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## Labor Productivity and Real Exchange Rate: The Balassa-Samuelson Disconnect in the former Yugoslav Republic of Macedonia

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## IMF Working Paper

Policy Development and Review Department and European Department

### **Labor Productivity and Real Exchange Rate: The Balassa-Samuelson Disconnect in the former Yugoslav Republic of Macedonia**

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Authorized for distribution by Dimitri Demekas and Martin Gilman

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#### **Abstract**

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This paper seeks to investigate the transmission mechanisms linking productivity to the real exchange rate in the former Yugoslav Republic of Macedonia. At first glance, the stylized facts—low labor productivity growth and a trend real depreciation—suggest that a Balassa-Samuelson effect is in play. We find that the relationship between the two is not a result of the traditional Balassa-Samuelson effect. Instead, the depreciation of the real exchange rate reflects mainly the behavior of prices in the tradable sector. We argue that the depreciating real exchange rate may reflect a prolonged transition associated with slow technological growth and the low quality of the country's tradable-goods basket.

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## I. INTRODUCTION

Two striking features of the Macedonian economy are the low labor productivity growth and the trend depreciation of the real exchange rate. The link between productivity and the real exchange rate has attracted much interest from economists focusing on transition economies. This link has usually been attributed to the Balassa-Samuelson (B-S) effect which predicts that higher growth in productivity in transition countries will translate into higher inflation and appreciation of the real exchange rate. Given that the former Yugoslav Republic of Macedonia (hereinafter referred to as FYR Macedonia) has experienced relatively declining productivity growth vis-à-vis its partners and a depreciating real effective exchange rate, we examine if the B-S effect is at play in FYR Macedonia. To do so, we investigate the mechanism through which productivity affects the real exchange rate in FYR Macedonia.

We find that although the declining real effective exchange rate (REER)<sup>2</sup> in FYR Macedonia is associated with decreasing relative productivity trends, this is not attributable to the B-S effect. The low productivity growth is not putting downward pressure on prices through the labor market channel that is typically associated with the B-S effect. Instead, the main driving factor is the depreciation of the relative price of domestic to foreign tradable goods, which has a large impact on the REER owing to the large share of tradable goods in the economy.

One possible explanation of this depreciating REER-tradables trend is increasing differentiation of tradable output. Low profitability, low investment, and lack of technological enhancements have prevented Macedonian firms from producing high-value-added and high-quality goods, which also explain FYR Macedonia's inability to improve export performance and access new markets.

This paper is organized as follows. Section II examines the relationship between REER and labor productivity in FYR Macedonia. Section III describes the transmission mechanisms from productivity to the real exchange rate, including the B-S and alternative channels. Section IV explores possible explanations for the observed links between productivity and the real exchange rate in FYR Macedonia and discusses the main findings of the paper. Section V provides concluding remarks.

## II. STYLIZED FACTS

In contrast with most transition economies, both price- and cost-based REER indicators in FYR Macedonia show a depreciating trend between 1995 and 2003 (Figures 1 and 2). Current

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<sup>2</sup> Defined as the relative price of domestic to foreign output. An increase thus implies an appreciation.

real exchange rate levels stand close to the 1997 levels seen when FYR Macedonia devalued the denar almost 16 percent. The REER depreciation was driven mostly by a decline in relative prices compared with transition countries (Figure 3).

Despite the depreciation, trade indicators remain grim. Export performance has weakened as is evident from the declining market shares of Macedonian exports to the European Union and the United States (Figure 4). This decline is in contrast to the increasing market penetration by regional neighbors. Furthermore, the export sector has been unable to diversify into new product lines.

FYR Macedonia has also experienced lagging labor productivity growth over the past decade. The long-run productivity trend as measured by per capita GDP and GDP per employee (Figures 5 and 6) show that FYR Macedonia has been unable to converge to the more advanced economies. In 1995, per capita GDP stood at 10 percent of EU levels, which were considerably higher than those in its neighboring countries (Albania, Bosnia, Bulgaria, and Romania). In 2003, FYR Macedonia remains at this level while all of these neighboring countries have converged to it. The labor productivity growth rate has been too low to sustain the living standards in the country.

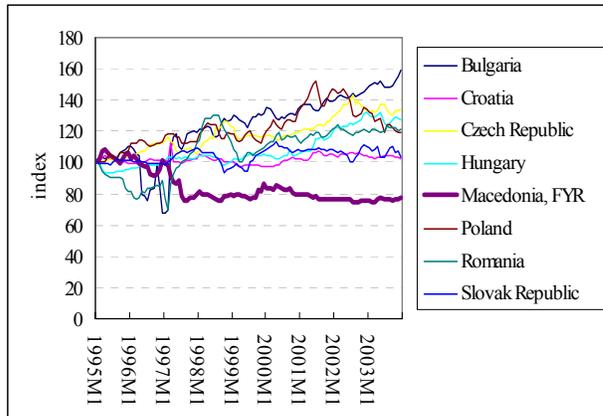
### **III. IS THERE A BALASSA-SAMUELSON EFFECT AT PLAY IN FYR MACEDONIA?**

The standard methodology in the literature to test for the Balassa-Samuelson effect is to establish the empirical relationship between the real effective exchange rate and the sectoral labor productivity differential. Since time-series data on sectoral labor productivity are unavailable for a sufficiently long period to run this estimation, we adopt a two-stage process to analyze the B-S effect. We first examine the empirical link between the REER and the aggregate labor productivity differential and find a positive relationship between the two variables. Having established this long-term relationship, we subsequently analyze the sectoral prices and productivity growth to see if the positive impact of productivity differential on the REER in FYR Macedonia occurs through the traditional B-S transmission channels. Contrary to the B-S prediction, we find that movements in the REER are arising from tradable sector. We confirm this by reestimating the relationship between the aggregate labor productivity differential and the REER based on tradable prices.

#### **A. Long-Run Equilibrium Real Effective Exchange Rate**

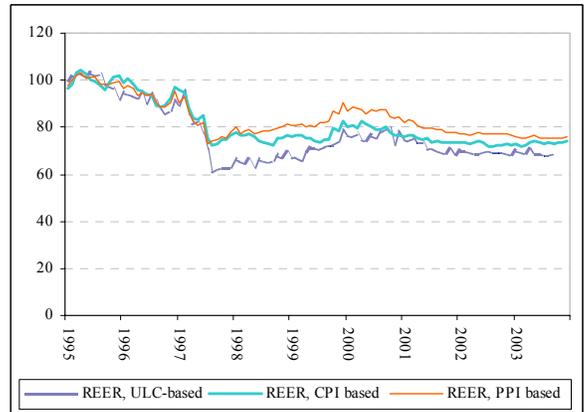
We examine the empirical link between the labor productivity differential and the real effective exchange rate (CPI-based) in FYR Macedonia. We use Johansen's cointegration technique to estimate the long-run relationship between these two variables. In line with most of the recent empirical studies on transition countries, we use the Behavioral Equilibrium Exchange Rate (BEER) framework, according to which the long-run equilibrium exchange rate is a function of

Figure 1. Consumer Price Index (CPI)-Based Real Effective Exchange Rate (REER) (1995=100)



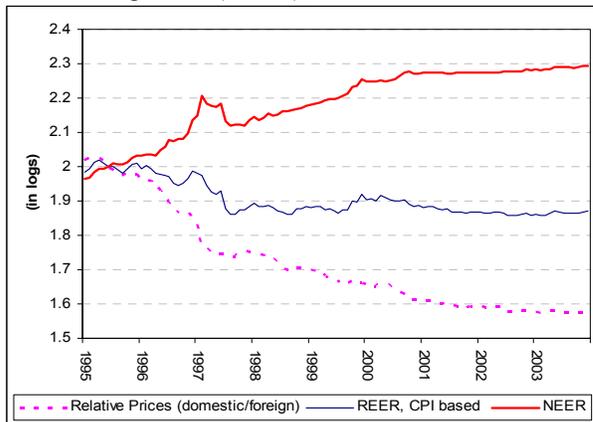
Source: IMF, World Economic Outlook database.

Figure 2. REER (1995=100)



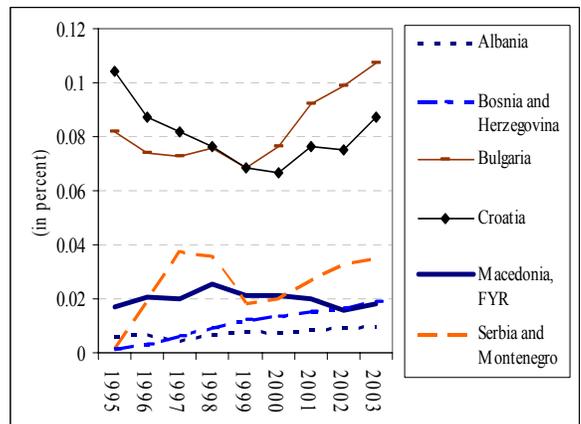
Source: IMF, World Economic Outlook database.

Figure 3. CPI-Based REER, Nominal Effective Exchange Rate (NEER), and Relative Prices



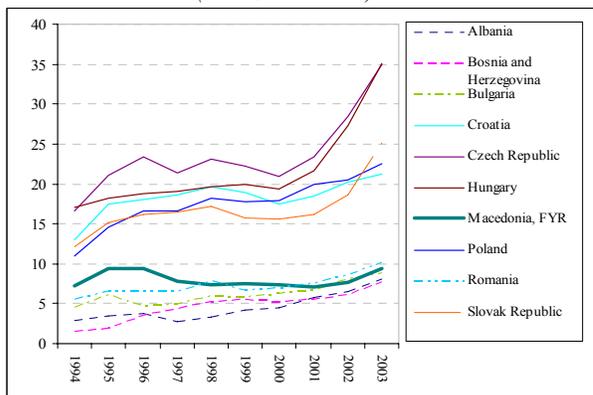
Source: IMF, World Economic Outlook database.

Figure 4. Export Shares in European Union and United States



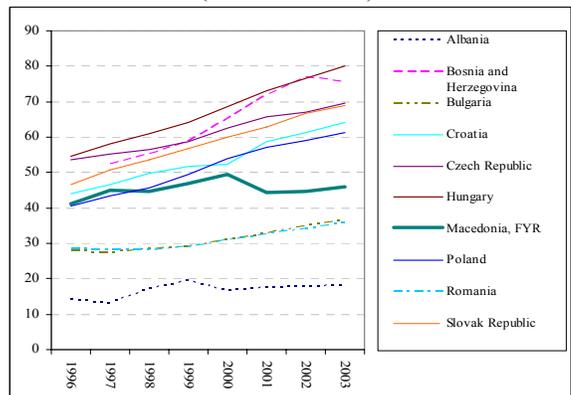
Source: IMF, Direction of Trade Database.

Figure 5. Nominal Per Capita GDP (1995, EU=100)



Source: IMF, World Economic Outlook database.

Figure 6. GDP Per Employee (1995, EU=100)



Source: IMF, World Economic Outlook database.

the aggregate labor productivity differential between the home country and abroad (DPROD) and the net foreign assets (NFA).<sup>3</sup>

$$REER_t^{CPI} = \beta_0 + \beta_1 DPROD_t + \beta_2 NFA_t$$

A positive relationship between real exchange rate and productivity differential is usually considered to reflect the B-S effect. Similarly, an increase in net foreign asset, in the context of the stock-flow models (Obstfeld and Rogoff, 1995), is also associated with a real exchange rate appreciation.

We use quarterly data covering the period 1995:1-2003:4. Needless to say, the results should be interpreted with caution given the limited data availability and frequent structural breaks due to political crises and policy regime changes.<sup>4</sup> Tests for stationarity show that all series are integrated of order one. Cointegration tests indicate the existence of one cointegrating equation (See Appendix 1). Normalizing for the REER, we find the following the long run equation:

$$reer_t^{CPI} = 5.94 + 1.35dprod + 0.18nfa$$

(0.15)      (0.05)

where the small letters denote log values of the variables.

We find that the parameter associated with the productivity differential is positive as found in many studies (Table 1). It suggests that a decline in domestic productivity growth relative to its trading partners leads to a depreciation of the real exchange rate. The positive relationship between the REER and the productivity differential does not necessarily imply that a B-S effect is at play in FYR Macedonia. This would be the case only if the impact of slower productivity growth on the REER occurs as follows: relative to the more technologically advanced foreign economy, slower productivity growth in the tradable sector of the home country dampens labor

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<sup>3</sup> See Alberola (2003) for a detailed presentation of the theoretical model that links the equilibrium exchange rate to the net foreign asset position (external equilibrium) and to the sectoral (tradable versus non tradable) evolution of productivity (internal equilibrium).

<sup>4</sup>In particular, the security crisis that erupted in the spring of 2001 halted growth, investment and slowed structural reforms. As a result, labor productivity and exports declined sharply. Furthermore, data quality issues remain. Inadequate coverage of firms in a transition economy may provide a downward bias to the economic data if the sample is not updated and is limited to older, less competitive firms.

demand and leads to lower wage growth pressure in this sector. Under the standard assumption<sup>5</sup> of perfect labor mobility, wages in the non-tradable sector would also equalize with the tradable sector wages. The low wage growth means that there is no cost driven pressure to increase prices in the non-tradable sector. The lower increase in the price of non-tradable in the home country would thus lead to a depreciation of its real exchange rate. The following section explores whether the productivity growth affects the REER in FYR Macedonia through the B-S channels.

Table 1. Cross-Country Comparison of Cointegration Results Using Consumer Price Index (CPI)-Based Real Effective Exchange Rate (REER)

	<i>Differential Productivity</i>	<i>Net Foreign Assets</i>	<i>Adjustment Coefficient</i>
<b>FYR Macedonia</b>	<b>1.35</b>	<b>0.18</b>	<b>-0.20</b>
Estonia	1.0	-0.18	-0.12
Latvia	0.99	-0.15	-0.05
Lithuania	1.02	-0.18	-0.16
Hungary	1.1	0.17	-0.05
Poland	1.84	0.05	-1.33
Czech Republic	1.03	0.04	-0.77

Sources: Burgess, Fabrizio, and Xiao (2003); and Egert (2003).

## B. Sectoral Labor Productivity and Price Trends

In this section, we explore the sectoral trends in prices and labor productivity and their impact on the REER. Specifically, we decompose the REER into two components: the real effective exchange rate based on the tradables sector prices and the sectoral relative prices (internal real exchange rate) differential between the home and foreign economies. We then investigate the role of these two components in transmitting productivity changes to the REER. Under the B-S effect, the REER would be driven by the second component, i.e. the change in the internal real exchange rate relative to foreign economies. The contribution of the tradables sector prices would be negligible. This is explained further in the equations below.

### Analytical framework

Assuming that there are two countries, each producing a tradable good (T) and a non tradable goods (N), the real effective exchange rate can be defined as:

<sup>5</sup> The main assumptions under the B-S channel are that (i) domestic and foreign produced tradable goods are perfect substitutes, and thus purchasing power parity (PPP) holds for tradables; (ii) wages are linked to productivity in the tradable sector, and (iii) wages tend to equalize across the tradable and the non tradable sectors.

$$q = e + p^* - p \quad (1)$$

where  $p$  denotes the logarithm of consumer price index (CPI), and  $e$  is the logarithm of nominal exchange rate, expressed as the domestic currency price of a unit of foreign currency. An asterisk indicates the foreign country. The CPI for each country can be expressed as follows:

$$p = \alpha p_T + (1 - \alpha) p_N \quad (2)$$

$$p^* = \alpha^* p_T^* + (1 - \alpha^*) p_N^* \quad (3)$$

where  $p_T$  and  $p_N$  are the prices of tradable and non-tradable goods, and  $\alpha$  is the share of tradable goods in the consumer price basket. Substituting (2) and (3) in (1), the real effective exchange rate can be expressed in terms of tradable and non tradable goods prices:

$$q = e + \alpha^* p_T^* + (1 - \alpha^*) p_N^* - \alpha p_T - (1 - \alpha) p_N \quad (4)$$

Rearranging equation (4), we obtain,

$$q = (e + p_T^* - p_T) + (1 - \alpha)(p_T - p_N) - (1 - \alpha^*)(p_T^* - p_N^*) \quad (5)$$

Assuming, for simplicity, that  $\alpha = \alpha^*$ :

$$q = (e + p_T^* - p_T) + (1 - \alpha)[(p_T - p_N) - (p_T^* - p_N^*)] \quad (6)$$

In terms of growth rates, equation (6) can be restated as,

$$\hat{q} = (\hat{e} + \hat{p}_T^* - \hat{p}_T) + (1 - \alpha)[(\hat{p}_T - \hat{p}_N) - (\hat{p}_T^* - \hat{p}_N^*)] \quad (6')$$

where the  $\hat{\phantom{x}}$  denotes the growth rate. The first term of the equation (6'),  $(\hat{e} + \hat{p}_T^* - \hat{p}_T)$ , is the relative price of domestic to foreign tradables (REER-tradables). The second term,  $(1 - \alpha)[(\hat{p}_T - \hat{p}_N) - (\hat{p}_T^* - \hat{p}_N^*)]$ , is the difference in sectoral relative prices (tradables to non tradables) in the home and foreign economies. We show below that this term is equivalent to relative productivity differential which captures the B-S effect. For simplicity, we express this as:

$$\hat{q} = \hat{q}_T + \hat{q}_{BS} \quad (7)$$

where,

$$\hat{q}_T = \hat{e} + \hat{p}_T^* - \hat{p}_T \quad (8)$$

$$\hat{q}_{BS} = (1 - \alpha)[(\hat{p}_T - \hat{p}_N) - (\hat{p}_T^* - \hat{p}_N^*)] \quad (9)$$

Based on a two-sector neoclassical framework with perfect capital mobility, and interest rate assumed exogenous, it can be shown that sectoral relative prices reflect the differential sectoral productivity, as follows.<sup>6</sup>

$$\hat{p}_N - \hat{p}_T = \kappa \hat{a}_T - \hat{a}_N \quad (10)$$

where  $\kappa$  is the ratio of the labor share in tradables output to the labor share in non-tradables output, and  $\hat{a}_i$  is the labor productivity in sector  $i$ . Thus, equation (9) can be rewritten as:

$$\hat{q}_{BS} = (1 - \alpha)[(\hat{a}_N - \kappa \hat{a}_T) - (\hat{a}_N^* - \kappa \hat{a}_T^*)] \quad (11)$$

Thus, the B-S effect could be explored using the movement of the internal real exchange rate differential (equation 9) or the differential sectoral productivity (equation 11). Since data on sectoral labor productivity is not available, we use the internal real exchange rate differential. We can conclude that the positive relationship between the productivity differential and REER in FYR Macedonia is explained by the B-S effect if purchasing power parity (PPP) holds for tradables ( $\hat{q}_T \cong 0$ ), and the REER is determined by the internal real exchange rate differential ( $\hat{q} = \hat{q}_{BS}$ , equation 7).

## Results

We find that sectoral price trends in FYR Macedonia is not consistent with a B-S effect. According to the B-S effect, a depreciation of the real exchange rate would result from a depreciation of the internal real exchange rate in the home country at a rate higher than in the partner country. Alternatively, a lower appreciation of the internal real exchange rate in the home country could also lead to real depreciation of the REER. Table (2) compares the growth in the internal real exchange rate between FYR Macedonia and its main partners (Euro countries) using the ratio of the producer price index (PPI) to the CPI as a proxy for the internal real exchange rate ( $P_T/P_N$ ).<sup>7</sup>

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<sup>6</sup> See Egert 2003.

<sup>7</sup> This indicator has been used in several papers (Alonso-Gamo et. al., 2002; Burgess et. al., 2003; Rahn, 2003). The implicit assumption is that PPI represents the price of tradables and CPI includes a large share of non-tradables. Reliable sectoral data prior to 2001 is not available.

Table 2. Sectoral Relative Prices

<i>Data Description</i>	<i>Variables</i>	<i>2001–2003 (period to period)</i>
<b>CPI based REER vs. Euro Area</b>	$\hat{q}$	<b>1.1</b>
<b>Internal Relative Prices (Using PPI/CPI)</b>	$(\hat{p}_T - \hat{p}_N) - (\hat{p}_T^* - \hat{p}_N^*)$	<b>-3.6</b>
	$(\hat{p}_T - \hat{p}_N)$	-5.4
	$(\hat{p}_T^* - \hat{p}_N^*)$	-1.8

Sources: Macedonian authorities; and IMF staff estimates.

We see that the appreciation (decline) of the internal real exchange rate in FYR Macedonia is found to be higher than in Euro area countries [ $(\hat{p}_T - \hat{p}_N) - (\hat{p}_T^* - \hat{p}_N^*) < 0$ ] or ( $\hat{q}_{BS} < 0$ ). This implies, under the assumption that PPP holds for tradables, an appreciation of the REER (Table 3, column 1).

Table 3. Sectoral Relative Price Trends: Expected Versus Observed

<i>Expected Effect Under B-S</i>	<i>FYR Macedonia: Effect Under PPP</i>	<i>FYR Macedonia: Effect Under Alternative Assumption of PPP</i>
$\hat{q}_T \cong 0$	$\hat{q}_T \cong 0$	$\hat{q}_T > 0$
$\hat{q}_{BS} < 0$	$\hat{q}_{BS} < 0$	$\hat{q}_{BS} < 0$
$\hat{q} < 0$	$\hat{q} > 0$	$\hat{q} > 0$

However, in the case of FY Macedonia, we observe instead a depreciation of the REER (Table 3, column 2). This could be the case only if PPP—one of the main assumptions behind the B-S effect—does not hold for tradables, and if the effect of REER-tradables dominates in the REER (Table 3, column 3). This indeed appears to be the case in FYR Macedonia, where both relative tradables prices and PPI-based REER depreciate in line with the depreciation in REER (Table 4).<sup>8</sup>

<sup>8</sup> FYR Macedonia maintains a de facto peg with the euro. We thus exclude  $e$  in our discussion of the REER-tradables,  $q_T$ .

Table 4. Tradable Prices

<i>Data Description</i>	<i>Variables</i>	<i>2001-2003 (period to period)</i>
<b>CPI based REER vs. Euro Area</b>	$\hat{q}$	1.1
<b>PPI based REER vs. Euro Area</b>	$\hat{q}$	4.2
<b>Tradable price (Using PPI)</b>	$\hat{p}_T^* - \hat{p}_T$	4.5
	$\hat{p}_T$	-1.9
	$\hat{p}_T^*$	2.5

Sources: Statistical Office of FYR Macedonia; and IMF staff estimates.

To further investigate the possibility of persistent deviation from PPP in prices of tradables goods between FYR Macedonia and its partners, we estimate the effect of productivity differential on PPI-based real effective exchange rate and compare the results with those obtained using the CPI-based REER.

$$REER_t^{CPI} = \beta_0 + \beta_1 DPROD_t + \beta_2 NFA_t$$

$$REER_t^{PPI} = \delta_0 + \delta_1 DPROD_t + \delta_2 NFA_t$$

The B-S hypothesis implies that productivity growth will not have a major impact on the PPI-based real exchange rate, but will have a significant impact on the CPI-based REER (through the non tradable sector). In the equations above, this would imply that  $\delta_1$  is not significantly different from 0. If  $\delta_1$  is significantly different from zero and not significantly different from  $\beta_1$ , this would suggest that the impact of productivity on the REER is transmitted mainly through the tradables sector. In other words, PPP does not hold.

Estimation results indicate that the impact of productivity growth on PPI-based REER is not significantly different from the effect on CPI-based REER (table 4), confirming that the depreciation of the CPI-based real exchange rate comes mostly through the tradables sector. This is not surprising for a small, open economy such as FYR Macedonia, where the share of tradables in the economy is relatively high.

Table 5. Cointegration Results

	<i>Differential Productivity</i>	<i>Net Foreign Assets</i>
REER CPI	1.35 (0.15)	0.18 (0.05)
REER PPI	1.16 (0.15)	0.13 (0.05)

Sources: Statistical Office of FYR Macedonia; and IMF Staff Estimates.

We thus conclude that the depreciation of the real exchange rate in FYR Macedonia is not a consequence of a B-S effect. We show that PPP for tradables does not hold and the effect of REER-tradables dominates in the REER

#### IV. WHY PPP FAILS

In a number of countries, real exchange rate changes have been found to be largely driven by movements in the cross-country ratios of tradables prices (Engel, 1999; Canzoneri, Cumby, and Diba, 1999). Explanations for the failure of PPP in the tradable sector include increasing differentiation of goods, the presence of transaction and distribution costs (MacDonald and Ricci, 2001), tariffs and non-tariff barriers, pricing to market behavior of multinational firms (Engel, 2002). In the same vein, we argue that PPP fails in FYR Macedonia because the domestically produced tradables goods are imperfect substitutes of foreign produced tradables and the economy is unable to catch up by move up along the value-added chain of goods. We make this case based on the declining trends in productivity growth and prices in FYR Macedonia compared to major trading partners. This trend is consistent with a gradual specialization in lower quality goods with lower prices.

As noted above, the depreciation of REER in FYR Macedonia is due to the decline in the prices of tradables in FYR Macedonia relative to tradables in its main partners (Euro countries).

$$\begin{matrix} \hat{q}_T = \hat{e} + (\hat{p}_T^* - \hat{p}_T) \\ (+) \qquad \qquad (+) \end{matrix} \quad (12)$$

We also observe that the depreciation of REER is positively related to the productivity differential in tradables.

$$\begin{matrix} \hat{q}_T = f(\hat{a}_T^* - \hat{a}_T) \\ (+) \qquad \qquad (+) \end{matrix} \quad (13)$$

We thus explore under what conditions the price differential and productivity differential are positively related.

$$(\hat{p}_T^* - \hat{p}_T) \propto (\hat{a}_T^* - \hat{a}_T) \quad (14)$$

The combination of declining relative productivity growth and depreciation observed in FYR Macedonia would be consistent with any of the following three scenarios: (i) a declining relative wages, or other input costs; (ii) a squeezing of relative profit margins; or (iii) a production of increasingly differentiated tradable goods. Under imperfect competition, the profit maximization condition is given by:

$$\hat{w}_T = \hat{p}_T + \hat{a}_T - \hat{\mu}_T \quad (15)$$

where  $\hat{\mu}_T$  denotes the markup over wages. Substituting equation (15) in equation (12), one obtains:

$$\hat{q}_T = \hat{e} + (\hat{p}_T^* - \hat{p}_T) = \hat{e} + (\hat{w}_T^* - \hat{w}_T) - (\hat{a}_T^* - \hat{a}_T) - (\hat{\mu}^* - \hat{\mu}) \quad (16)$$

(+)                    (+)                    (?)                    (+)                    (?)

Equation (16) shows that a positive inflation differential and a positive productivity growth differential would be consistent only under the following condition.

$$(\hat{w}_T^* - \hat{w}_T) + (\hat{\mu}^* - \hat{\mu}) > (\hat{a}_T^* - \hat{a}_T) \quad (17)$$

In other words, this could occur if wages or other input costs were declining in relative terms or if profit margins were being squeezed. This could occur in a scenario where labor markets are not sufficiently flexible to allow wage costs to fall when productivity declines. In such a case, the relative decline in productivity growth necessitates a squeezing of profit margins and an eventual exit; or else, production of imperfect substitutes, or reduction of the quality of goods with relatively lower prices. This could then manifest as a relative price decline and a depreciation. In the case of FYR Macedonia, given the labor market rigidities, a relative wage decline is unlikely to be the main factor<sup>9</sup> in driving down relative domestic prices. Furthermore, a reduction of profit margins alone cannot explain these trends over the long run given that there is a limit to the reduction of profit margins that can be achieved. Thus, an alternative explanation could be increasing differentiation of home produced goods. Under this scenario, firms survive only if they produce relatively lower quality goods with lower input costs and lower prices.

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<sup>9</sup> Several indicators point to a structural labor market rigidity in FYR Macedonia. The unemployment rate has been persistently high at around 30 percent or above. Yet real net wages have not declined and have grown by around 4 percent annually. Centralized wage bargaining, indexation of wages to industry average, high social contribution rates and costly dismissal procedures contribute to high labor market rigidities. For further details, see Darbar (2002) which reviews developments in the labor market.

The depreciating real effective exchange rate could reflect a prolonged transition process during which FYR Macedonia has not been able to develop the capacity to produce higher value-added quality goods. In the early phases of transition, domestic supply capacity is uncompetitive and goods produced are of low quality. A substantial real depreciation may be needed as trade is liberalized, particularly as import demand for higher quality consumer goods rise. The depreciation observed is thus an adjustment towards its equilibrium value. During the transition process, as market based structural reforms are implemented, resources are allocated more efficiently which help to improve supply capacity. Increased investment also enable the necessary technological improvements needed for production of higher quality goods. Prices of tradables goods increase with quality improvements which results in an appreciation of the REER.

In FYR Macedonia, however, due to the slow progress in implementing structural reforms and attracting investment (in particular, foreign investment), and the regional political instability, producers have not been able to foster technological growth, enhance quality of their products, and access new markets. Foreign direct investment in FYR Macedonia is one of the lowest in the region. Investment rate is also very low by regional standards (see Appendix II). Export performance is also weak. Thus, an increase in prices and an appreciation of the real exchange rate that is typically observed with quality enhancements of the tradable goods is not observed in FYR Macedonia. On the contrary, firms may be reducing profit markups and producing lower quality goods to stay in business. This could partially explain the weak trade performance in FYR Macedonia<sup>10</sup>. The lower quality of goods produced has prevented the home country firms from sustaining current export markets and accessing new ones, despite the depreciating real exchange rate.

These observations need to be assessed in the context of the poor industrial data quality in Macedonia. Recent reviews of data standards have raised concerns about the quality of the source data, especially the coverage of the industries. The sample has not been updated since 1998 as a result of which the data reflects the performance of older firms which have not been able to make the full transition to a more competitive structure. This is in keeping with Zaldueño (2003) which shows using micro financial data from firms that there exists a dichotomy with older firms remaining uncompetitive and newer start-up firms being more profitable. The limited coverage of the sample would suggest a bias towards the former group of less profitable and less productive companies.

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<sup>10</sup> There are other factors that could also explain the weak export performance observed in FYR Macedonia. For instance, with the appreciation of the internal exchange rate, some firms may shift from the tradables sector to the relatively attractive non-tradables sector. This volume effect does not appear to be significant when analyzing the data on the share of tradables and non-tradables in GDP.

## V. CONCLUSION AND POLICY IMPLICATIONS

We conclude that the depreciating real exchange rate in FYR Macedonia reflects a prolonged transition process associated with relatively low technological growth and a declining quality of its tradable goods basket vis-à-vis its trading partners. The B-S effect does not play an important role in explaining the depreciation of the exchange rate. Macedonian producers are caught in a vicious cycle of low growth, low productivity, low profitability, and low investment. Firms lack the technology to produce higher-quality exportable goods owing to lack of investment and technology improvements. Investment incentives are low owing to relatively low productivity and low profitability.

Policies should therefore focus on enhancing productivity growth in the tradable sector by lowering barriers to private investment and implementing labor market reforms. Further research is needed to enable analysts to understand the reasons for the low productivity growth. One explanation could be the low investment ratio in FYR Macedonia, which has led to a lack of capital deepening. Although (anecdotally) the capital-labor ratio has been high, it is not evident to what extent obsolete capital has been replaced. Privatization failed to attract significant new foreign investments that could have generated technology transfer and access to markets. An under-developed financial sector and relatively high real interest rates have resulted in a high cost of capital and deterred investment financing. Furthermore, frequent conflicts in the region and small internal markets have lowered expected profits and investment prospects. Measures to reduce the barriers to investment, improve the business climate, and increase labor market flexibility should be implemented to improve profitability and increase investments.

## APPENDIX

### Estimating the Equilibrium Real Effective Exchange Rate

#### The Data

Data availability constrains the sample period to 1995:Q1 to 2003:Q4.

- CPI-Based real effective exchange ( $reer^{CPI}$ ): The CPI-based exchange rate is a weighted index of nominal bilateral exchange rates and relative consumer price indices for FYR Macedonia vis-à-vis its main partners (including ex-Yugoslavia). The data on consumer price indices and bilateral nominal exchange rates were obtained from IFS and INS database and the weights for the trade shares were based on an average of 1995-1998 trade data.
- PPI- Based real effective exchange rate ( $reer^{PPI}$ ): The series is constructed with the same methodology as the CPI-based REER while using producer price indices. The data sources were IFS and INS databases. PPI data for FYR Macedonia was obtained from the Statistical Office.
- Net foreign assets as a share of GDP ( $nfa$ ): Data were obtained from the IMF International Financial Statistics.
- Labor productivity ( $prod$ ): GDP per employee and GDP per capita were obtained from the WEO database.
- Sectoral labor productivity: Tradable and non-tradable productivity measures for FYR Macedonia were constructed from sectoral value added data in the annual GDP publication and the sectoral employment data from the annual labor force survey (LFS). Tradables sector include agriculture, manufacturing, mining and trade sectors. Sectoral data for euro area countries is available at the Total Economy Database from the Groningen Growth and Development Center.

### Unit Root and Cointegration Tests

Table A-1. Unit Root Tests

	Augmented Dickey-Fuller	Phillips-Perron
reer <sup>CPI</sup>	-1.53	-1.64
D (reer <sup>CPI</sup> )	-4.72	-4.71
reer <sup>PPI</sup>	-1.87	-1.87
D(reer <sup>PPI</sup> )	-4.01	-3.94
Prod	-2.83	-1.83
D(prod)	-2.74	-2.85
Nfa	-0.28	-0.37
D(nfa)	-4.59	-4.61

Note: Critical values are 3.61( 1% level), 2.95 (5 % level) and 2.61 (10 % level).

Table A-2. Cointegration Test Results Using CPI-Based Real Effective Exchange Rate

	Trace Statistic	1 Percent Critical Value	Max-Eigen Statistic	1 Percent Critical Value
None	47.73	35.65	29.39	25.52
At most 1	18.34	20.04	13.10	18.63
At most 2	5.23	6.65	5.23	6.65

Table A-3. Cointegrating Vector Using CPI-Based Real Effective Exchange Rate

	reer <sup>CPI</sup>	Prod	Nfa
Coefficients (Standard errors)	1.00	-1.35 (0.15380)	-0.18 (0.04685)
Adjustment coefficients (Standard errors)	-0.20 (0.05877)	0.15 (0.05162)	-0.18 (0.20642)

Table A-4. Cointegration Test Results Using PPI-Based Real Effective Exchange Rate

	Trace statistic	1 percent critical value	Max-Eigen statistic	1 percent critical value
None	37.25	35.65	20.65	25.52
At most 1	16.59	20.04	13.25	18.63
At most 2	3.33	6.65	3.33	6.65

Table A-5. Cointegrating Vector Using PPI-Based Real Effective Exchange Rate

	reer <sup>PPI</sup>	Prod	nfa
Coefficients (Standard errors)	1.00	-1.16 (0.15657)	-0.13 (0.04585)
Adjustment coefficients (Standard errors)	-0.12 (0.06479)	0.22 (0.05860)	-0.21 (0.25399)

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