

REAL EXCHANGE RATES IN ADVANCED TRANSITION ECONOMIES

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ABSTRACT

The recent evidence from Eastern Europe suggests that one of the major obstacles towards the adoption of euro may lie in the impact that the recession of 2008 exerted on the trajectory of real exchange rates in new member countries (European Commission, 2015). This paper aims to establish and explain the relationship between the external shocks derived from the global financial crisis and recession of 2008 and equilibrium real exchange rate in advanced transition economies of Eastern Europe. The interplay between the external and internal balances is explained by developing an inter-temporal optimizing model of the real exchange rate determination in a small open economy with structural distortions. The results of our model suggest that, in the aftermath of recession, if the Eastern European economies attempt to restore and maintain the balance between the consumption, saving, and investment, the equilibrium real exchange rate will tend to reverse its trajectory from appreciation to depreciation over time in order to encourage a greater production in the future. The equilibrium real exchange rate depreciation in the future may obtain either as a result of an increase in the direct subsidies on investment or as a result of reduced subsidies on the "net-of-investment" income. The depreciation of countries' real exchange rate, however, may continue to act as an effective constraint against the adoption of euro.

Keywords: Real Exchange Rates, Transition, Recession, Subsidies, Eastern European Countries.

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INTRODUCTION

The advanced transition economies, members of European Union – the Czech Republic, Hungary, and Poland have all expressed the interest in joining the Eurozone in the future, but also postponed the target date for the euro's introduction. The speed and success of transition to monetary union by these countries will crucially depend on the restoration of internal and external balances required to sustain stable real exchange rate. The determination and maintenance of equilibrium real exchange rate is the necessary precondition for joining first the European Exchange Rate Mechanism and adopting euro at some time in the future.

The advanced transition economies can be defined as countries that have accomplished significant progress in their adoption of market institutions, but have still not reached a public consensus on the interplay between the state and markets and future path of their transformation. These are the countries that continue to make effort in adjusting their economies to the requirements of monetary union, but are still facing significant road blocks on their path towards adoption of euro. The recent evidence from Eastern Europe suggests that one of the major obstacles towards adoption of euro may lie in impact of external shocks on both the current and anticipated trends of the exchange rates between the new member countries' currencies

and euro (European Commission, 2015). Currently, neither the Czech Republic, or Hungary, or Poland, that have joined the European Union in 2004, can reach public consensus on the target date for participating in Exchange Rate Mechanism II, and eventually adopting euro in place of their national currencies. One of these challenges is in uncertainty concerning the proper equilibrium level of real exchange rates at the time of accession to Eurozone.

This paper aims to establish and explain the relationship between the external shocks derived from the recession of 2008 and the equilibrium real exchange rate in advanced transition economies of Eastern Europe. During the period preceding global financial crisis and recession of 2008, most transition economies have experienced a trend of real exchange rate appreciation (Solanes, 2008, Corriceli, Jazbec, 2004), as they increased the productivity in sector of tradables and eliminated governments subsidies in nontradables (Halpern, Wyplosz, 2001). The significance of real exchange rate appreciation is in providing a signal to domestic consumers that their relative purchasing power has increased, and that the future conversion to euro will preserve their savings at higher relative levels. In addition, the net inflow of foreign direct investment is likely to strengthen in countries with appreciating exchange rates. In the aftermath of recession, however, we have been observing a trend towards real exchange rate depreciation in Czech Republic, Hungary, and Poland (European Commission, 2015). This trend was accompanied by a decline in domestic savings, capital formation, and foreign direct investment, and increasing hesitation concerning the adoption of euro.

The aim of our paper is to explain this variation in real exchange rates after the external shock coming from global financial crisis and recession of 2008. Whether the reversal from real exchange rate appreciation to depreciation is only temporary misalignment, or it point towards new and different trajectory, can be analyzed with the use of appropriate theoretical and empirical model. While the temporary misalignment of real exchange rate relative to its equilibrium level is often the result of monetary exchange rate determinants, including monetary policies and devaluations undertaken by central banks, the change in the equilibrium levels over time must be attributed to real or fundamental

determinants that determine country's saving and investment. For example, the Czech National Bank have devalued nominal exchange rate in 2013 in order to help correct country's trade deficit and to encourage inflationary expectations in a deflationary environment (European Commission, 2015). While the monetary intervention with the purpose of currency weakening always leads to real exchange rate depreciation, the resulting depreciation will likely lead to a temporary misalignment, rather than change in equilibrium real exchange rate. However, if devaluations act to induce an anticipation of future inflation, and therefore increase preference to present consumption over saving and consumption in the future, this this may lead to a new and different trajectory of equilibrium real exchange rate.

This paper proposes a dynamic optimizing model of real exchange rate determination in advanced transition economy. The model focuses on real factors that determine the evolution of saving, investment, productivity, and economic growth, that in turn alter the country's external balance and the equilibrium real exchange rate. Three types of changes are the center of analysis: changing system of taxes and subsidies during transition, changing preference toward investment compared to a previous pre-recession of 2008 transition period, and the anticipated change in the government policies. Our goal is to see if we can attribute and explain the reversal of real exchange rate trajectory - from appreciation before the recession of 2008 to depreciation in its aftermath - by the change in real factors (rather than monetary) that call for a change of equilibrium real exchange rate.

The equilibrium real exchange rate is defined as the real exchange rate that maintains a country's external and internal balance (Williamson, 1994). For a transition economy, the equilibrium real exchange rate will emerge when, after a certain period of transition, prices and wages become flexible and markets competitive, although, at the same time, some inherited structural distortions may remain present. In this paper we show how the further relaxation of structural distortions, coupled with external shocks from the recession of 2008, may influence the movement of the equilibrium real exchange rate.

One of these distortions, peculiar to the transition economy, relates to the inherited structure of investment and production subsidies. The investment-bias in Eastern European

economies developed as an inevitable consequence of long-lasting soft budget constraints, coupled with virtually nonexistent price of capital, and it remained implicitly present for as long as production and investment subsidies were still available. During the initial stages of economic liberalization, the investment initiative was hampered in almost all sectors, as producers were suddenly exposed to a harder budget constraint. Over the longer run, we can expect that the pattern of production subsidies will change, and that this change will alter the future production, consumption, and investment. How will this reform process affect overall competitiveness of Eastern European countries? How will the relative prices adjust, and what levels of the equilibrium real exchange rates we can expect to prevail in the course of future restoration of external and internal imbalances?

The achievement of stable, predictable equilibrium real exchange rates, that would guide a country's competitiveness, requires a relatively longer period of structural adjustment. In order to explain the determination of the real exchange rates in transition, we use the framework similar to the Edwards (1991) model of intertemporal optimization, where all prices are flexible, and distortions pertain only to the foreign sector. The distinguishing feature of our work, however, is to incorporate the structural economic distortions, including taxes and subsidies on investment, that are of particular relevance in explaining the behavior of equilibrium real exchange rates in post-socialist transition economies. We show that the production-based discount factor may depend both upon (the market determined) real interest rates and upon the (current and anticipated) subsidy rates determined by the government. The change in the time-profile of relevant subsidies alters the production-based discount factor, thereby affecting the allocation of production resources within and across different periods. This, in turn, alters the behavior of the equilibrium real exchange rates.

The assumption used in most inter-temporal optimizing models is that the time preference concerning present and future consumption and production can be captured by the constant, exogenously determined discount factor (Frederic, Loewenstein, O'Donoghue, 2002). The sociological and psychological determinants of these choices are captured by time discounting, as defined by any reason for carrying less about future consequences, including reasons for diminished

future utility due to a changing tastes or uncertainty. The time discounting may remain stable over longer periods, reflecting the same underlying economic evaluations that would determine marginal propensity to save. A declining discount rate, however, may be the result of structural shifts in these evaluations, arising from the external shocks associated with the recession of 2008. This, in turn, will also alter the behavior the equilibrium real exchange rate.

In the second section, we develop an inter-temporal optimizing model of real exchange rate determination in a transition economy. The third and fourth sections employ the model to analyze the effect of various disturbances on the equilibrium real exchange rates in the present and future periods. First, the reduction of current production subsidies is introduced to signify the transition from soft budget constraint to hard budget constraint in transition economies. Second, the reduction in anticipated production subsidies is introduced to signify the impact of global financial crisis and recession of 2008 on the availability of credit, and the prospect of further fiscal tightening and possible austerity associated with the future inclusion in the Eurozone. The reduction in anticipated production subsidies acts as to reduce the discount factor, and to discourage saving and investment.

In the fourth section, the inclusion of investment into our analytical framework will indicate several ways in which the government subsidization policy can help in restoring the balance between the current and future consumption and investment. This process of structural adjustment will alter the levels of the country's equilibrium real exchange rates and the degree of its competitiveness in the present and in the future.

THE MODEL OF REAL EXCHANGE RATE DETERMINATION IN A SMALL OPEN ECONOMY WITH STRUCTURAL DISTORTIONS

The model features a small open economy that produces three goods - nontradables, importables, and exportables, and consumes domestically only two goods - nontradables and importables across two periods, the present (period 1) and the future (period 2). The government consumes and subsidizes the products of nontradables and importables sectors, financing its consumption by revenues from the export taxes and import tariffs.

There are three types of distortions in this economy: production subsidies, export taxes, and import tariffs.

Because all economic participants face an intertemporal budget constraint, the present value of aggregate income must equal the present value of aggregate expenditure. During the particular period, however, the expenditure can exceed income as firms, consumers, and government borrow from abroad. For the sake of simplicity, we assume no restrictions on foreign borrowing or lending. It is assumed that the foreign debt has been fully repaid and it is zero at the beginning of period 1.

The long run equilibrium is reached when the discounted present value of trade imbalances equals zero. The nontradables market clears period by period. The equilibrium real exchange rate is the relative price of domestically produced goods (compared to the price of foreign produced goods) that, for prevailing values of government's consumption, subsidies, tariffs, taxes, interest rates, and the foreign prices, reconciles the current account imbalance in each period with the desired capital flows.

Exogenous disturbances, including the reduction of subsidies, tariffs, export taxes, or changes in the government consumption, will affect the equilibrium real exchange rate in each period through the two interrelated channels. First, they affect consumption and resource allocation across goods **within each period** through the change in the relative price of nontradables. Second, they affect the consumption and resource allocation decisions **across periods** through the change in the domestic discount factors, that is, through the change in the present values of aggregate income and expenditure. The consumption-based discount factor reflects the subjective marginal rates of substitution in consumption, while the production-based discount factor reflects the (subsidy inclusive) marginal rates of technical transformation in production over the two subsequent periods. But, they also comprise the market-determined interest rates, which are relevant for saving, investment, and for the accumulation (or reduction) of a foreign debt. The **intertemporal** movement of the equilibrium real exchange rate arises from the possibility of foreign borrowing and lending. During periods when economic actors borrow, because desired consumption exceeds income, the equilibrium real exchange rate will tend to appreciate in

response to increasing demand for all goods, including nontradables. Accordingly, during periods of lending the equilibrium real exchange rate will tend to depreciate. These **intertemporal** effects are combined with the **intra-temporal** effects in determining the overall response of the equilibrium real exchange rates to exogenous disturbances.

Equations (1)-(16) summarize the model. The single apostrophe (') over a variable indicates the second period variable. The world price of exportables is set as a numeraire, (i.e. $p_x^* = p_x'^* = 1$), and therefore, all variables in the model are expressed in terms of exportables goods. The real exchange rates for periods 1 and 2 are defined as:

$$E^R = (P_n/P_x)^a (P_n^*/P_m^*)^{-a} (P_x^*/P_m^*)^{(1-b-b^*)} (A)^b (B)^{(1-b)}; \quad (1.1)$$

$$E^{R'} = (P_n'/P_x')^a (P_n^*/P_m^*)^{-a} (P_x^*/P_m^*)^{(1-b-b^*)} (A')^b (B')^{(1-b)}. \quad (1.2)$$

The prices of nontradables, (P_n and P_n') are the only prices in this economy that are endogenously determined. The prices of importables (P_m) and exportables (P_x) are determined exogenously by the world prices, together with the exogenously set import tariffs ($A=1+f$) and export tax ($B=1-x$) rates. The increase in the relative price of nontradables will appreciate the real exchange rate, while the decrease in the relative price of nontradables will depreciate the real exchange rate.

The consumer problem can be stated as one of minimizing the present value of expenditure (E) required to attain a desired level of utility (U) from the consumption of nontradables (C_n) and importables (C_m) in two periods. That is, the consumer's intertemporal optimization behavior can be described as:

$$E = \min (p_n C_n + p_m C_m) + (1+i)^{-1} (p_n' C_n' + p_m' C_m'), \quad (2.0)$$

subject to,

$$U[z(C_n, C_m), z'(C_n', C_m')] < U.$$

where (i) is the domestic interest rate in terms of the exportables goods. Because there are no restrictions on capital flows, the domestic interest rate equals the exogenously determined world interest rate. The domestic discount factor is defined as:

$$r = (1+i)^{-1}, \quad (3)$$

The real consumption-based discount factor, which is relevant for the intertemporal consumption decisions, can be obtained by normalizing the nominal discount factor, (r), in terms of the price of consumption in period 1.

That is, the real consumption discount factor r^c can be defined as:

$$r^c = rP'(p_n', p_m')/P(p_n, p_m). \quad (3.1)$$

The consumer demands for nontradables are defined as the price partial derivatives of the overall expenditure function. That is,

$$C_n[P(p_n, p_m), rP'(p_n', p_m'); U] = E_p P_{pn} \quad (4)$$

$$C_n'[P(p_n, p_m), rP'(p_n', p_m'); U] = E_p P'_{pn} \quad (4.1)$$

The demands for importables are obtained as:

$$C_m = P(p_n, p_m)z - p_n C_n, \quad (5)$$

$$C_m' = P'(p_n', p_m')z' - p_n' C_n'. \quad (5.1)$$

The terms (E_p) and (E_p') contain the information about the real spending (on both goods) in periods 1 and 2, and they capture the sensitivity of the overall, lifetime consumption, (E) , to a change in the costs of consumption in each period.

Firms' production decisions maximize the present value of profits from the production of nontradables, (Q_n) , importables, (Q_m) , and exportables, (Q_x) , over two subsequent periods. In each period, the producers' problem is to choose the technologically feasible production mix of nontradables, importables, and exportables that will, for given product prices, (p_n, p_m, p_x) , production subsidies, (s_n, s_m) , and already efficient (cost-minimizing) input quantities, (V) , maximize the value of output.

Under the assumption that current investment is zero, the (total) revenue function for period 1 can be written as:

$$R(p_n, s_n, p_m, s_m, (1-x); V) = \max [p_n(1+s_n)Q_n + p_m(1+s_m)Q_m + (1-x)Q_x; F(Q, V) < 0]; \quad (6)$$

where (for the simplicity of exposition) we express production subsidies as "ad valorem" subsidy rates.

The partial derivatives of the revenue function with respect to the product prices give the corresponding supply functions (in terms of exportables). That is,

$$R_{pn} = Q_n(p_n; s_n, p_m, s_m, (1-x), V); \quad (7)$$

$$R_{pm} = Q_m(p_m; s_m, p_n, s_n, x, V); \quad (8)$$

Under the alternative assumption, if the investment is non-zero, the revenues in period 2 will be augmented by the profits from the investment in period 1. That is, consider a country which inherits the initial sequence of output endowments, (Q^i, Q^i') , that can either be consumed or invested through the intertemporal production process. The sectors producing nontradables and importables are (implicitly) encouraged to invest

because they receive subsidies. In the nontradables sector, the output produced in period 2, (Q_n') will be linked to the output produced in period 1, (Q_n) , through the following transformation function,

$$Q_n' = (1+s_n')[Q_n^i + F(I_n)]; \quad (9)$$

where (Q_n^i, Q_n^i') is the initial sequence of nontradables endowments, while, $(Q_n^i - Q_n)$, denotes the level of nontradables output which was not consumed but invested in period 1.

The discount factor, which is relevant for the production and investment decisions in the nontradables sector, therefore, comprises both the market interest rates and the subsidy rates over two periods. We call this discount factor a production-based discount factor. It can be written as,

$$r_n^p = (1+i)^{-1}(1+s_n)/(1+s_n), \quad (3.2)$$

where the subscript, (n) , indicates that it is a discount factor relevant for nontradables producers.

Similarly, if the producers of importables receive subsidies, the "production-based" discount factor relevant for the production and investment decisions in the importables sector can be written as,

$$r_m^p = (1+i)^{-1}(1+s_m)/(1+s_m). \quad (3.3)$$

Anticipated subsidy reduction and fiscal tightening implicit in the Eurozone will act to reduce the production based discount factor.

The government imposes the (ad valorem) tariff on the private sector's imports of importables goods. With the presence of a tariff, the domestic price of importables, (p_m) , exceeds the world price, (p_m^*) , in each period. That is,

$$p_m = p_m^*(1+f); \quad (10)$$

$$p_m' = p_m^*(1+f'); \quad (10.1)$$

where (f) and (f') denote the tariff rates in periods 1 and 2.

The domestic price of exportables, (p_x) , is lower than the world price, $(p_x^* = 1)$, by the level of imposed export tax rate. That is,

$$p_x = (1-x); \quad (11)$$

$$p_x' = (1-x'); \quad (11.1)$$

where (x) and (x') denote the tax rates in periods 1 and 2.

Firms and consumers can borrow or lend internationally, but the amount of borrowing (lending) in period 1 must be repaid (received back) in period 2. Because the government can also borrow or lend internationally, the

government expenditure on nontradables, (G_n), importables, (G_m), and on subsidies, (s_n, s_m), need not equal total revenue from taxation period by period.

The government budget constraint is:

$$p_n G_n + p_m G_m + p_n s_n (Q_n^i - I_n) + p_m s_m (Q_m^i - I_m) - f p_m (C_m - Q_m) - x Q_x = (1 + i)^{-1} \{ p_n G_n' + p_m G_m' + p_n s_n [Q_n^i + F(I_n)] + p_m s_m [Q_m^i + F(I_m)] - f p_m (C_m' - Q_m') - x Q_x' \} \quad (12)$$

where $(C_m - Q_m)$ and $(C_m' - Q_m')$ denote imports of the private sector in periods 1 and 2.

The government budget constraint states that the present value of total government expenditures must equal the present value of total government revenues. That is, if the government presently borrows from abroad to finance its budget deficit, in the following period the government will be forced to either reduce its expenditures or increase revenues in order to repay its portion of the foreign debt. Thus, although the government budget constraint is relatively "soft" in the present it becomes "hard" in the future.

For the private sector, the intertemporal budget constraint implies that the present value of private sector's total expenditures must equal the present value of private sector's total income, including the income from investment. That is,

$$p_n C_n + p_m C_m + (1 + i)^{-1} \{ p_n C_n' + p_m C_m' \} = p_n (1 + s_n) Q_n^i + p_m (1 + s_m) Q_m^i + (1 - x) Q_x - (1 + s_n) I_n - (1 + s_m) I_m + (1 + i)^{-1} \{ p_n (1 + s_n) Q_n^i + p_m (1 + s_m) Q_m^i + (1 - x) Q_x + (1 + i)^{-1} \{ (1 + s_n) [F(I_n)] + (1 + s_m) [F(I_m)] \} \} \quad (13)$$

Thus, the private sector's total income in period 1 will be lower by the amount of total investment, while in period 2 the total income will be augmented by the investment income.

For a period 1, the current account imbalance, (CA), equals the same period trade imbalance, (TB) which is given (in terms of exportables) by,

$$CA = -TB = -[p_m (C_m + G_m - Q_m) - Q_x] \quad (14)$$

The current account imbalance in period 2 equals the trade imbalance in period 2 plus the interest payments on period's 1 total foreign borrowing (B). The total period's 1 foreign borrowing is proportional to the trade imbalance in period 1. That is,

$$CA' = -[TB' - i(B)] = -[p_m (C_m' + G_m' - Q_m') - Q_x'] + i[p_m (C_m + G_m - Q_m) - Q_x] \quad (14.1)$$

The intertemporal budget constraint implies that the current account deficit from period 1 must be reversed into a current account surplus in

period 2. That is, the discounted value of trade imbalances must equal zero,

$$CA + (1 + i)^{-1} CA' = 0 \quad (14.2)$$

The equilibrium real exchange rate will be the rate that reconciles current account imbalances with a desired capital flows (given all the others exogenous variables). In addition, the movement of real exchange rates ensures equilibrium in the market for nontradables in each period. The (nontradables) market clearing equations are (for periods 1 and 2) given by,

$$C_n + G_n - Q_n = 0, \quad (15)$$

$$C_n' + G_n' - Q_n' = 0. \quad (15.1)$$

The implicit functional form that describes the vector of the equilibrium real exchange rates (i.e the equilibrium real exchange rate for periods 1 and 2) can be written as:

$$\{E^R, E^{R'}\} = F\{f, f'; x, x'; i; G_n, G_n'; G_m, G_m'; s_n, s_n'; s_m, s_m'; p_m, p_m'; p_x, p_x' \dots\} \quad (16)$$

The purpose of this model is to show the main channels through which changing exogenous variables, that is, the fundamental determinants of the real exchange rates (given on the right-hand side of the equation (16)), may affect the movement of equilibrium real exchange rate in the present and future periods.

THE REDUCTION OF SUBSIDIES

In order to examine the effect of changes in the government subsidies on the equilibrium real exchange rates, we use a simplified version of our general model. We first analyze the effect of subsidy reductions in an economy with no investment. Then, we extend the analysis to the case where investment is present.

The main simplification of our general model is in that we assume no government consumption of nontradables or importables, and no government subsidies on importables. In accordance to a common practice in trade modeling, it will be assumed that all tariff revenues are ultimately redistributed to consumers in the form of positive income transfers, while all subsidies are ultimately taken away in the form of negative income transfers (Dixit 1980). The rationale for this simplification is to eliminate the government demand function as well as the additional disturbances that arise through the government budget balancing.

The simplified version of the model's equilibrium conditions can be summarized by the following equations:

$$C_n - Q_n = 0, \tag{17}$$

$$C_n' - Q_n' = 0. \tag{18}$$

$$p_n C_n + p_m C_m + r\{p_n' C_n' + p_m' C_m'\} - R[p_n s_n, p_m s_m, (1-x); V] - I_n + rR'[p_n' s_n', p_m' s_m', (1-x'); V'] + r[F(I_n)] - p_m f(C_m - Q_m) - p_m' f(C_m' - Q_m') - p_n s_n (Q_n - I_n) - r p_n' s_n' [Q_n' + F(I_n')] = 0; \tag{19}$$

where the equation (19) gives the "consolidated" budget constraint for this economy.

If, initially, we assume that investment is zero, the equation (19) can be rewritten as,

$$p_n C_n + p_m C_m + r\{p_n' C_n' + p_m' C_m'\} = R[p_n s_n, p_m s_m, (1-x); V] + rR'[p_n' s_n', p_m' s_m', (1-x'); V'] - p_m f(C_m - Q_m) - p_m' f(C_m' - Q_m') - p_n s_n Q_n - r p_n' s_n' Q_n'. \tag{19.1}$$

In this version, the system can be solved for (p_n) , (p_n') , and (W) . We first consider the effect of reduction in the current subsidies on nontradables, (s_n) , on the equilibrium real exchange rates in periods 1 (present) and 2 (future). Then, we look at the effects of anticipated subsidy reductions, (s_n') . Finally, we compare these results with the effects of subsidy reductions under the alternative system specification, where the investment is included.

The Reduction of Current Production Subsidies - Transition from Soft Budget Constraint to Hard Budget Constraint

The effect of reduction in the current subsidies on nontradables on the equilibrium real exchange rate in period 1 is obtained as,

$$\frac{dp_n}{ds_n} = -1/[J]\{[dQ_n/ds_n(dC_n'/dp_n' - dQ_n'/dp_n')] + [p_n Q_n(dC_n'/dp_n' - dQ_n'/dp_n')(dC_n/dW) - dC_n/dp_n'(dC_n'/dW)]\}. \tag{20}$$

The Jacobean determinant of the system (which, for the sake of simplicity, will be evaluated at zero initial tariffs and zero initial subsidies) is obtained as,

$$[J] = -\{dQ_n/dp_n - dC_n/dp_n\}(dQ_n'/dp_n' - dC_n'/dp_n') + dC_n/dp_n'(dC_n'/dp_n');$$

and it is negative if the stability conditions of the system are satisfied and the intratemporal effects dominate the intertemporal effects.

The term, (dQ_n/ds_n) , in the first parenthesis of this expression denotes the intratemporal effect of substitution in production. The reduced subsidization of nontradables producers will decrease the production of nontradables and induce reallocation of resources toward the production of importables and exportables. In response to a reduction in the relative supply of

nontradables the price of nontradables must increase in the present, thereby requiring an equilibrium real exchange rate appreciation. The terms in the second parenthesis summarize the intratemporal and intertemporal income effects, which tend to dampen the intratemporal production effect. That is, the subsidy reduction will decrease the consumer overall wealth, which, in turn, decreases the overall consumption, including the consumption of nontradables. Thus, the reduction of nontradables subsidies will require an equilibrium real exchange rate appreciation in the present period, if the intratemporal production effect dominates the income effects,

$$dp_n/ds_n < 0 \tag{20.1}$$

Note that the income effects and the production substitution effect work in the same direction, which is the implication of our simplifying assumption about the "consolidated" budget constraints of the private sector and the government.

In the future (period 2), the equilibrium real exchange rate tends to depreciate by the virtue of intratemporal and intertemporal income effects. These income effects, however, are dampened by the effect of intertemporal substitution in consumption, as consumers react to the higher price of nontradables in the present by reallocating their expenditures away from the present and towards future. This intertemporal consumption substitution effect may not be of equal magnitude in cases where the subsidy reduction is assumed permanent as in cases where it is assumed transitory.

The change in the price of nontradables in the future in response to a present subsidy reduction is given by,

$$\frac{dp_n'}{ds_n} = -1/[J]\{[p_n Q_n(dC_n'/dp_n' - dQ_n'/dp_n')(dC_n'/dW) - dC_n/dp_n'(dC_n/dW)] - [dQ_n/ds_n(dC_n'/dp_n')]\}; \tag{20.2}$$

where the term, (dC_n'/dp_n') , in the second parenthesis denotes the effect of intertemporal substitution in consumption.

The Reduction of Anticipated Production Subsidies - Transition to Eurozone in the Aftermath of Recession of 2008

If consumers come to anticipate the subsidy reduction in the future, that is, the reduction in (s_n') , the income and the intertemporal substitution effects work in the opposite direction in the present. The expected decrease in the level

of overall wealth induces a decline in the demand for all goods, including nontradables, thereby requiring an equilibrium real exchange rate depreciation the present. The intertemporal substitution effect is in that consumers regard current consumption (while subsidies are not yet reduced) relatively less expensive comparing to the consumption in the future when (as expected) the reduction in subsidies will induce a decline in the nontradables supply and a subsequent increase in the price of nontradables. Thus, consumers tend to consume more nontradables in the present, while their price is still relatively lower, which, in turn, induces an upward pressure on the current price of nontradables, thereby requiring an equilibrium real exchange rate appreciation. Whether the equilibrium real exchange rate appreciates or depreciates in the present in response to the anticipated subsidy reductions in the future will depend on whether the overall income effects or the intertemporal substitution effects dominate. That is,

$$\frac{dp_n}{ds_n} = -1/[J]\{[rp_n'Q_n'(dC_n'/dp_n' - dQ_n'/dp_n')(dC_n/dW) - dC_n/dp_n'(dC_n'/dW)] - [dQ_n'/ds_n'(dC_n'/dp_n')]\}; \quad (21.1)$$

where again, the term, (dC_n'/dp_n') , in the second parenthesis summarizes the intertemporal substitution effect.

The intertemporal substitution takes place only in consumption, and not in production, for as long as we assume that producers make no investment decisions. On the other hand, the intratemporal effects of reduced subsidies (i.e, the terms, dQ_n'/ds_n' , and dQ_n'/dp_n') are exclusively the supply-side effects, describing the reallocation of production resources in response to a current change in the levels of sector-specific subsidies. Consumers, on the other hand, will not reallocate their consumption between nontradables and importables until they perceive a subsidy-induced change in relative prices.

The change in the price of nontradables in the future (period 2) in response to a reduction in the period's 2 subsidies is given by,

$$\frac{dp_n}{ds_n} = -1/[J]\{[dQ_n'/ds_n'(dC_n'/dp_n' - dQ_n'/dp_n)] + [rp_n'Q_n'(dC_n'/dp_n' - dQ_n'/dp_n)(dC_n'/dW)] - dC_n'/dp_n'(dC_n'/dW)\}; \quad (21.2)$$

where the term, (dQ_n'/ds_n') , in first parenthesis gives the intratemporal production effect which takes place in period 2.

That is, in the future, the reduced subsidies will decrease the production of nontradables, thereby

requiring a higher nontradables price and a consequent appreciation of the real exchange rates. This effect, again, will be dampened by the income effects of reduced subsidies.

To summarize, the reduction of current subsidies (i.e, subsidies in period 1) is likely to require an equilibrium real exchange rate appreciation in the present and in the future. The real exchange rate tends to appreciate in the present because nontradables output declines, thereby inducing an upward pressure on the price of nontradables. This is the intratemporal production substitution effect. In the future, the real exchange rate tends to appreciate because consumers tend to spend more on all goods, including nontradables, as they regard future consumption relatively less expensive comparing to the present consumption. This is the intertemporal consumption substitution effect. The appreciation of the equilibrium real exchange rates in both periods may be dampened by the (negative) intratemporal and intertemporal income effects, which tend to reduce demand for all goods, including nontradables.

Similarly, the anticipation of the nontradables subsidy reductions in the future (i.e, in period 2) is likely to require an equilibrium real exchange rate appreciation in the present, by virtue of intertemporal substitution in consumption; and an equilibrium real exchange rate appreciation in the future, by virtue of intratemporal substitution in production.

It can be shown that, if the subsidy reductions were applied on the importables instead of nontradables, the result will likely be an equilibrium real exchange rate depreciation both in the present in the future. For example, the current reduction in the importables subsidies will induce a reallocation of resources away from importables and towards nontradables. The increased supply of nontradables will put a downward pressure on the nontradables prices, thereby requiring an equilibrium real exchange rate depreciation in the present. As for consumers, the overall consumption in the present appears cheaper comparing to the consumption in the future. Thus, in the future, because demand for all goods is lower, and the part of this reduced demand falls on nontradables, the equilibrium real exchange rate may continue to depreciate.

THE REDUCTION OF INVESTMENT

SUBSIDIES - THE ROLE OF THE REAL EXCHANGE RATES AND SUBSIDIES IN RESTORING THE BALANCE BETWEEN CONSUMPTION AND INVESTMENT

Once the investment is included into a framework of intertemporal optimization, the change in the levels of subsidies begins to affect the production-based discount factor, thereby inducing the intertemporal production effects. While the intertemporal consumption effect concerns the consumer's decision on how much to save today in order to consume more goods in the future, the intertemporal production effect concerns the producer's decision on how much to invest today in order to produce more goods in the future. Given the country's production capabilities, the intertemporal investment decisions will depend both upon the market determined interest rates and upon the production subsidy rates determined by the government.

While the abandonment of price controls during transition induces producers to start behaving as cost minimizers, the retention of the government subsidies continues to preclude them from calculating properly their current and future investment benefits and costs. For as long as the financial systems across Eastern Europe are still repressed through the inherited non-performing government loans, the governments often have no other choice than to continue to subsidize unfinished investment ventures, once initiated by their own. Ultimately, however, the Eastern European governments must decide on how to promote the balance between current and future consumption needs and to improve the overall investment climate.

The inclusion of investment into our analytical framework will indicate several ways in which the government subsidization policy can help in restoring the balance between the current and future consumption and investment. This process of structural adjustment will alter the levels of the country's equilibrium real exchange rates and the degree of its competitiveness in the present and in the future.

With the presence of investment, the response of the country's equilibrium real exchange rates to the change in subsidies will crucially depend on how exactly these subsidies are perceived by producers. If the current subsidy (s_n) is perceived as a subsidy on the net-of-investment income, then the reduction in current subsidies actually

helps to encourage investment and discourage current production. As a result of increased investment and reduced current production, the equilibrium real exchange rate can be expected to appreciate in the present (period 1), when subsidy is reduced. In the future (period 2), on the other hand, the production will increase as a result of higher investment in the present, thereby inducing an equilibrium real exchange rate depreciation.

Under this scenario, the improvement in the country's budgetary position is consistent with the improvement in its foreign competitiveness, which makes the adoption of euro easier and more desirable.

These results are obtained by differentiating totally equations (17)-(19) with respect to (s_n),

$$\begin{aligned} dp_n/ds_n = -1/[J] \{ & [(dQ_n/ds_n)] [(dC_n'/dp_n - \\ & dQ_n'/dp_n) - r(Q_n^i + F(I_n))dC_n'/dW] + \\ & [dC_n'/dp_n] [(dQ_n'/ds_n) - (I_n - Q_n^i)dC_n'/dW] + \\ & [dC_n'/dW] [(dQ_n'/ds_n)r(Q_n^i + F(I_n)) - (I_n - \\ & Q_n^i)(dC_n'/dp_n - dQ_n'/dp_n)] \}; \end{aligned} \quad (22)$$

where the terms in the first parenthesis as signifying the intratemporal production effect; the terms in second parenthesis give the intertemporal substitution effect; while the remaining expression summarizes the overall income effects.

If the substitution effects dominate, the overall expression will have a positive sign, indicating that the equilibrium real exchange rate must increase (appreciate) in the present, to accommodate increased investment and reduced production.

The effect of present period's subsidy reductions on the price of nontradables in the future is given by,

$$\begin{aligned} dp_n/ds_n = -1/[J] \{ & [(dQ_n'/ds_n)(dC_n'/dp_n - dQ_n'/dp_n) - \\ & Q_n^i(dC_n'/dW)] - [dQ_n'/ds_n(dC_n'/dp_n - \\ & Q_n^i(dC_n'/dW))] + (Q_n^i - I_n)[(dC_n'/dp_n - \\ & dQ_n'/dp_n)dC_n'/dW - (dC_n'/dW)(dC_n'/dp_n)] \}; \end{aligned} \quad (22.1)$$

where the terms in the first parenthesis summarize the effect of intertemporal substitution in production. The term that appears in (22) and (22.1), but did not appear in the "non-investment" cases, (dQ_n'/ds_n), is the effect of current subsidy reductions on the production of nontradables in the future. That is,

$$dQ_n'/ds_n = [dQ_n'/dF(I_n)][dF(I_n)/dI_n][dI_n/ds_n]. \quad (22.2)$$

By affecting the desired level of investment in

the present, the current subsidy reduction will also affect the future investment income, and thereby the overall revenues in the future. The sign of the term, dQ_n'/ds_n , is negative, because the reduction of present period's net-of-investment income will act as to encourage investment and thereby increase overall revenues in the future.

The effect of subsidy reductions is different if subsidies are perceived by the producers of nontradables as the direct subsidies on investment, instead as subsidies on (entire) net-of-investment income. In this case, the current reduction of an investment subsidy acts as to discourage investment, which, in turn, increases the current production and places a downward pressure on the price of nontradables. As a result, the equilibrium real exchange rate tends to depreciate in the present period. In the future period, on the other hand, the equilibrium real exchange rate tends to appreciate in response to the reduced levels of output and income from investment.

If the real exchange continues to appreciate, the initiated improvement in budgetary position will be unsustainable because of its adverse impact on country's competitiveness, and thus the adoption of euro will be less likely and desirable. The resulting movement of the real exchange rate can be interpreted as an indicator about the changing economic structure of transition economies.

CONCLUSION

The global financial crisis and the recession of 2008 have increased uncertainty concerning the future inflow of capital and availability of domestic government subsidies in transition countries of Eastern Europe. As a result, both consumers and producers in transition economies have adjusted their time preferences across the present and future periods, and subsequently reduced saving and investment. The advanced transition economies – countries that have reformed their market institution to a sufficient degree to join the European Union, but have not yet adopted euro, have been confronted with the greater difficulty in aligning the real exchange rates, as indicators of their domestic competitiveness, with the goals of maintain their own internal and external balances and those in the entire Eurozone.

The results of our inter-temporal model suggest that, if the Eastern European economies attempt

to restore the balance between the consumption and investment in the nontradables sector, their real exchange rate may have to depreciate over time in order to encourage a production for the future consumption. This would represent an equilibrium real exchange rate depreciation, rather than temporary misalignment. The equilibrium real exchange rate depreciation in the future may obtain either as a result of increase in the direct subsidies on investment or as a result of decreased subsidies on the "net-of-investment" income. Only in this light, the continuation of subsidies on the "net-of-investment" producers' income might be justified as a measure that helps to speed-up the process of required structural adjustment.

The reversal of real exchange rate trajectory – from appreciation before the recession of 2008 to depreciation in its aftermath – can be attributed to the change in real factors (rather than monetary) that determine evolution of saving and investment and call for a change of equilibrium real exchange rate. The resulting movement of the equilibrium real exchange rates can be interpreted as an indicator of the changing economic structure in the transition economies, not temporary misalignment. The empirical model on the movement of real exchange rates and selective budgetary outlays, saving, and investment is still part of an undergoing research.

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