of the world) and hence, they are expected to have positive effects on domestic output and employment. Similarly, high rates of inflation measured in terms of dollars in Argentina and Brazil should cause demand switching toward Uruguay's goods. This should lead to pressures in the domestic market and, to some extend, to imported inflation.

3.3.3 Empirical Methodology

There are several specific features of our VAR specification that should be described. First, in order to ensure efficient estimation the time series properties of the different variables were examined. Augmented Dickey-Fuller (ADF) were conducted on the log of each variable (with the exception of the real interest rate, which was introduced without transformation) to test for the presence of unit roots. The results of these tests are presented in Table 6. The ADF test suggests that at a 10% significance level all variables but the Brazilian industrial output have a unit root, but are stationary in first differences. According to this test, the rate of growth of Brazil's industrial

product still contains a unit root. The Phillips-Perron (PP) test, however, suggests that the first difference of the mentioned variable is stationary. Taking into account this result and the fact that the ADF test accept the hypothesis of a unit root in the first difference of the Brazilian variable at a 15% level (the p value is 0.14), we conclude that all variables are stationary in first differences.

Once we have verified the existence of unit roots, we need to check whether there exists a long-run relationship among the levels of the variables. If this were the case, then it would be a mistake to run a VAR in first differences since we would be loosing some valuable long run information[22]. Table 7 presents Engle and Grange 1987 tests of cointegration. We reject unambiguously the hypothesis of cointegration among the variables, i.e., there is enough evidence to reject the hypothesis of a long run relationship among the variables. As a result of these tests, the VARs were estimated in first differences.

A second aspect that requires special consideration is the selection of the number of lags to be included in the model. This decision is important because inferences can be sensitive to the lag length chosen. The VAR literature assumes the same number of lagged terms in each equation. In this study, we introduce additional flexibility by allowing the number of lagged terms to be different for each equation (this extension is known in the literature as near-VAR approach). This would help to preserve degrees of freedom, and thus, to improve the efficiency of the estimation.

The near-VAR system to be estimated is of the following form:

$$x_{1t} = \sum_{i=1}^{P_1} B_{1i} X_{t-i} + u_{1t}$$

$$x_{2t} = \sum_{i=1}^{P_2} B_{2i} X_{t-i} + u_{2t}$$

$$\cdot \quad \cdot \quad \cdot \quad (3.1)$$

$$x_{kt} = \sum_{i=1}^{P_k} B_{ki} X_{t-i} + u_{kt}$$

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[22] A VAR in differences is not consistent with a cointegrated system (see, for example, Hamilton (1994). When the series are cointegrated, the system should be reformulated and estimated the *error-correction* representation.

where $X = (x_1, x_2, ..x_k)'$ is a vector comprising the rest of the world, regional and domestic variables, p_i is the number of lags involved in equation i, $B_{ki} = (b^k_{i1}, b^k_{i2},..b^k_{ik})$ is the vector of coefficients in equation k associated to vector X lagged i periods, and u_{it} is the stochastic disturbance corresponding to equation i. The reduced form error, u_t, has zero mean and covariance matrix Σ[23].

A number of criteria are available to determine the number of lags (see, for example, Lutkepohl, (1985)). Here, we use the Akaike (1973) Information Criterion.[24] This test compares the benefits of additional information from increasing the length of the VARs with its cost in terms of degrees of freedom lost. Table 8 shows us the appropriate lag length for each equation.

Third, before proceeding to estimate the VAR models, it is necessary to briefly discuss the identification restrictions made in the analysis. It is well known that due to the correlation among the residuals, the autoregressive representations are difficult to interpret. The reduced form innovation, u_t, reflects common effects of *structural* or *fundamental* shocks. Thus, it cannot be used to distinguish between domestic, regional and rest of the world shocks (for example, a shock to the domestic relative price equation, u_{pt}, may reflect the impact of both external and domestic disturbances). The way to deal with this problem is to compute the moving average representation and to impose restrictions on the interactions among the variables in the system[25].

We follow Sims (1980) in imposing a recursive, or triangular, structure on the contemporaneous relationship among the variables (orthogonalization based on the Choleski decomposition)[26]. This method assumes a

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[23] The systems to be estimated also include seasonal dummies to account for the remarkable seasonality of some variables. For notational simplicity, the deterministic components (i.e., a constant term and seasonal dummies) are suppressed.

[24] The AIC statistic is obtained from:

$$AIC = N \log o^2 + 2K$$

where N is the number of observations, and K is the number of parameters to be estimated.

[25] A detailed analysis of VAR systems can be found in Hamilton (1994).

[26] In the recent literature, two additional ways to identify orthogonal innovation have been proposal. Bernanke (1986), imposed exclusion restrictions on the contemporaneous relationships among variables that come from the economic theory. On the other hand, Blanchard and Quah (1989) achieved identification by imposing long run restrictions on the coefficients of the moving average representation. These two methodologies have been criticized because they also imply some arbitrariness and the results will depend on the

contemporaneous ordering of the variables in the VAR from the most exogenous to the least exogenous. The identifying restriction made in this study is that world's variables appear first, then Brazil's variables, in third place Argentina's variables, and finally Uruguay's variables in the Choleski ordering. This set of restrictions is based on the assumption that a larger economy is not affected contemporaneously by shocks occurring in the smaller economy.

Within each Southern Cone country, the order is output (or consumption) first followed by prices measured in terms of U.S. dollar. This implies that within each country output is not assumed to depend contemporaneously on domestic relative prices. Equivalently, putting prices expressed in dollar terms at the end of the ordering means that we assume it is more likely that an innovation in output affects relative prices contemporaneously than that an innovation in relative prices will lead to a contemporaneous innovation in output/consumption.

Note that these identifying restrictions deal only with the contemporaneous relations among the variables in the system. The near-VAR approach allows us to impose the large country/small country assumption in the lag structure of the VAR.In particular, we assume that lagged values of a smaller country variables do not enter the equations for a larger country. This assumption also allows us to improve the efficiency of the estimation.

3.3.4 Estimation

According to Campbell and Perron (1991), a VAR model that contains only stationary variables can be efficiently estimated by ordinary least squares (OLS). However, given that we are working with a VAR with different lag length for each equation, there are some efficiency gains to using SUR to estimate the system[27]. Table 9 contains the SUR estimates for the near-VAR model.

Before studying the results of the estimation, we need to be sure that the coefficients of the regressions are stable. CUSUMQ test were used to test

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assumed structure.

[27] The gain in efficiency is larger if the residuals are correlated across equations, and if the regressors are not the same in each equation. When the residual correlation is not large and there is much duplication in regressors, the improvement will be small.

stability for the Uruguayan output and relative price equations. We fail to find evidence of structural instability at a 5% significance level. We thus conclude that there is no statistically significant evidence of a break in the data.

We first review the statistical causality between domestic and regional variables[28]. Interpreting causality test is not always easy. In fact, causality relationships are hard to establish. In general, these tests only establish what precedes what. For example, time series that reflect forward-looking behavior, such as stock prices and interest rates, are often found to be excellent predictors of many key economic time series. This clearly does not mean that these series cause GNP or inflation to move up or down. Granger tests in these cases should not be used to infer a direction of causation. There are circumstances, however, in which Granger causality may offer useful evidence about the direction of true causation. We believe that the case we are dealing with is one of those circumstances. The meaning of Granger tests in our analysis is straightforward. Given the sizes of the economies embraced in the study, regional and rest of the world variables must be considered as exogenous to the Uruguayan economy (i.e., their are caused by forces entirely outside the Uruguayan economy). Therefore, we must conclude that -when significant- these tests are evidence in favor of true causality.

Studying the tests of significance of lags (see Table 10) we observe that there is strong evidence of one-sided causality from the Argentina's inflation rate expressed in dollars term to the corresponding Uruguayan variable at a significance levels of less than two percent. In fact, the Argentinean relative price is the only variable in the system that Granger causes the Uruguayan relative price. As for Uruguay's GDP, it is only Granger caused by itself at a 10% significance level. Observe however that the larger values of the F statistics correspond to those of regional variables (in particular, the F-statistic associated to Argentinean variables is significant at a level less than 20%).

Although Granger tests are useful to examine causality relationships between variables, they do not say much about the relative contribution of a

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[28] The idea of study causality relationships between regional and domestic variables may look strong since one can argue that omitted variables can make a difference in ten s of Granger-causality relationships. However, Litterman and Weiss (1985) have shown that it is unlikely (although not impossible) that the inclusion of omitted variables will reverse exogeneity findings.

variable in explaining short-term and long-term movements in other variables. In order to get additional insights of the evidence regarding the pass-through of regional disturbances to the domestic variables it will be necessary to invert the VAR and compute the moving average representation. The moving average representation produces three sets of results: variance decompositions (VDCs), which distribute the forecasting error for one variable at different lags among all variables in the system, impulse response functions (IRFs), which illustrate the evolution of the endogenous variables following an innovation to one of them and historical decompositions (HDCs) which assign responsibility for fluctuations in any one of the VAR's variables beyond a specified point in the available time series, among all the variables included in the system.

Before inverting the estimated VAR it is important to discuss the patterns of contemporaneous correlations implied by the estimated models. In the VAR representation only lagged values of the endogenous variables appear as explanatory variables. It follows that any contemporaneous correlation among the variables in the system is captured by the innovations. Given the nature of the orthogonalization, the VDCs may be sensitive to the ordering of the variables in the Choleski decomposition if the residual covariance matrix is non-diagonal. The greater the correlation among residuals, the more likely our results being affected by the ordering of the variables.

Table 11 contains the partial correlations coefficients of the residuals from each equation in the system. Contemporaneous correlation among the residuals in the equation system appears to be low. The highest partial correlation coefficient is 0.31. Our results, therefore, should not be sensitive to the ordering of variables chosen for the Choleski decomposition of the residual covariance matrix[29].

Under standard invertibility conditions the system in (3.1) has the following moving average representation:

$$X_t = \sum_{i=0}^{\infty} \Pi_i e_{t-i} \qquad (3.2)$$

where the vector of orthogonal innovations, e_t, is obtained by orthogonalizing

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[29] We have tried a different ordering (though accepting the criterium defined above in which any variable of a larger countries entries before any variable of a smaller country in the VAR ordering), and we confirmed this claim.

the covariance matrix through a Choleski-factorization (Sims' (1980) method). These errors have zero mean and diagonal covariance matrix Ω[30].

3.3.5 Results of Variance Decompositions and Impulse-Response Functions

We first turn to examine the relative contribution of external variables to the variability of the rate of growth of Uruguayan GDP and the inflation rate expressed in dollar terms by means of variance decompositions. That is, we calculate what percentage of the total variance of each variable is accounted for by the different shocks.

Table 12 presents the variance decompositions for a forecast-error horizon of 12 quarters into the future. Regional shocks have a sizable role in accounting for forecast error variance of the Uruguayan GDP. Taken together, the regional variables account for 30% of the variance of GDP and for 40% of the variance of the inflation rate measured in dollar terms.

Innovations to Argentina's consumption growth constitute a relatively large proportion of the forecast errors of Uruguay's output, explaining 10% of its variance. The change in the relative price in that country explains an additional 11%. As for Brazil, shocks to the rate of growth of industrial GDP explain 8% of the output fluctuation after two years. The power of brazilian relative prices for explaining output fluctuations in Uruguay is small.

Shocks to the relative prices in Argentina have also a strong impact on the Uruguayan inflation rate measured in dollar terms. They seem to account for 23% of the inflation rate after 2 years. This result highlights the influence of Argentina in the determination of relative prices in Uruguay.

It can be concluded that the region as a whole was the main focus of external disturbances faced by Uruguay's economy in the period. This is perhaps not surprising given the high degree of economic integration of Uruguay with its neighbors. When studying the effects of foreign shocks on the Uruguayan economy in this period it is thus a serious omission   leave out

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[30] $\Sigma = A^{-1}\Omega(A^{-1})$

The matrix W is obtained from:

where A is a lower triangular matrix that contains the contemporaneous coefficients of the system. The structural error, e, is related to the reduced form error, u, by the equation: e=Au.

regional variables from the analysis. This is the case at least for Argentina's real consumption and relative prices and for Brazil's real output.

Once recognized the importance of Argentina and Brazil, the next task is to investigate how domestic variables react to regional shocks. We calculated the responses of Uruguay's GDP to one unit shocks in the regional variables. According to Figures 12A and 12B, the Uruguayan output responds with a lag to shocks to Argentina's consumption or Brazil's industrial output. Although the dynamic response is similar in both cases, the reaction to shocks to the Argentinean variable is much greater than the reaction to shocks to the Brazilian variable. In the case of Argentina, the long run transmission effect is 0.5 (a 1% increase in consumption induces a 0.5% increase in output in Uruguay). In the case of Brazil, the coefficient is 0.2.

The GDP of Uruguay is also sensitive to shocks of relative prices in Argentina (see Figure 13). A 20% increase in the relative price in that country causes a 3% output increase in Uruguay. Most of this increase shows up during the first year. Finally, the response of the CPI/EX.RATE ratio to shocks to the relative prices in Argentina is plotted in Figure 14. A raise in the price of A positive shock to Argentina's relative prices is accompanied by a contemporaneous increase in the Uruguayan inflation rate.

3.3.6 Results of Historical Decompositions

In this last section, we approach to the issue of the transmission of regional shocks from a historical perspective. The technique of historical decompositions allows us to identify the periods in which the contribution of regional shocks was of special importance. In particular, we will use this technique to assess the influence of the main desinflacionary programs in Argentina and Brazil on Uruguay's macroeconomic performance.

The historical decomposition is based upon the following partition of the moving average representation (equation 3.2)

$$x_{T+j} = \sum_{i=0}^{j-1} \Pi_i e_{T+j-i} + \sum_{i=j}^{\infty} \Pi_i e_{T+j-i} \qquad (3.3)$$

The first term represents that part of the historical time series attributable to innovations between T and T+J, and can be used to establish the role of the innovations of each variable separately. The second component is termed a *base projection* of X_{T+j} and is formed solely from information available at time T. The historical decomposition partitions responsibility for the difference between the base projection and the actual series among the innovations of the variables in the VAR. From (3.3), it is clear that the introduction of innovations since T in all variables yields the actual series; hence the importance of any one variable, or set of variables, can be determined be examining the extent to which the introduction of the innovations since T in that variable or set of variables closes the gap between the base projection and the actual series.

In this paper, a baseline projection is calculated at the end of each year. Quarterly decompositions for the following year (J= 4 quarters) are then estimated. Finally, annual decompositions are obtained as an average of the quarterly decompositions.

Annual historical decompositions for Uruguay's GDP and inflation rate expressed in dollar terms are presented in Figures 15A, 15B and 15C. Each figure shows the actual series and the contribution of innovations to Argentina or Brazil variables. It can be observed that innovations in Argentina's consumption and relative prices played an important role in the behavior of Uruguay's GDP during the *tablita* period (1978-82), in 1985, 1989, and in the 1990's. Brazil, on the other hand, seems to have affected negatively the Uruguayan output in 1981, and positively during 1985-86, 1989-90, and 1996.

Consistently with the results of variance decompositions and impulse-response function, the historical decompositions suggest that Argentina's variables are more important than Brazil variables for the determination of Uruguay's GDP and relative prices. The greater importance of Argentina found in this paper may be due to the particular linkages between Uruguay and its neighbors. Most of the Uruguayan exports to Argentina are composed by what we have denominated *regional goods* (i.e., goods and services which are non-traded with the rest of the world). Most of the products exported to Brazil, on the other hand, can be sold in alternative markets, though at a lower price (beef, rice, etc). In this sense, the model described in section 2 fits better the economic linkages between Argentina and Uruguay. This feature of the bilateral trade makes the Uruguayan economy more exposure to the economic fluctuation in

Argentina. Nevertheless, the conclusion that Argentinean cycles are more important for the Uruguayan economy than Brazilian cycles must be taken carefully since we do not have a reliable series of quarterly consumption for Brazil, and thus, we are unable to assess the impact of change in Brazilian consumption on Uruguay's GDP.

The Influence of Argentina

During the first years of the tablita there was a dramatic appreciation of Argentina's real exchange rate vis-a-vis Uruguay. The phenomenon started in 1977, and deepened during 1979 and 1980. Argentina was following a exchange rate policy with greater vigor than Uruguay, and inflation measured in terms of dollar was greater in the former country. This dramatic change in relative prices together with a consumption boom in the neighboring country contributed to explain output growth in Uruguay (see Figure 15A)[31]. It is interesting to note that Uruguay imported a considerable amount of inflation expressed in dollar from Argentina during these years (see Figure 15B).

The Argentinean *tablita* collapsed in February, 1981, and inflation moved to an even higher level. The series of massive devaluations during 1981 and 1982 caused a dramatic depreciation of the real exchange rate in that country (the Argentinean exchange rate deflated by the price level depreciated 100% in one year). With a high degree of arbitrage in the goods market, regional demand on Uruguayan goods contracted and Uruguayans shifted their expenditures to Argentina[32]. The change in relative prices together with the recession in Argentina account for a considerable portion of the output decline in Uruguay. In 1981, Uruguay had a high inflation rate expressed in dollar terms despite the fact that is was importing deflation in dollar terms from Argentina. This means that other factors must be responsible for the

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[31] During 1979-80 tourism coming from Argentina reached historical high levels. The flocks of Argentineans who visited Uruguay added to existing inflationary pressures. Commodity exports also responded to the fall of the real exchange in Argentina (according to official statistics they increased by 100% in 1979, and an additional 80% in 1980). Ignited by Argentineans' purchases of real estate in Punta del Este (the principal tourist attraction of the country) a real estate boom developed. The price of residential housing skyrocketed, and the construction sector had a strong impulse.

[32] Unofficial statistics point to 1982 as the year of greatest illegal trade.

appreciation of the real exchange in Uruguay during that year (for example, the existence of indexation mechanisms or the lack of credibility on policy announcements).

During 1983 and 1984 both countries allowed their currencies to float with intervention largely confined to smoothing operations. Bilateral trade in both merchandise and services shrank to a minimal expression. It can be seen in Figure 15A that the influence of Argentina during these years was of small importance.

By the beginning of 1985, Argentina was suffering high inflation and a large recession. According to the historical decompositions, the dramatic fall of the Argentinean consumption affected the Uruguayan economy in a significant way. Though 1985 was a year of recovery for the Uruguayan economy, it was explained by favorable world economic conditions, and a positive Brazilian shock . Had not these favorable conditions verified, Uruguay would have showed a negative performance in that year.

The Austral Plan, launched in June, 1985 in Argentina, seems to have had a positive effect on the Uruguayan economy, specially in 1986 and 1987. According to Figure 15A, the shocks associated with this plan were transmitted to the Uruguayan economy through changes in the level of consumption (the Austral plan did not induce major change in relative prices as compared to other stabilization attempts).

On February 1989, Argentina's Central Bank was forced to suspend the convertibility of the austral because of the intense demand for foreign exchange in the daily auctions. This marked the end of the Spring Plan, the last program implemented by the Alfonsin administration. The black-market premium skyrocketed, and the economy got totally out of control. The hyperinflation, which brought about a dramatic change in relative prices and a strong decline in consumption, affected negatively the Uruguayan economy. In fact, the stagnment of Uruguay's GDP in 1989 is mainly explained by the negative shocks coming from Argentina. The negative influence of Argentina in 1989 which is found in this analysis is consistent with the evolution of bilateral trade in that year: Uruguay's exports to that country fell by 25%, and registered imports increased by 5%[33].

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[33] However, these statistics may not represented the magnitude of the increase in the Uruguayan demand for Argentinean goods. Smuggling was of considerable magnitude. In this

The Bonex plan, adopted in Argentina in January, 1990, was thought as a mean of killing hyperinflation. Unlike the Austral plan, the real effects associated to this plan were mainly transmitted through changes in relative prices: consumer prices measured in terms of dollars doubled in a period less than 1 year. Innovations in the Argentinean relative price explain a considerable portion of the inflation expressed in dollar terms in Uruguay.

In February, 1991, there was a new run against the currency, which resulted in an upsurge of inflation. Cavallo, announced in April, 1991 the Convertibility plan that became the basis for the price stability enjoyed to the present. During the period 1991-1994, Argentina enjoyed a period of prosperity, with high rates of output and consumption growth. The Convertibility plan had a strong impact on Uruguay's economy (see again Figure 15A and 15B). The consumption boom rose the Argentinean demand for Uruguayan products. Tourist arrivals from Argentina increased steadily since 1990. The importance of Argentina's market in Uruguay's exports of goods also increased from 5% in 1990 to 20% in 1994. The boom from higher Argentina's imports and tourism contributed to the persistence of high inflation expressed in dollar terms in Uruguay.

In 1995, Argentina faced a crisis of considerable dimensions, partially explained by the effects of the Mexican devaluation of December, 1994. As can be seen in the Figure 15A, the decline of the Argentinean consumption account for almost all the decline in the Uruguayan GDP. Again, as in 1981-82, in 1985, or in 1989, Argentina appears to have played a important role in the fall of Uruguay's GDP.

4 Final comments

Uruguay has always had difficulties avoiding the consequences of swings in the economic policies of its neighbors. The main underlying sources of regional shocks affecting the Uruguayan economy were generally associated to the adoption of new stabilization programs, or to the collapse of old attempts. Antiinflationary plans induced important changes in real variables in both

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year the Uruguayan government had to impose quantitative constraints on purchases of Argentinean goods.

countries such as output. consumption, and the real exchange rate. Recent examples of these dramatic changes can be easily found in the Convertibility plan in Argentina and the Real plan in Brazil. The failure of many stabilization programs. on the other hand, also had important real effects, and affected the Uruguayan economy in a negative way (e.g., the collapse of the *tablita* and the Spring plan in Argentina).

We have identified several channels through which regional shocks were transmitted to the Uruguayan economy. The high degree of substitutability among goods between these countries is one of the main multiplier of regional shocks. Of particular relevance is the presence of a regional demand for some goods which are basically non-traded with the rest of the world. This external demand is explained by the importance of tourism and related activities and, on the other hand, by the existence of preferential trade agreements with neighboring countries. These atypical mechanisms allow for trading in what would otherwise be nontradable goods and services (or goods that are nontradable vis-a-vis the rest of the world but partially tradable within the region). The existence of a regional demand for these kinds of goods has deepened the economic ties of Uruguay with its neighbors. The importance of this *nonconventional* channel has exacerbated the impact of regional disturbances, and overall, the economy has become more vulnerable to regional shocks. The increasing trends to economic integration among Southern Cone economies is likely to aggravate this problem.

Figure 1
THE MARKET OF THE REGIONAL GOOD AND THE EXTERNAL SECTOR

Figure 1A

Figure 1B

Figure 1C
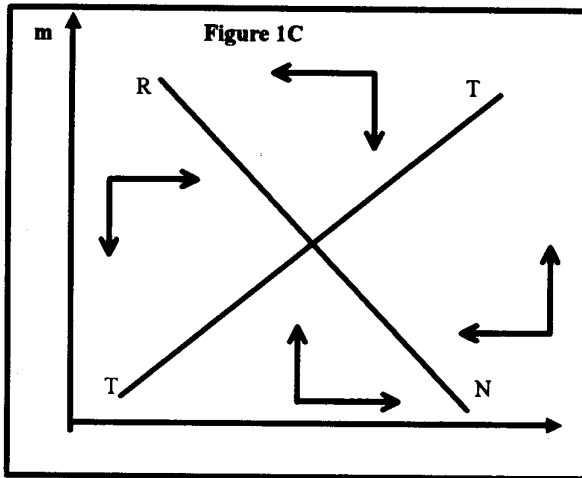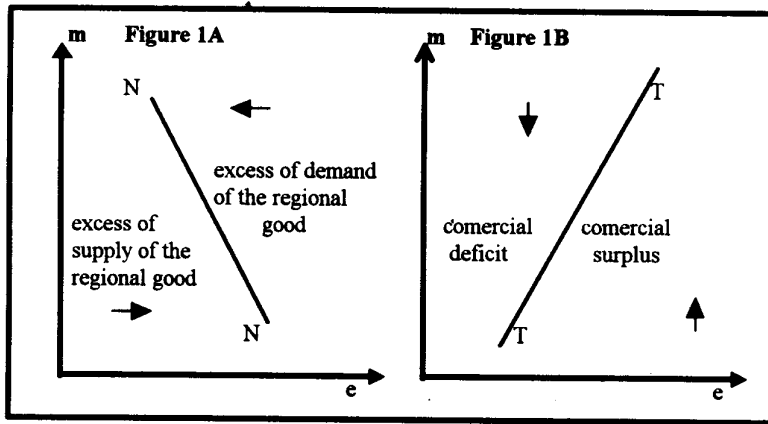
DYNAMIC AJUSTMENT WHEN THE SMALL ECONOMY FACES A FAVORABLE REGIONAL SHOCK

CASE 1: P_R AJUSTS SLOWLY FIXED EXCHANGE RATE REGIMEN
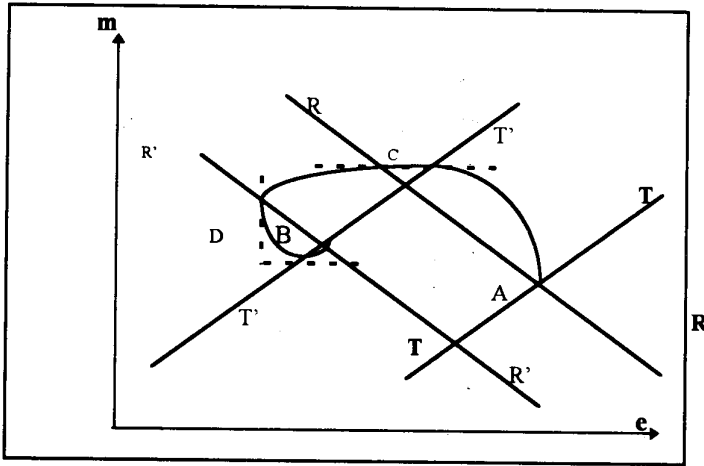
PATH OF THE MONEY STOCK AND THE RELATIVE PRICE DURING THE ADJUSTMENT PERIOD

Case 1: Sticky prices and fixed exchange rate
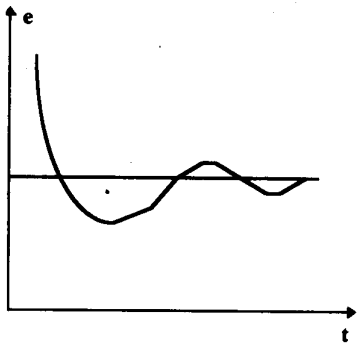
Figure 3A
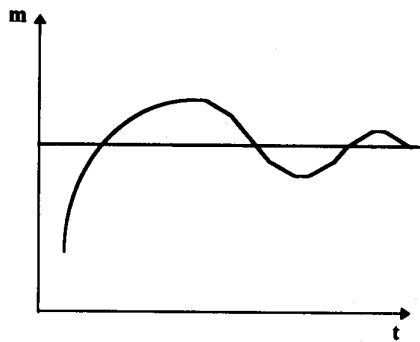
Figure 3B

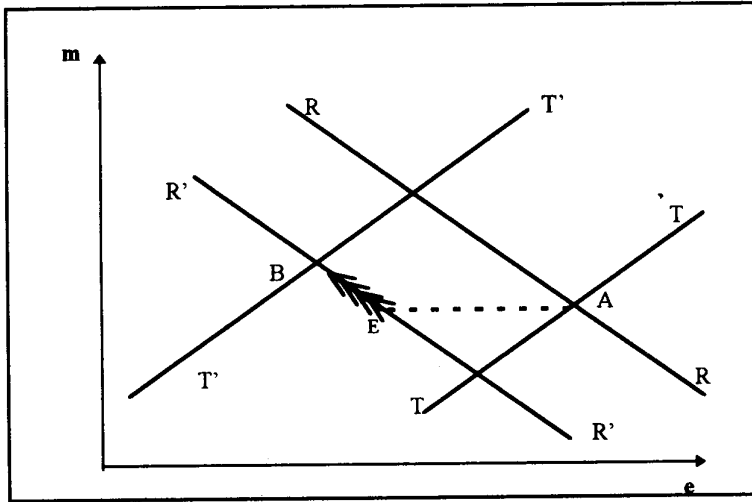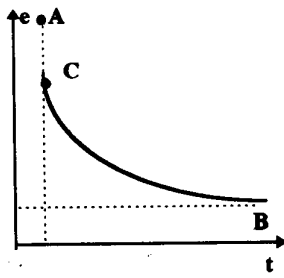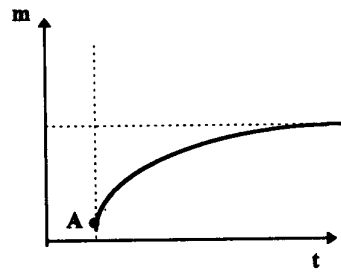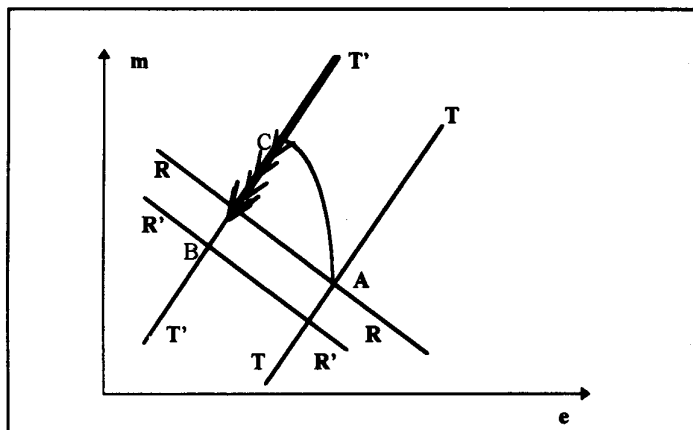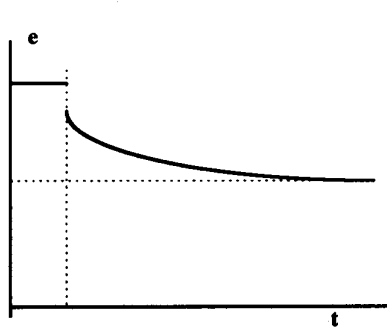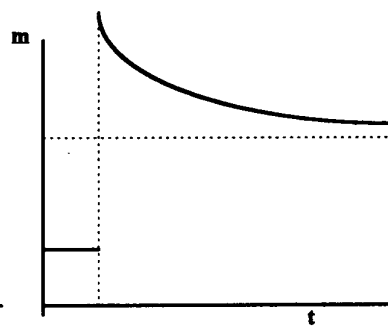## Figure 4

CASE 2: P_R IS FLOATING EXCHANGE RATE REGIMEN

Figure 5

PATH OF THE MONEY STOCK AND THE RELATIVE PRICE DURING THE ADJUSTMENT PERIOD

Case 2: Flexible prices and fixed exchange rate

Figure 5A

Figure 5B

Figure 6

CASE 3: P_R AJUSTS SLOWLY FLOATING EXCHANGE RATE REGIMEN

Figure 7

PATH OF THE MONEY STOCK AND THE RELATIVE PRICE DURING THE ADJUSTMENT PERIOD
Case 3: Sticky prices and flexible exchange rate

Figure 7A   **Figure 3.7B**

Case 4: flexible prices and exchange rate
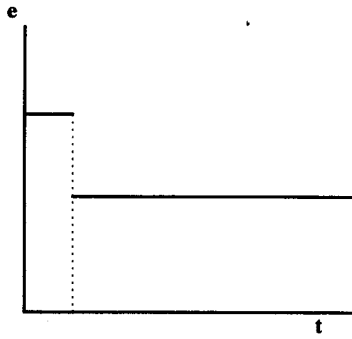
Figure 3.7C
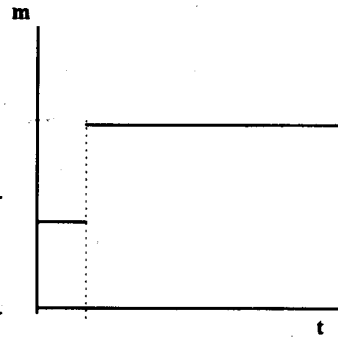
Figure 3.7D

Figure 8
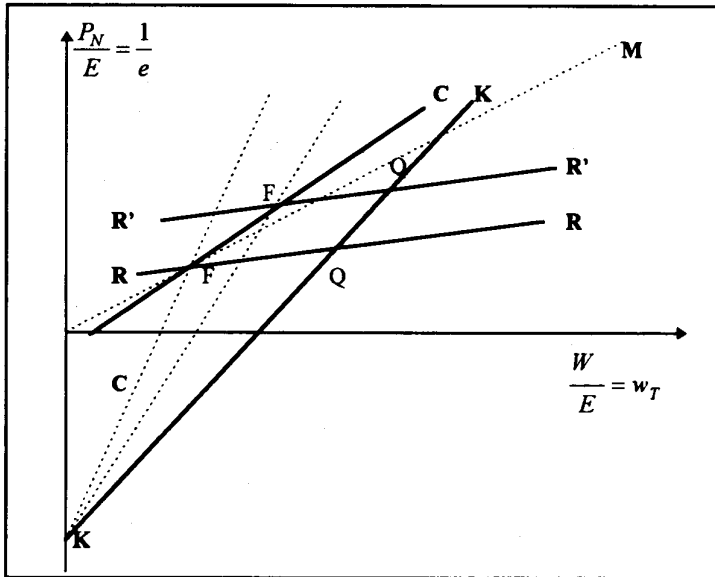
EFFECTS ON EMPLOYMENT OF A FAVORABLE REGIONAL SHOCK
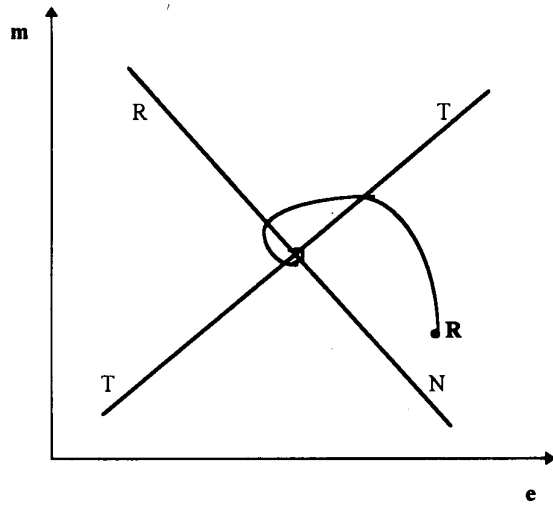
Figure 9

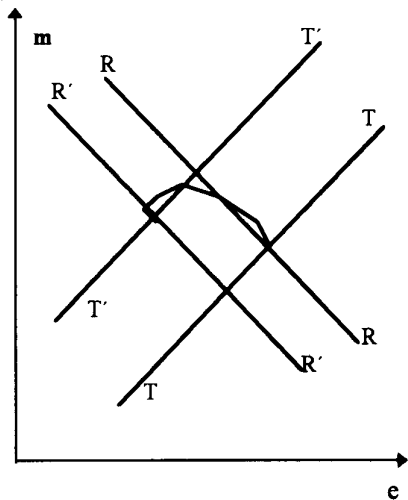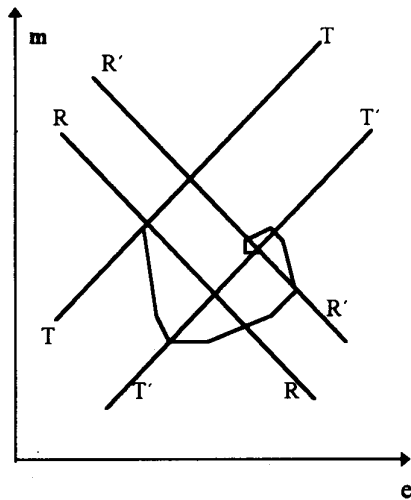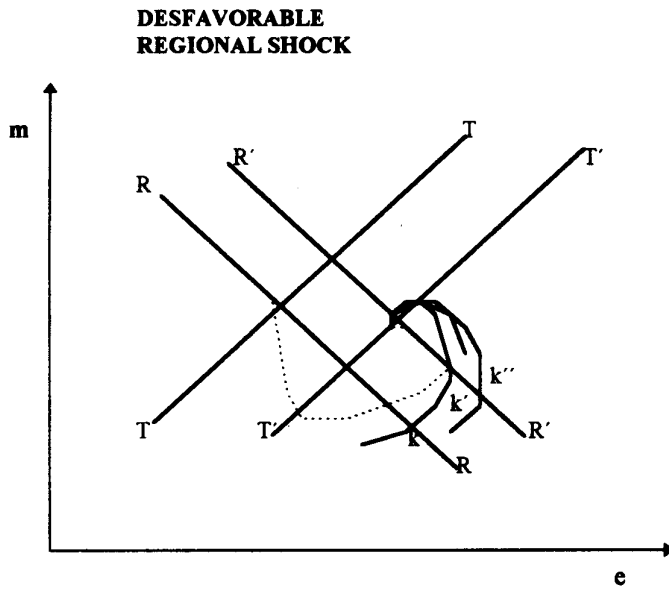## A DEVALUATION UNDER A FIXED EXCHANGE RATE SYSTEM

Figure 10

**ADJUSTMENT OF THE SMALL ECONOMY WHEN PRICES ARE
MORE RIGID DOWNWARDS THAN UPWARDS**

**FAVORABLE
REGIONAL SHOCK**

**DESFAVORABLE
REGIONAL SHOCK**

Figure 11

THE ROLE OF A DEVALUACION WHEN PRICES ARE STICKY
DOWNWARDS

**DESFAVORABLE
REGIONAL SHOCK**

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