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ABSTRACT

Two major stylized facts that emerged during the early transition experience of the economies of Central and Eastern Europe were the fall in output and the appreciation of the real exchange rate. In this paper, we attempt to give a theoretical explanation, beyond that found in the existing literature, for the emergence of these two facts, which relies on the role of two basic characteristics of these economies in the early stages of transition. The first refers to their structure involving the existence of an almost liberalized price system for domestic output, a large part of which, however, was still produced by state firms and the second to the nature of the disturbances they initially encountered.

Keywords: Transition economies, real exchange rate dynamics, output decline, structural reform, price liberalization.
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1. Introduction

The considerable appreciation of the real exchange rate as well as the persistent output decline immediately after the beginning of the transition process constitute stylized facts common to most economies of Central and Eastern Europe. With respect to the real exchange rate, the evidence clearly indicates an appreciating trend after the initial depreciation across almost all transition economies primarily reflecting the initial inflation, which was followed by rising productivity[1]. The large falls in output constitute one of the most striking common phenomena that characterized the course of the transition process. The negative supply shocks, the break-down of trade relations, the credit crunch that followed the reduction of state subsidies as well as the restrictive nature of the macro policies adopted constitute some of the main causes of the output decline identified by the existing literature[2].

In addition, two basic characteristics were fairly common in these economies early in transition. The first refers to a structural feature that, while in many of these countries prices were liberalized almost immediately, measures for the structural reform of the real sector proceeded at a relatively slow pace. That is, most transition economies liberalized domestic prices abolishing state control very early in transition. In contrast, the implementation of privatization proved to be time-consuming largely reflecting both the nature of the process, particularly with respect to medium and large-scaled enterprises and the weak commitment to reform by the policy makers at least in some of these countries[3]. As a result, even though small-scaled enterprises were privatized quite rapidly, by the end of 1995, more than 50 percent of GDP was still produced by state

[1] See Halpern and Wyplosz (1997), Krajnyak and Zettelmeyer (1998) and Papazoglou and Pentecost (2004).

[2] See, among others, Kornai (1994), Allsopp and Kierzkowski (1997), Gomulka (1998), Roland and Verdier (1999), Mills and Pentecost (2001) and Papazoglou and Pentecost (2004).

[3] In 1995, according to EBRD's transition indicators, large-scale privatization reached an average score of 2.5 according to which less than 50 percent of large-scale enterprise assets were in private hands or in the process of being privatized. The respective average score for price liberalization was more than 3.5, which stood for substantial progress in price liberalization reflecting the almost complete removal of state procurement at non-market prices. See the EBRD's *Transition report 2003*. As a matter of fact, according to EBRD (2000) and Estrin (2002), when one looks at privatization of large-scale enterprises, only in five transition economies - Bulgaria, Czech Republic, Estonia, Hungary and Slovakia - were more than half of the assets in private hands by the year 2000. See, also, Takla (1999) and Gomulka (2000).

firms in most transition economies[4]. Thus, a structural feature that characterises several of these economies, particularly during the initial phases of transition, refers to the existence of an almost completely liberalized price system for domestic output, a large part of which, however, was still produced by state firms retaining most of the practices of the previous regime.

The second characteristic refers to two basic disturbances that these economies encountered early in transition. The first is macroeconomic stabilization, which was a fundamental policy objective aiming at reducing the inflation that initially resulted from price liberalization and the monetary overhang. The second disturbance is associated with increasing demand for private sector output as the dismantling of the state sector necessitated increased reliance on the private sector, reflecting the path of these countries towards the establishment of a functioning market economy.

The scope of this paper is to provide a theoretical explanation for the stylized facts concerning the behaviour of the real exchange rate and output in these economies by relying on these two basic characteristics. As a result, we employ a dynamic macroeconomic model of a representative transition economy operating under a flexible exchange rate regime, which also incorporates the co-existence of a state as well as a private sector in the market for domestic output, while prices are assumed to be fully liberalized[5]. Within this model we examine the impact of first a decrease in money growth and second an increase in the demand for output produced by the private sector, representing the shrinking of the state sector as a result of the change in the structure of the economy. In addition, the analysis assumes secular inflationary conditions as being more appropriate to actual prevailing experience of these countries and in that respect the basic theoretical framework draws from the early works of Dornbusch (1980), Turnovsky (1981) and Buiter and Miller (1982).

The paper is set out as follows. The specification of the model is described in Section 2, while Section 3 includes the solution to the dynamics. The impact of the

[4] According to EDRD (1995), there were sixteen transition economies in a total of twenty-five with a private sector share below the 50 percent of GDP. See, also Svejnar (2002).

[5] Not all transition economies adopted a flexible exchange rate regime. Some of them adopted a fixed regime and this primarily reflected their aim for effective stabilization.

monetary contraction is examined in Section 4. Section 5 considers the effect of an increase in the demand for output produced by the private-sector. Finally, Section 6 offers some concluding remarks.

2. The model

As already noted domestic output is produced partly by the private sector, which operates under conditions of a market economy and as a result responds to market forces and partly by the state sector which does not respond to such forces. Moreover, aggregate output is taken to be endogenous and not fixed at the full employment level due to the existence of idle and/or underutilized resources.

The model, in which all variables are expressed in logarithms, is as follows:

$$Y_m = b_1 Y - b_2 (r - p^*) + b_3 c + k \qquad 0 < b_1 < 1, b_2 > 0, b_3 > 0 \qquad \text{(1a)}$$

$$c = P_f + E - P \qquad \text{(1b)}$$

$$Y = \theta Y_m + (1-\theta)\bar{Y}_G \qquad 0 < \theta < 1 \qquad \text{(1c)}$$

$$p = \gamma Y_m \qquad \gamma > 0 \qquad \text{(1d)}$$

$$M - P = a_1 Y - a_2 r \qquad a_1 > 0, a_2 > 0 \qquad \text{(1e)}$$

$$r = r_f + e^* \qquad \text{(1f)}$$

$$p^* = p \qquad \text{(1g)}$$

$$e^* = e \qquad \text{(1h)}$$

$$\dot{M} = \mu \qquad \text{(1i)}$$

$$\dot{c} = p_f + e - p \qquad \text{(1j)}$$

where

Y = real domestic output, expressed in logarithms

Y_m = real domestic output produced by the private (market) sector, expressed in

logarithms

$\bar{Y}_G$ = real domestic output produced by the government (state) sector, expressed in logarithms and assumed fixed

r = domestic nominal rate of interest

r_f = foreign nominal rate of interest, exogenous to the domestic economy

P = domestic price level (in terms of domestic currency), expressed in logarithms

P_f = price of imported good (in terms of foreign currency), expressed in logarithms

E = logarithm of current exchange rate (measured in units of the domestic currency per unit of foreign currency)

c = relative price of foreign to domestic goods

k = shift factor

M = logarithm of the domestic nominal money supply

$\mu \equiv \dot{M}$ = rate of domestic nominal monetary expansion, taken to be exogenous

$p = \dot{P}, y = \dot{Y}, e = \dot{E}, y_m = \dot{Y}_m, p_f = \dot{P}_f$ where lower case letters denote rates of change, i.e. p denotes the actual rate of inflation of P, y is the rate of change in real output (growth rate), e is the rate of exchange depreciation, etc.

p^*, e^* = expected rates of inflation of the domestic price level P and of exchange depreciation respectively.

The economy is assumed to produce one good part of which is produced by the market sector and the rest by the old state sector[6]. The price of the domestic good and its inflation rate are endogenous, as well as the output produced by the private sector. The part of output produced by the state sector is assumed not to respond to market forces and as a result is exogenously set[7]. Moreover, the price of the imported good and its inflation

[6] This assumption is rather unrealistic. State goods are usually of low quality and as a result cannot be considered as perfect substitutes for private ones. Note, however, that by introducing two goods instead, one for the private and the other for the state sector, we would complicate our analysis without significantly altering our results. The same assumption is made elsewhere as well, see Grafe and Wyplosz (1999).

[7] The assumption of fixed output of the state sector is rather strict since the share of the state sector in total real output declined quite significantly during the transition process. Note, however, that the aim of the analysis is to examine the impact of the existence of a large enough state sector at the initial stages of transition on the stylized facts described above. It is in that sense that we assume it to be fixed.

rate is taken to be exogenous as well. Given these assumptions, the specification of the model, which is described below, is quite standard.

Equation (1a) states that the aggregate demand for domestic private output varies positively with real income and the relative price, c, but inversely with the real rate of interest $(r - p^*)$. k is a shift factor intended to capture the impact of an increase in the demand for output produced by the private sector. The second equation defines the relative price, c. Equation (1c) states that part of output is produced by the private sector and the rest by the state, with the relative shares being θ and $(1-\theta)$, respectively. This means that the greater the θ, the larger the private sector which, in turn, implies that the transformation process has proceeded more vigorously.

Equation (1d) represents a Phillips-type relation that links domestic inflation to output fluctuations. Note that as a result of our assumption of a fixed output level for the state sector, inflation is related to privately produced output only[8]. Inflation is linked to the current output level and not to the excess product demand reflecting the limited thickness of the market due to the existence of the state sector as well as our assumption of idle resources in the long run.

Equation (1e) describes money market equilibrium. The real money stock depends positively on real income and negatively on the domestic nominal interest rate. Equation (1f) reflects the uncovered interest rate parity condition. That is, the domestic interest rate is equal to the world rate plus the expected rate of exchange depreciation. This assumption is rather unrealistic for the particular economies since most of them are characterized by underdeveloped financial markets, which, as a result, are not fully integrated with world markets. Nevertheless, by simplifying the analysis, it allows us to focus on the main objective of the paper without altering our results in any essential way.

The two exponential variables p^*, e^* are assumed to satisfy the rational expectations hypothesis, which in the absence of uncertainty, implies perfect foresight. This condition, described by equations (1g) and (1h), requires the expected rates of

[8] In case of an increase in state sector output, inflation is affected through its impact on the demand for private output as captured by equation (1).

inflation and exchange depreciation respectively to coincide with the corresponding actual rates.

The final two equations determine the dynamics of the system. The first, (1i), specifies a simple rule for monetary policy which fixes the rate of growth of the domestic money supply. This, then, means that at any moment in time the nominal stock of money is predetermined. An expansionary monetary policy is specified by an increase in the monetary growth rate μ. The last equation, (1j), describes the evolution of the real exchange rate c, and is simply the time derivative of (1b).

The model is better analyzed when expressed in real terms. To do this, we define the real stock of money, h, as:

$$h \equiv M - P \tag{2}$$

and, by doing the necessary substitutions as well, reduce the system (1a) - (1k) to the following set of equations:

$$\left(\frac{1}{\theta} - b_1\right)Y = \left(\frac{1-\theta}{\theta}\right)\bar{Y}_G - b_2\left(r_f + e - p\right) + b_3 c + k \tag{3a}$$

$$p = \frac{\gamma}{\theta}[Y - (1-\theta)\bar{Y}_G] \tag{3b}$$

$$h = a_1 Y - a_2(r_f + e) \tag{3c}$$

$$\dot{h} = \mu - p \tag{3d}$$

$$\dot{c} = p_f + e - p \tag{3e}$$

Note that by solving (1c) for Y_m, which is then substituted into (1a) and (1d), we arrive at equations (3a) and (3b) respectively. Also, equation (1e), describing the uncovered interest parity condition, is substituted into equations (3a) and (3c). Turning to the evolution of the system, we assume that, at all points other than those where the exchange rate undergoes jumps in response to unanticipated disturbances, the real exchange rate and the real stock of domestic money evolve continuously and can be taken as predetermined. The three equations (3a)-(3c) yield the short-run solutions for the three

variables Y, e, p in terms of c, h. Substituting these solutions into (3d) and (3e), the dynamic adjustment of the system is determined.

The steady-state equilibrium is reached by setting $\dot{h} = \dot{c} = 0$ in (3d) and (3e). More specifically, the steady-state equilibrium values, denoted by tildes, are given by:

$$\left(\frac{1}{\theta} - b_1\right)\tilde{Y} = \left(\frac{(1-\theta)}{\theta}\right)\bar{Y}_G - b_2 r_f + b_3\tilde{c} + k \qquad (4a)$$

$$\tilde{p} = \frac{\gamma}{\theta}[\tilde{Y} - (1-\theta)\bar{Y}_G] \qquad (4b)$$

$$\tilde{h} = a_1\tilde{Y} - a_2(r_f + \tilde{e}) \qquad (4c)$$

$$\tilde{p} = p_f + \tilde{e} = \mu_0 \qquad (4d)$$

Using the above equations we determine the long-run equilibrium values for Y, p, h, e, c. The long-run solutions for Y, c and h are summarized as follows:

$$\tilde{Y} = \frac{\theta}{\gamma}\mu_0 + (1-\theta)\bar{Y}_G \qquad (5a)$$

$$\tilde{c} = \frac{(1-\theta b_1)}{b_3\gamma}\mu_0 - \frac{1}{b_3}k - \frac{(1-\theta)b_1}{b_3}\bar{Y}_G \qquad (5b)$$

$$\tilde{h} = \frac{\theta a_1 - \gamma a_2}{\gamma}\mu_0 + a_1(1-\theta)\bar{Y}_G. \qquad (5c)$$

Note that, μ_0 is the initial long-run rate of domestic nominal monetary growth.

3. The general solution of the system

For the evolution of the economy over time to be determined we must reduce the system (3a)-(3d) to a pair of autonomous differential equations in c and h. First, however, we must solve for the short-run solutions of Y, p and e. These solutions are given by the following expressions:

$$Y = \frac{b_3 a_2}{\Delta} c + \frac{b_2}{\Delta} h + \frac{a_2}{\Delta} k + \frac{(1-\theta)(1-\gamma b_2) a_2}{\theta \Delta} \bar{Y}_G \tag{6a}$$

$$e = \frac{b_3 a_1}{\Delta} c - \frac{(1-\theta b_1 - \gamma b_2)}{\theta \Delta} h + \frac{a_1}{\Delta} k + \frac{(1-\theta)(1-\gamma b_2) a_1}{\theta \Delta} \bar{Y}_G \tag{6b}$$

$$p = \frac{\gamma a_2 b_3}{\theta \Delta} c + \frac{\gamma b_2}{\theta \Delta} h + \frac{\gamma a_2}{\theta \Delta} k - \frac{\gamma (1-\theta)[a_1 b_2 - a_2 b_1]}{\theta \Delta} \bar{Y}_G \tag{6c}$$

where $\Delta \equiv (a_2 / \theta)(1 - \theta b_1 - \gamma b_2) + a_1 b_2$, which is taken to be positive. Substituting (6a)-(6c) into (3d) and (3e), the dynamics of the economy are written as follows:

$$\begin{bmatrix} \dot{c} \\ \dot{h} \end{bmatrix} = \begin{bmatrix} q_{11} & q_{12} \\ q_{21} & q_{22} \end{bmatrix} \begin{bmatrix} c \\ h \end{bmatrix} + \begin{bmatrix} g_{11} & g_{12} & 0 \\ g_{21} & g_{22} & 1 \end{bmatrix} \begin{bmatrix} k \\ \bar{Y}_G \\ \mu \end{bmatrix} \tag{7a}$$

where,

$$q_{11} = \frac{b_3(\theta a_1 - \gamma a_2)}{\theta \Delta} \qquad q_{12} = -\frac{(1-\theta b_1)}{\theta \Delta} < 0$$

$$q_{21} = -\frac{\gamma a_2 b_3}{\theta \Delta} < 0 \qquad q_{22} = -\frac{\gamma b_2}{\theta \Delta} < 0$$

$$g_{11} = \frac{\theta a_1 - \gamma a_2}{\theta \Delta} \qquad g_{12} = \frac{(1-\theta)(a_1 - \gamma a_2 b_1)}{\theta \Delta}$$

$$g_{21} = -\frac{\gamma a_2}{\theta \Delta} < 0 \qquad g_{22} = \frac{\gamma (1-\theta)(a_1 b_2 - a_2 b_1)}{\theta \Delta} \tag{7b}$$

It can be shown that $q_{11} q_{22} - q_{12} q_{21} = -\gamma b_3 / \theta \Delta$, which means that the equilibrium is a saddlepoint with roots $\lambda_1 < 0$ and $\lambda_2 > 0$.

The general solution to the system is obtained by integrating (7a), assuming that μ, k and $\bar{Y}_G$ remain constant. We consider only the stable solution, which simplifies to:

$$c = -A \frac{q_{12}}{q_{11} - \lambda_1} \exp(\lambda_1 t) + \frac{q_{12}}{\lambda_1 \lambda_2} \mu - \frac{1}{b_3} k - \frac{b_1(1-\theta)}{b_3} \bar{Y}_G \tag{8a}$$

$$h = A\exp(\lambda_1 t) - \frac{q_{11}}{\lambda_1\lambda_2}\mu + (1-\theta)a_1\bar{Y}_G \qquad (8b)$$

The stable arm is obtained by eliminating $A\exp(\lambda_1 t)$ between equations (8a) and (8b). In particular the stable locus may be expressed as:

$$c = -\frac{q_{12}}{q_{11}-\lambda_1}h - \frac{q_{12}}{(q_{11}-\lambda_1)\lambda_2}\mu - \frac{1}{b_3}k - (1-\theta)\left[\frac{b_1}{b_3} - \frac{a_1 q_{12}}{q_{11}-\lambda_1}\right]\bar{Y}_G \qquad (9)$$

This locus is positively sloped since $q_{12} < 0$ and $q_{11} - \lambda_1 = \lambda_2 - q_{22} > 0$. Equation (9), together with the short-run solutions given by (6a)-(6c), form the basis for our analysis of the two disturbances under consideration.

4. A decrease in the money growth rate

In this section, we examine the impact of a decrease in money supply growth. The long-run solutions are described by equations (5a)-(5c). We see from (4d) that a decrease in μ leads to proportional fall in p and e. The decline in the rate of exchange rate depreciation means a lower domestic interest rate. As a result, money market equilibrium requires a fall in the level of output. This, in turn, leads to an appreciation in the real exchange rate so that product market equilibrium is maintained as well. Note that, due to the existence of the state sector, the output decline stems from the private sector. Thus, the smaller the size of the private sector the greater the impact of any excess demand on output produced by the particular sector which, in turn, means larger appreciation in the real exchange rate for product market equilibrium. The fall in both output and the nominal interest rate mean that equilibrium in the money market is compatible with either a higher or a lower real money stock. Note that the real stock is more likely to increase when θ, the proportion of output produced in the private sector, is low in which case the overall output fall is smaller, causing less of an impact on the money market.

To determine the short-run impact of the decrease in the monetary growth rate μ on the economy, we first take the differential of (9) with respect to μ and o btain:

$$\frac{dc_0}{d\mu} = -\frac{q_{12}}{\lambda_2(q_{11}-\lambda_1)} > 0 \qquad (13)$$

where subscript 0 denotes the initial impact effect. Hence it follows that a decrease in the monetary growth rate gives rise to an immediate discrete appreciation in the real exchange rate. As a matter of fact, as we shall see below, depending on the size of the state sector, the real appreciation may overshoot its long-run equilibrium level. The initial jump in c has immediate repercussions on the short-run equilibrium variables of the system, e, Y and p. These can be obtained by taking the differential of (6a)-(6c) and substituting from (13). More specifically:

$$\frac{de_0}{d\mu} - 1 = -\frac{q_{11}}{\lambda_2}\left(1 + \frac{q_{12}}{q_{11}-\lambda_1}\right) \qquad (14a)$$

$$\frac{dp_0}{d\mu} - 1 = -\frac{q_{11}}{\lambda_2} \qquad (14b)$$

$$\frac{dY_0}{d\mu} = \frac{\theta q_{12} q_{21}}{\gamma\lambda_2(q_{11}-\lambda_1)} > 0 \qquad (14c)$$

where in all cases the subscript 0 is used to denote the initial impact effect. In addition, the above results imply:

$$\frac{d\dot{c}_0}{d\mu} = \frac{d(e_0 - p_0)}{d\mu} = -\frac{q_{11}}{\lambda_2}\left(\frac{q_{12}}{q_{11}-\lambda_1}\right) \qquad \frac{d\dot{h}_0}{d\mu} = 1 - \frac{dp_0}{d\mu} = \frac{q_{11}}{\lambda_2} \qquad (15)$$

which captures the adjustment process towards the long-run equilibrium. The effects of the monetary contraction are illustrated in Figure 1 where the original steady state is given by point A on the stable locus (line SL). The effect of the initial appreciation in the real exchange rate, as a result of the jump in the nominal exchange rate, leads to a shift in the stable locus to position SL' and point D reflects the short-run equilibrium. Then, both c and h begin to adjust and the system could converge either to point B or to point C,

which represent the new long-run equilibrium, depending on the signs of the relations reported in (15), which, in turn, are affected by the signs of (14a) and (14b).

The initial impact effects are reported in (14). A decrease in the money growth rate, μ, leads to an instantaneous appreciation of the nominal exchange rate. Given that the price of domestic output adjusts sluggishly, which means that it is fixed at the time of the monetary contraction, the real exchange rate c_0 immediately decreases. The demand for domestic output therefore falls, and as result a decrease in domestic supply is required to equilibrate the output market. The fall in output also leads to a reduction in the rate of domestic inflation via the Phillips curve. Notice, however, that the fall in p depends on the size of the market sector θ. The smaller the portion of privately produced output the larger the impact on inflation. The lower output reduces the demand for real money balances and, given the real supply, necessitates a decline in the nominal domestic interest in order for money market equilibrium to be maintained. Given interest rate parity, equilibrium is re-established by a decrease in the rate of exchange depreciation.

Note that, depending on the sign of q_{11}, p and e may overshoot or undershoot their long-run equilibrium values. In particular, as we see from (7b), q_{11} will be positive or negative according to whether,

$$\frac{\theta}{\gamma} \gtrless \frac{a_2}{a_1} .$$

As we see the likelihood of $q_{11} > 0$ varies positively with the size of the market sector. In particular, in case that $q_{11} < 0$, if $\theta < \theta^* \equiv \gamma a_2 / a_1$, then the decrease in p and e exceeds the long-run decline, with the possibility that e may undershoot, while it is certain that:

$$\left|\frac{dp_0}{d\mu}\right| > \left|\frac{de_0}{d\mu}\right| \qquad (16)$$

which means that the relations in (15) are negative.

Intuitively, in case that $q_{11} < 0$ reflecting a small θ, the impact of the initial real appreciation will be greater on privately produced output leading to a larger fall in inflation. Note, however, that the existence of a relatively large state sector limits the

impact on overall output causing, as a result, a smaller fall in the nominal interest rate as reflected by the reduction in the rate of exchange depreciation in the money market equation. Hence, the fall in inflation exceeds the corresponding decrease in the rate of exchange depreciation and nominal monetary expansion. This, in turn, implies a higher real interest rate, and hence a larger short-run output decline and real exchange rate appreciation relative to the long run. As a result the adjustment process is associated with real exchange rate depreciation and rising output while the money stock increases as well. The new long-run equilibrium is at point C which, in comparison with the initial one, corresponds to lower c and higher h.

Briefly, in the event that $q_{11} > 0$ there will be less of a decline in inflation. Thus, during the adjustment process, the real exchange rate and real money stock will fall as the initial fall in inflation falls short of the corresponding one in the rates of exchange appreciation and nominal monetary contraction. Furthermore, output and the real exchange rate decline by less in the short run and thus both fall further during adjustment. In this case, point B represents the new long-run equilibrium.

In conclusion, the fall in the monetary growth rate leads to a fall in output and to real exchange rate appreciation. In the short run, in the case of a large enough state sector, the output fall and the real exchange rate appreciation overshoot their long-run levels. This largely reflects the fact that, because the private sector does not extend over the entire economy, the impact of any excess demand on output produced by that sector is magnified causing the over-adjusting of the particular variables.

5. Increase in the demand for output produced by the private sector

In this section, we examine an increase in the demand for privately produced output (using the shift factor k) which is the result of a corresponding decline in the state sector output following the dismantling of this sector[9]. More specifically, given the

[9] The dismantling of the state sector proceeded since "growth of the new regime will not occur until the new incentives are in place and made credible", (Havrylyshyn, 2001).

relative importance of the two sectors as captured by equation (1c), this is derived by using the fact that:

$$d\bar{Y}_G = -\frac{\theta}{1-\theta}dk \qquad (17)$$

In the long run, derived using (5a)-(5c) and substituting from (17), an increase in the demand for privately produced output does not affect overall output directly since it is offset by a corresponding decline in $\bar{Y}_G$. It is affected, however, indirectly through the upward pressure of higher demand on the inflation rate. More specifically, since inflation cannot be affected in the long run, as it is tied to the monetary growth rate, market output must decrease in order to offset the upward pressure on inflation. This, in turn, requires a real exchange rate appreciation. Thus, we reach the surprising result that an increase in the demand for market output eventually leads to an output decline. That is, the increase in privately produced output does not fully compensate for the decline in state sector output. Note that, as in the case of monetary contraction, due to the existence of the state sector, privately produced output is more sensitive to changes in demand which, in turn, necessitates a larger real exchange rate appreciation. Finally, the real money stock must decrease because of the fall in the demand for money following the output contraction.

Turning to the short-run, we take the differential of (9) with respect to k and substitute from (17) in order to ascertain the instantaneous effect of an increase in market output on the real exchange rate. In particular:

$$\frac{dc_0}{dk} = -\frac{(1-\theta b_1)}{b_3}\left[1-\frac{q_{11}-q_{12}}{q_{11}-\lambda_1}\right] \qquad (18)$$

while the impact effect on the short-run equilibrium variables of the system is obtained by taking the differential of (6a)-(6c) and substituting from (17) and (18). As a result:

$$\frac{de_0}{dk} = -\theta a_1 \lambda_1 \left(1+\frac{q_{12}}{q_{11}-\lambda_1}\right) \qquad (19a)$$

$$\frac{dp_0}{dk} = -\theta a_1 \lambda_1 > 0 \qquad (19b)$$

$$\frac{dY_0}{dk} = -\theta a_2 \lambda_1 \left(1 + \frac{q_{12}}{q_{11} - \lambda_1} \right) \tag{19c}$$

from which it follows that:

$$\frac{d\dot{c}_0}{dk} = \frac{d(e_0 - p_0)}{dk} = -\frac{\theta a_1 \lambda_1 q_{12}}{q_{11} - \lambda_1} < 0 \qquad \frac{d\dot{h}_0}{dk} = -\frac{dp_0}{dk} = \theta a_1 \lambda_1 < 0 \,. \tag{20}$$

The response of the economy to a rise in the demand for privately produced output reflecting a corresponding fall in state output is illustrated in Figure 1 as well. Starting from the initial steady state at point A on the line SL, the initial real appreciation of the exchange rate leads to a shift in the stable locus to position SL' and point D represents the short-run equilibrium. Then, both c and h begin to fall and the system converges along this locus towards the new equilibrium at point B.

In the short run, the rise in demand for output produced by the private sector leads to an increase in inflation which, in turn, generates an expansionary effect on output through a lower real interest rate. On the other hand, the higher output requires an increase in the nominal interest rate, through a rise in the rate of exchange depreciation, for money market equilibrium. This increase in the interest rate reduces the initial expansionary impact on output. The fact that the rise in Y_m impacts more on inflation than the rate of exchange rate depreciation means that overall output may increase. As a result, the real exchange will undershoot its long-run equilibrium appreciating by less in the short run. During the adjustment, both the real exchange rate and the real money stock fall, as the relations reported in (20) indicate, until they get to the new long-run equilibrium at point B. Thus, the adjustment process is associated with real exchange rate appreciation and output decline until the system is brought to the new long-run equilibrium.

7. Conclusions

In this paper we have developed and analyzed a macroeconomic model of a small open transition economy operating under flexible exchange rates. The analysis incorporates two basic sets of assumptions regarding the structure as well as the nature of disturbances faced by such an economy in the early stages of transformation. With respect to the structure, state firms are taken to produce part of domestic output while complete liberalization of prices is assumed. Turning to the disturbances, the analysis considers the impact of a monetary contraction and of an increase in the demand for output produced by the private firms, resulting from a corresponding decline in output produced by the state sector. In addition, the fact that these economies have been experiencing conditions of generally secular inflation is introduced as well. The aim of the paper has been to assess the extent to which the existence of the particular structural feature together with the consideration of the two specific shocks have contributed to the experience of an appreciating real exchange rate and falling output.

The analysis indicated that both disturbances lead to output falls and real exchange rate appreciation over the long run. As a matter of fact, with respect to real exchange rate, the fact that privately produced output constitutes a “thinner” market due to the existence of the state sector causes greater long-run appreciation in the exchange rate than what it would have otherwise been. However, the impact of the two disturbances differs in the short run. In the case of monetary contraction, the two stylized facts become more profound as the output decline and the real exchange rate appreciation overshoot their long-run levels. In the case of an increase in the demand for output, the two variables undershoot their long-run level which, in turn, gives rise to an adjustment process of real exchange rate appreciation and output decline as the system moves towards the new long-run equilibrium.

The structure of these economies early in transition as well as the nature of the disturbances they faced facilitated the emergence of the particular behavior. That is, the fact that part of the real sector is not market determined in conjunction with the complete price liberalization magnifies the influence of any excess demand on privately produced output, which, in turn, leads to more of an impact on the inflation rate. Furthermore, the

existence of the state-sector reduces the response of overall output to either of the shocks and, thus, the impact on the money market, reducing as a result the pressure for exchange rate depreciation. The greater response of the inflation rate relative to the rate of exchange depreciation affects the real interest rate more in the short run causing, in the case of monetary contraction, a larger fall in output and an overshooting of the real exchange rate appreciation. In the case of an increase in the demand for private-sector output, it leads to a smaller decrease in overall output in the short run and an undershooting of the real exchange rate appreciation, generating, as a result, an adjustment process of declining output and further real exchange rate appreciation.

Thus, it appears that the slow progress of structural reform in several transition countries in conjunction with the nature of the disturbances they faced early in transition may have constituted an additional reason for the emergence of the particular stylized facts. This, in turn, does not mean that the importance of other explanations, given elsewhere in the literature, some of which are presented in the first paragraph of the text, is in any way diminished. Furthermore, it enhances the policy recommendations that were given to these countries for faster structural reform to accompany the liberalization measures already taken early in transition.

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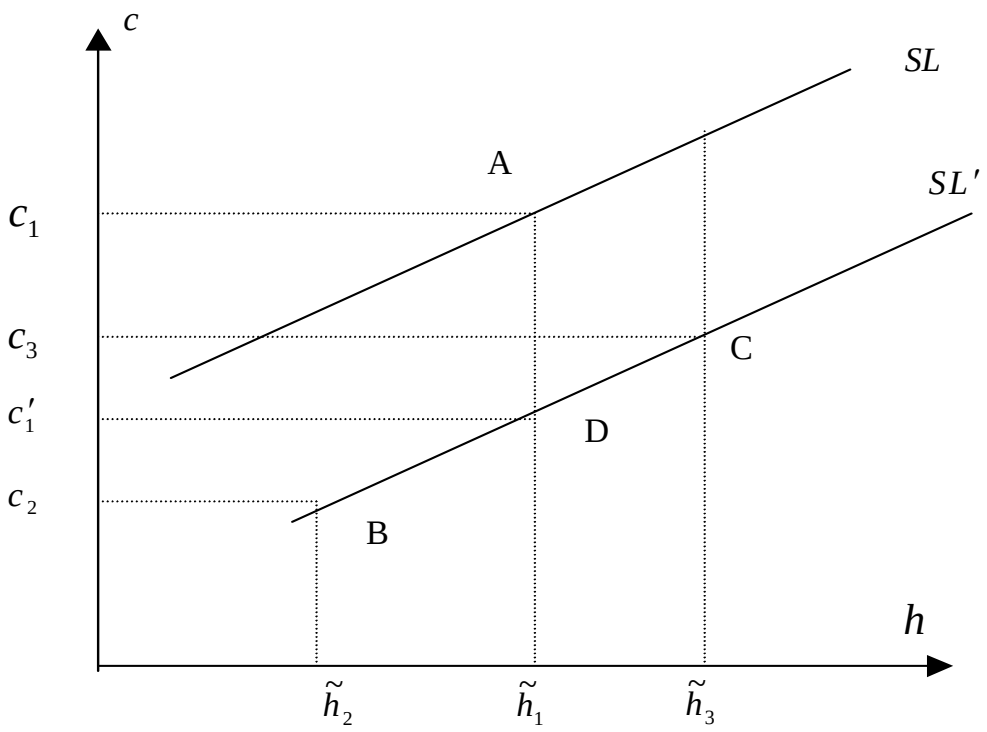

Figure 1. Responses to the two disturbances.

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