

## **Equilibrium Exchange Rates in Transition Economies: Further Results**

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## 1. Introduction

Nearly ten years into the transition process, the exchange rate remains a central policy issue. Among the successful economies, the Czech Republic abandoned its peg after a mini-crisis in the spring of 1997, Poland has resorted to floating and yet underwent a tremor later that summer, while Hungary still follows a narrow crawling peg despite occasional jolts to its financial markets. Estonia sticks to the currency board that it adopted early on. It has been joined by Bulgaria in 1997 while Lithuania successfully abandoned the currency board arrangement. Croatia is still groping for the "right" exchange rate level as it operates a heavily managed float. In the less successful countries, the exchange rate remains a focus of anxiety. In the summer of 1998, Russia has undergone a major currency collapse with deep regional and world-wide repercussions. Romania's and Macedonia's exchange rates have not yet found their equilibrium levels.

This is not surprising, of course. Transition countries are not alone in finding it difficult to deal with the exchange rate, as the Asian crisis well illustrates. What makes the transition countries' problem harder is the combination of a short history and rapidly changing domestic conditions. Any exchange rate policy faces two issues. First is the question of the proper level of the exchange rate. There is a vast literature on the equilibrium exchange rate. Both the theoretical definition and empirical implementations remain contentious. Modern approaches (Edwards, 1989 and Williamson, 1985) emphasize the sustainability of the current account, incorporating the older literature which focused on prices (Balassa, 1964; Samuelson, 1964). More recently, the phenomenon of capital inflows has led to a new concern about capital account mobility, see e.g., Calvo *et al.* (1993).

The second issue is the choice of an appropriate exchange rate regime. The traditional choice between a fixed and a flexible exchange rate is no longer relevant. There is a whole range of practical possibilities including currency boards, crawls, fuzzy target zones. While the menu of possible regimes has expanded of late, the high degree of capital mobility may have narrowed down feasibility (Wyplosz, 1999).

In transition economies, the two issues of regime and equilibrium level are intimately linked, further deepening the complexity of policy decisions. If the equilibrium exchange rate is undergoing rapid change, policy has to be flexible enough to accommodate this evolution. On the other side, rapid inflation due to initially unsettled conditions and frequent difficulties in minimizing the inflation tax, reinforces the need for an exchange rate anchor (Bruno, 1985, Begg, 1998), especially as new market-oriented central banks seek to establish their credibility.

The behavior of real exchange rates in transition economies is reported in Figure 1.<sup>1</sup> With few exceptions, after an initial fall at the time when markets are established, the real exchange rate undergoes a massive appreciation. The average rate of appreciation from the early trough to the latest available observation is 180%. The lowest real appreciation is in Slovenia (7.5%) and the highest in Latvia (800%). The first country is atypical, the second is representative of the pattern observed in the former Soviet Union with other central east European countries in-between.

This dramatic appreciation greatly complicate matters. Undoubtedly, it is partly a catch-up following the initial exchange rate collapse which led to sizeable undervaluation. Partly it is due to an equilibrium real appreciation as economic conditions improve and pent-up craving for foreign currency is satisfied. Indeed, in most countries the rate of real appreciation levels off as time passes by, suggesting that normalcy is settling in. When is the equilibrium is reached? Given the size of changes observed since the start of transition, the margin for error in answering this crucial question is *a priori* enormous.

Figure 1

This paper represents a renewed attempt to provide estimates for the real exchange rate. Previous estimates for the transition countries have been presented in Halpern and

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<sup>1</sup> We use the local and US CPI to deflate the average monthly nominal exchange rate. The sample corresponds to data availability in *IFS*. The scales are chosen to be of equal width for all countries, with the exception of Lithuania.

Wyplosz (1997).<sup>2</sup> Two approaches were then tried. The first one uses the monthly dollar wage as a measure of the real exchange rate.<sup>3</sup> It assumes that dollar wages are related to a set of indicators that measure the country's level of development --in a manner not necessarily related to Balassa (1964) and Samuelson (1964), see further-- as well as distortions. The world is used as the sample which also exploits the time series dimension with low frequency data. The second approach looks at other measures of the exchange rate (CPI deflated nominal exchange rate, the ratio of nontraded to traded good prices) and focuses on the short history of transition economies with high frequency data. It assumes that actual real exchange rates converge to their equilibrium level, following an error-correction mechanism.

The exercise is undertaken again because we can now include more countries over a longer period of time beyond 1990. This is especially important because it allows us to include the transition countries which were previously present only as their centrally-planned economies ancestors. In addition data that were not available for enough countries now can be found in sets which include internationally comparable data. This allows us to capture factors such as financial distortion and openness to trade.

The next section presents the methodology and data base. The results from the econometric estimation are reviewed in Section 3 and used in Section 4 to provide estimates of the equilibrium dollar wage in transition economies. The last section offers our conclusions.

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<sup>2</sup> Krajnyak and Zettelmeyer (1997) apply the same approach to a different set of transition economies.

<sup>3</sup> Conventionally the real exchange rate is written as  $P/EP^*$  where  $P$  and  $P^*$  are domestic and foreign price indices, and  $E$  is the nominal exchange rate defined as the domestic price of foreign currency. The dollar wage use the nominal wage as the relevant price index and further benchmarks the foreign wage  $W^*$ , i.e. if the wage real exchange rate is  $\lambda = W/EW^*$ , the dollar wage is  $W/E = W^* \lambda$ .

## 2. Methodology

### 2.1. The dollar wage

The present paper focuses entirely on the dollar wage. There are several reasons for choosing this measure. To start with, it is the most widely used and intuitive measure, routinely employed both by economists "on the ground" and by travelers who want to get a sense of local standards of living. The procedure simply makes systematic and better-grounded from a statistical view point casual comparisons.

Second, resorting to low frequency and to a very large sample of countries drawn from all five continents provides strong justification for the claim that the fitted values can be interpreted as representing equilibrium values. Indeed, with a very low frequency -- observations spaced five years apart-- and a long horizon (1970-95), the error terms obtained from the time series dimension of the sample are quite likely to pick non-related cyclical disturbances. The world-wide sample provides a cross section dimension which is expected to reject in the estimation errors the national idiosyncratic effects.

Third, data in the transition economies remain of uneven quality and the sample period is still far too short for reliable country-by-country estimates, especially if the objective is to detect long-run equilibrium values. Less than ten years have gone by since recession started. In such a sample it is quite unlikely that cointegrating relationships really uncover the long-run. This is why Halpern and Wyplosz (1997) and Krajnyák and Zettelmeyer (1998) resort to panel data. Price indices cannot be compared across countries, but wages can once they are converted into the same currency.

We use estimates of monthly wages converted into dollars. Local currency wages are provided by the ILO in its *Yearbook of Labour Statistics*. They are converted into dollar wages using the average annual exchange rate from the IMF's International Financial Statistics. The ILO provides either monthly wages or weekly, or even hourly wages. Often the ILO also indicates the number of hours or days worked by weeks and this is then used to arrive at monthly wages. When this is not provided, we have used

information from the IMF's country desks previously used in Halpern and Wyplosz (1997).

## 2.2. Principles

A limitation of this and other studies is that the various definitions of *the* real exchange rate correspond to different theoretical concepts.<sup>4</sup> How do these measures relate to each other in transition countries? For example, the real appreciation path visible in Figure 1 is suggestive of the Balassa-Samuelson effect. This effect, however, relies on faster productivity growth in the traded than in the nontraded good sector. Halpern and Wyplosz (1997) show that this pattern is typically not found in transition economies, at least during the early years. The nontraded sector has generally long been repressed in planned economies. Transition starts with inefficient distribution systems which led to the celebrated early-morning lines in front of stores and to saving banks which provided the most rudimentary services. Improved distribution, the emergence of a banking system and a quickly thriving network of small service enterprises represent one of the most spectacular facets of transformation. The Balassa-Samuelson effect would predict a real exchange rate depreciation as industrial tradable good prices rise faster than nontraded service prices. Clearly this is not what happened as Figure 2 shows. The figure displays the ratio of nontraded to traded good prices (approximated by the ratio of the CPI to the WPI). In all countries where the series are available, there is a clear trend of rising relative nontraded good prices.

Figure 2. PT/PNT form IFS

Grafe and Wyplosz (1997) present a model intended to reconcile Figure 1 and 2 with some stylized facts of transition: the gradual emergence of a state-owned sector with low but rising productivity, and lasting wage differentials between the "modern" traded and nontraded sectors on one hand and, on the other hand, the "old" industrial sector which often continues to operate under soft budget constraints. This theoretical investigation shows that the dollar wage plays the same crucial role of reallocating

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<sup>4</sup> For an excellent discussion of these issues see Lipschitz and McDonald (1992).

productive resources as is usually performed by the real exchange rate in "normal" economies. Labor costs and the real exchange rate need to be initially low to allow the new traded sector to generate high enough profit margins to be able to expand. At the same time a continuous real appreciation is needed to attract labor away from the state sector which is then forced to close down inefficient production lines. The link between real appreciation and rising productivity in the traded good sector can be seen as a Balassa Samuelson effect in reverse: labor productivity increases are a consequence of real appreciation, not the exogenous driving force behind it.

### 2.3. Choice of data <sup>5</sup>

This early investigation in the economics of the real exchange rate during transition remains preliminary and sketchy. Yet it is suggestive of the factors that are likely to contribute to the evolution of the real exchange rate. To start with, aggregate labor productivity moves along with the average real wage and hence, *ceteris paribus*, with the average dollar wage too. The remaining variables deal with the *ceteris paribus* question: this a reasonably free search for relevant variables available for a wide sample of countries informed by the limited recent literature (Freeman, 1994, Rodrik, 1998).

A first set of variables deal with human capital. Given GDP per capita, it is expected that a country with a higher human capital stock will be able to produce more advanced and better differentiated goods, thus reaping a rent and allowing for higher dollar wages. Human capital, though, is not measurable. What is used instead is investment into human capital measured by various indicators of schooling. This is a very imperfect flow proxy for the desired stock variable. In addition, most indicators fail to account for the quality of investment.<sup>6</sup> We experiment with various variables but fail to come up with a statistically significant coefficient.

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<sup>5</sup> See the Data Appendix for full details.

<sup>6</sup> On these issues see Barro and Lee (1993).

Second, we look at the country's demographic characteristics focusing on age dependency, the ratio of inactive to active population. A high ratio means that currently active workers must be "taxed".

Third, countries which are more open to trade rely less on protection and associated distortions to balance their external accounts. Accordingly one would expect better goods quality and therefore the ability to sustain better terms of trade and higher dollar wages. Openness is defined as the ratio of exports and imports to GDP, from the World Bank's *World Development Indicators* 1998 CD-ROM.

Fourth, external indebtedness requires that the country generates a primary current account surplus. This calls for a lower real exchange rate. We use two measures of the net foreign asset position: for the country as a whole (source: Sinn, 1990), and for the banking system, including the central bank (source: *IFS*, latest CD-ROM).

Fifth, we look at various public interventions and distortions which may introduce a wedge between labor productivity and wages. We considered a wide array of possible distortions, but in the end were led by data availability.

### **3. Regression results**

The sample is determined by data availability. It includes 85 countries. Observations are taken every five years from 1970 to 1995, while in Halpern and Wyplosz (1997) the sample ends in 1990. In selecting the variables, care has been taken to include in the sample as many transitions economies as possible. These countries now enter as planned economies for the 1970-1985 observations and as transition economies in 1995, while 1990 is clearly in flux, more below. For ease of discussion, they are labeled "planned economies" throughout. Unfortunately the panel is unbalanced as data are not available for all six observations for all countries: instead of 510 observations most regressions are based on 330 data points, although we have many data for 373 observations. In particular, data for planned economies are rarely available before 1985.

### 3.1. Benchmark regression

The results are presented in Table 1. Testing for fixed effects would require using 85 dummy variables, an unsavory prospect. Instead we have systematically experimented with regional dummies for OECD countries, South-East Asia, Latin America, Africa and the planned economies and then selectively looked for national dummies, with particular attention to the transition countries. We have also used dummies for each of the six years: since the estimates were regularly increasing over time, we tested for, and could not reject, the presence of a linear trend. This trend comes on top of the evolution of GDP per capita which is itself trended upward for most countries.

The first column shows our preferred regression. The right hand-side variables explain 86% of the total variance, a very high proportion for panel data. Not surprisingly, dollar wages are tightly linked to the level of GDP per capita, a standard observation in the tradition of Balassa and Samuelson. The elasticity is significantly less than unity, though, suggesting that higher income is not entirely used to raise wages but may go to profits or to leisure. We do not explore this question which goes beyond the purview of this paper.

Openness increases the dollar wage. This is in line with recent results from the growth literature which show that openness adds to a country's economic performance (see Sachs and Warner, 1995). Our result shows that openness matters for the dollar wage over and above GDP. This variable was not available in Halpern and Wyplosz (1997). The effect is rather small however, as a 10% increase in openness only raises wage by 0.5%<sup>7</sup>, and not as significant as most other determinants. We retain this variable in our benchmark to reflect previously available evidence.

Another variable not used previously is the country's net asset position. The effect is significant: an increase in external indebtedness of 10% of GDP reduces the dollar

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<sup>7</sup> Openness being defined as the ratio of the sum of exports and imports to GDP, we consider a 10% increase exports OR imports.

wage by 3%. In principle, it should not matter whether the debt is owed by banks or by nonbanks. It turns out that nonbank indebtedness in fact increases the real dollar wage. The effect is not negligible: each 10% of GDP of bank foreign indebtedness raises the dollar wage by 5%. A possible interpretation is that this variable captures capital inflows, including foreign direct investment which raises the capital labor ratio. This interpretation is supported by the following exercise: we have split the sample in two subperiods: while over the period 1985-95 the same effect is detected (with a slightly higher elasticity of 0.6). in the 1970-1980 sample the effect is of opposite sign but not statistically significant (see Table 2 below). If we agree that foreign direct investments have increased over the more recent period as has been amply documented, see e.g. Calvo *et al.* (1993), the difference is readily explained. Clearly, this is just a possible interpretation and more work is required to support this assumption.

The life-cycle theory suggests that the demographic structure of a country affects its equilibrium real exchange rate. An aging population should, in principle, save and therefore the country is expected to run a current account surplus. This calls for a real depreciation. Conversely a population which includes a large proportion of young is expected to be borrowing, and hence to run a long-lasting current deficit. The outcome should be a depreciated real equilibrium exchange rate. Which effects dominates? Table 1 explores the effect of the age dependency ratio, i.e. the ratio of dependents -- the population under age 15 and above age 65-- to the working-age population --those aged 15-64. This measure mixes up both ends of the age structure and its effect is a priori ambiguous. Table 1 finds a significantly positive effect of the age dependency ratio: a 10% increase in the ratio leads to a 7.5% increase in the dollar wage, i.e. it encourages foreign borrowing.

We next consider the role of distortions. The first variable is the ratio of public consumption to GDP. This variable may have several effects. As a pure distortion, it would reduce overall productivity and, presumably, the dollar wage. Alternatively, public consumption, which includes education, infrastructure, justice, etc. is in the nature of investment. As such it may enhance economic effectiveness and raise the dollar wage. In addition, by increasing demand for labor (e.g. through public servants who are traditionally well organized in influential unions) it could tilt the distribution of

income towards wages. Table 1 indicates that it is the wage increasing effect which dominates: and increase of 10 percentage points of the share of public consumption in GDP increases the dollar wage by 4%.

The next source of distortion that we investigate is the financial system. In most developing countries, banks and financial intermediaries play a limited role in collecting savings and in financing capital accumulation. This is often the result of explicit financial repression and of a lack of specialized human capital. This factor clearly plays a crucial role in the early phase of transition. Table 1 measures financial development with the size of credit to the private sector as a proportion of GDP. The effect is highly significant and conforms with our prior: a 10% increase in the ratio of credit to GDP raises the dollar wage by 4%.<sup>8</sup>

In Halpern and Wyplosz (1997) we have found that the ratio of valued added in agriculture and industry exerted a significant effect on the dollar wage. Presumably, a relatively large agricultural sector leads to low aggregate productivity and low dollar wages and adverse terms of trade. This effect, though, should be indirectly captured by the GDP per capita measure. To directly affect dollar wages, the relative share of agriculture and industry must reflect other sources of low development, such as poor housing and information that inhibits migration towards urban centers, distortionary subsidies to farming, strong family bounds or factors that inhibit the emergence of the industrial sector. With our new dataset, we have failed to confirm the role of this variable. One possibility is that the ratio of valued added in agriculture and industry proxies for other variables that we have now added, mainly the extent of credit available for the private sector.

Another variable that played a prominent role in our prior work is the proportion of children enrolled in secondary education. This variable is a measure of flow investment in human capital, a noisy proxy for the stock of human capital. It appears as a

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<sup>8</sup> Attempts to measure the stage of development of the banking and financial systems with the ratio of money (M2) to GDP have not yielded any significant results. While the use of money should decrease as people have access to more instruments, it is also the case that money becomes more widely help when banks spread their branch network and compete for customers.

significant determinant of the dollar wage but systematically with a negative sign, a result for which we find no convincing interpretation. For that reason, this variable has been dropped.

Table 1

### 3.2. Country specific effects

Given the large number of countries (85) and the small size of the time series (at most 6 per country) it is impossible to systematically search for country specific effects. Instead, we search for regional effects, with special attention to the transition countries. Three purely regional country groupings, Africa, Latin America and South-East Asia, are generally found not to exhibit fixed effects, while two functional groupings, the OECD and planned economies, do. As expected, belonging to the OECD implies a higher dollar wage *ceteris paribus*, by some 50%, while planned economies face a discount of about 30%. One interpretation is that this effect reflects more economically efficient overall private and public structures. We return to this issue below.

Focusing further on the planned economies, Column 2 examines whether the planned economy effect has changed over time. This is done by splitting this dummy variable into six dummy variables which take the value one for a particular year and for the planned economies, and zero for all other years and for all market economies. Four of these dummy variables enter significantly, providing an interesting description of these countries' evolution. Not surprisingly, all of the estimated coefficients are negative, implying an adverse effect on the dollar wage. However this effect initially improves between 1970 and 1975, even disappearing over 1980 and 1985, with a massive worsening in 1990, the year of the collapse of the system in Central and Eastern Europe. This is followed by a marked improvement as early as 1995. We return to the interpretation of this finding in Section 4. Still, not too much should be made of it since

the hypothesis that all six dummy variables have the same coefficient cannot be rejected.<sup>9</sup>

The procedure used in Column 1 assumes that the elasticity of the real wage to its determinants is invariant from one country to another. Once again, it is impossible to test such a hypothesis for every country. Column 4 tests whether the planned economies are different in this respect. For all but two variables, the additional slope parameter is not significantly different from zero and the assumption of equal elasticity cannot be rejected at the 1% confidence level (see the table's footnote). The exceptions are government consumption and credit to private sector. In both case, the specific planned economy effect is negative and larger in absolute value than the global positive effect. This implies that the effect of public consumption on the dollar wage is negative, an indication that distortions outweigh the positive effects. The same applies to credit to the private sector. This is quite interesting as credit to the private sector has only started in earnest with transition. Taken literally, this result implies that credit is highly inefficient and distortionary in the transition economies.

Finally, we return to the interpretation of the regional dummies. What do they account for? Given that we already account for a wide range of economic and demographic factors, the regional dummies represent either unaccounted economic factors or social characteristics. Since we deal with regions, rather than with national idiosyncrasies<sup>10</sup>, the interpretation should be in terms of broad factors. An intriguing possibility has been suggested by Rodrik (1999) who finds that dollar wages are higher in democratic societies. Just adding the variable "democracy" --which ranges from zero to unity, with full democracy represented by unity-- does not yield any significant results. Only when we remove the regional (OECD and planned economies) dummies do we find that democracy has indeed a positive effect: in Column 3 our elasticity, about two-third of

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<sup>9</sup> The associated F-statistic is  $F(5, 312)=1.1388$ , well below the 5% critical level.

<sup>10</sup> We do not report the results of a search for national dummies. Those found significant are: China, Columbia, Morocco, Nicaragua, Portugal, Sri Lanka, and Swaziland (all with a negative sign except for Nicaragua). This list does not lend itself to any obvious generalization.

that found by Rodrik, suggests that would Mexico achieve the US level of democracy, its average dollar wage would rise by about 17%.

### **3.3. Endogeneity**

It has been noted that the dollar GDP per capita variable could be a proxy for the dollar wage. In Halpern and Wyplosz (1997) we argue that this is the case if the labor share in income is constant, an assumption that we find unappealing in a cross-section time series panel.<sup>11</sup> Still, it is conceivable that both variables respond to the same set of factors. Grafe and Wyplosz (1997) argue that it is real wage increase which draws the labor force to the modern high productivity sectors, away from the unproductive industries inherited from the planning system. These observations raise doubts that the GDP per capita can be taken as exogenous.

Column 5 in Table 1 presents the result of instrumenting GDP per capita, adopting a GMM estimator. Since we used all available variables on the right hand-side, there are few instruments available. We use as instruments the variables that proved to enter insignificantly in Column 1 and also add previously insignificant regional and time dummies. The results do not change significantly. In particular the coefficient of GDP per capita remains almost identical. This result is weak, though, since the J-statistic that tests for the overidentifying restrictions indicates that our instruments are not adequate, which could indicate that the apparent robustness of our estimates is spurious.

### **3.4. Robustness**

Given the limitations regarding data availability for such a large panel sample, the regression presented in Column 1 appears quite robust to the extensive specification search that we have performed. This regression will be used in the next section to estimate the equilibrium dollar wage. Before turning to that exercise, however, some words of caution are warranted.

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<sup>11</sup> See Footnote 13 in Halpern and Wyplosz (1997).

A first possibility is that the estimated relationship is not stable over time. We perform a Chow test splitting the sample into two sub-periods of three five-yearly observations: 1970-1980 and 1985-1995.<sup>12</sup> The corresponding F-statistic is 2.03; with 13 and 304 degrees of freedom it is below the 5% confidence critical value (2.21) and far from the 1% confidence value (3.17). This indicates that our results are robust to the time dimension.

A second possibility is that, for a variety of reasons, the posited relationship between the dollar wage and its determinants does not apply to the planned economies. We have already looked at this question in Section 3.2, and found that some coefficients (share of government consumption and credit to the private sector) differ. Columns 1 and 2 of Table 2 show the results obtained when the sample is split into two country groupings: the planned economies and the others.<sup>13</sup> Clearly, the results for non-planned economies differ little from those in Column 1 of Table 1. On the other side, the regression limited to the planned economies sub-sample delivers poor results. This may be due to the small size of the sample. This may also reflect the highly plausible assumption that planned economies fundamentally differed from market economies. Note, however, that out of the 28 observations in this sample, 15 correspond to the transition period (1990 and 1995). Formally, we can test for the restriction that the coefficient are the same across Columns 1 and 2 in Table 2. This test delivers an F-statistic of 0.728 which does not reject the null of coefficient equality.

In all the regressions presented so far, the various tests indicated the presence of heteroskedasticity (hence our use of White's procedure) and of non-normality of the residuals. Heteroskedasticity is a frequent implication of panel data estimation. Column 3 in Table 2 shows that if we restrict ourselves to the market economies and the to the period 1985-95, we can reject both non-normality of the residuals and misspecification.

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<sup>12</sup> This is not an accurate Chow test as the FSU variable cannot be used in the first sub-sample for lack of data on the Soviet Union.

<sup>13</sup> Note that the others include some economies that do not fully conform to a market economy classification, e.g. Algeria, Myanmar or Syria. China is included in the planned economy group.

At the same time, most coefficient estimates differ little from those of our benchmark regression in Column 1 of Table 1.

Table 2

## **4. Simulations**

### **4.1. Methodology**

The regressions can be thought of as capturing each country's equilibrium exchange rate as measured by the dollar wage. The low frequency implies that error terms reflect special year effects rather than some particular dynamics. The use of panel data further eliminates from the estimates national idiosyncrasies. Under this assumption, it is possible to use the regression to produce estimates of equilibrium dollar wages, both in and out of sample. In this section we present the results of this exercise for the transition countries, according to data availability.

A key question is the treatment of the regional dummy variables. Three such variables appear in our benchmark regression: the OECD, planned economies (PE) and former Soviet Union (FSU) dummies. Where transformation is slow, presumably the PE dummy is still valid. Elsewhere, though, its negative effect on the dollar wage should be erased. For most countries, therefore, we present two sets of estimates: with and without the PE dummy. In principle, as we move from 1990 to 1997, the equilibrium dollar wage should reach the level of the estimate that excludes the PE dummy. Looking further ahead, hopefully the successful transition countries should reach OECD status. Three of them (the Czech Republic, Hungary and Poland) are formal members of the OECD, yet they are unlikely to have achieved the level of economic development of most other members. Finally, the former Soviet Union countries all seem to undergo a more painful transition than the other countries. This justifies retaining the negative effect of the FSU dummy, but here too we would expect this effect to gradually vanish over time.

## 4.2. Broad features

The various possible paths of the equilibrium dollar wage are displayed in Figure 3, along with the actual dollar wage.<sup>14</sup> In contrast with the estimates presented in Halpern and Wyplosz (1997), it is no longer the case that the estimated equilibrium dollar wage systematically rises throughout the transition period. In Bulgaria, Hungary, Russia and the Ukraine it is actually declining, often sharply. For Bulgaria, this is due to the sharp decline of public spending and to the deterioration of the net external asset position. The same factors, along with lower credits to the private sector, stand behind the moderate decline found for Hungary. In Russia and the Ukraine, the story is more one of declining GDP per capita and deterioration in the age dependency ratio related to declining life expectancy, with a fall of public spending in Russia playing an additional role. Most of these variables were not used in our previous work.

This result underlines the complexity of the link between transition and the exchange rate. Productivity gains do not translate automatically in an equilibrium real exchange rate appreciation. The concept of real equilibrium exchange rate must be based on long-run sustainability of the current account. A worsening external debt position requires a real depreciation, as do deteriorating demographic factors. The role of the PE and FSU dummies must be emphasized, however. As "black box" estimates of the handicap inherited from the central planning era, they are expected to disappear over time, predicting a 33% increase in the dollar wage in central and eastern Europe, and a further 100% advance in the former Soviet Union. Our analysis only identifies the size of the handicap. It sheds no light on its deeper nature, nor the speed at which it can be expected to vanish.

Nearly everywhere, the fast real appreciation observed over the period 1990-95 represents a correction from the depreciation which has occurred at the onset of transition. The exception is Slovenia which occupies a specific position further

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<sup>14</sup> In principle, we should display the confidence interval. The estimated standard error is extremely large, on average 400% of the average wage in the transition countries. This is not surprising once it is realized that the world sample includes dollar wages that range from 13 to 4619, the average being 510 with a standard deviation of 672.

discussed below. Until 1996, there is little evidence of overvaluation, despite fear frequently expressed in the wake of the massive real appreciation witnessed since 1990. By 1996, however, a number of countries enter the "danger zone". This is the case of Hungary and Poland, the latter having undergone a correction in 1997. Slovenia and Romania are not far.

Crucial in the assessment is the role of the PE dummy variable. This requires judgement call. It is reasonable to consider that, by 1996-97, the successful transformers are better represented by the estimate that does not include the PE dummy. While the Czech Republic is safely below the estimate<sup>15</sup>, the questions arises for Hungary and Poland whether we should factor in the OECD dummy. The corresponding equilibrium dollar wage measures are shown for these two countries. They represent an absolute, and possibly far remote, upward bound.

Slovenia is a special case. Its dollar wage is far above the no-PE estimate. Given its special location and evolution, Slovenia is probably the country closest to "OECD status". For Slovenia, Figure 3 displays the corresponding estimate of the dollar wage: the actual wage lies below our estimate, but not far. So far, Slovenia has managed to maintain a positive current account, although a declining one. Clearly, this country is near the "danger zone", if not already within.

Figure 3

### **4.3. The Former Soviet Union**

Lack of data restricts our sample to the Baltics, Russia and the Ukraine. The Baltic countries have undergone a very different, and far deeper, transformation process than the other FSU countries. Their equilibrium dollar wage is estimated to have rapidly

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<sup>15</sup> Surprisingly, perhaps, the Czech Republic faced overwhelming speculative pressure in May 1997. This is an another manifestation of the innate instability of liberalized financial markets which are prone to self-fulfilling (i.e. not justified by the fundamentals) speculative attacks. On the policy dilemma faced by the Czech republic, see Begg (1998), on self-fulfilling attacks see e.g. Wyplosz (1999).

risen. Like the rest of the FSU, they faced an exchange rate collapse in 1992. The massive real appreciation that followed is the result of both a catch-up and an improvement in the fundamentals. Estonia has entered the zone where the question of overvaluation emerges. Given the depth of its transformation, its tight links with Finland the European Union, there does not seem to be ground for alarm at this stage. Still, its currency board acts as a real appreciation engine and ought to be seen as a potential policy problem.

On the basis of estimates that include the FSU dummy, the Russian and Ukrainian dollar wages appear far above equilibrium. The process of real appreciation clashes with a continually deteriorating equilibrium level. Indeed both countries have faced in 1997 severe exchange crises. Still, the magnitude of the FSU dummy requires careful appraisal. Figure 3 displays the estimated dollar wage ignoring both the PE and FSU dummies. Relative to this measure, neither country faces an overvaluation, although Russia was getting close by 1997, and has since moved back down (the August 1998 dollar wage was at 160, with an average of 170 for 1997). This raises, once again, the question of what lies behind the dummy variables. Many of the features that characterized the FSU have been eliminated, in particular the dismal state of the service sector, the social responsibilities of firms, the perverse payment system, and the massive overproduction of unwanted goods justified by the power of the military-industrial lobbies. Yet, in many respects, both Russia and the Ukraine retain a number of economic features of the Soviet Union. Property rights are still undefined, the banking system does not operate as such, massive subsidies are channeled to the military-industrial complex and to agriculture. Furthermore, the State has not established its role and fails to collect taxes. It is fair to consider that only a fraction of the FSU dummy ought to be erased from our estimates. In that view, the Russian exchange rate must be close to overvaluation --or possibly overvalued-- while Ukraine is probably safe.

## **5. Conclusions**

This paper presents an improved update of estimated equilibrium dollar wages in the transition economies. Improvements include better data coverage: more countries and more relevant variables. Undoubtedly, the margin of error remains sizeable and calls for extreme caution in passing judgement. Yet, since this exercise is routinely carried out in an informal way, the results presented here should be seen as a benchmark.

Further improvements are needed in a number of directions. Data are needed to capture, or better capture, some key characteristics still absent: human capital, market disruptions, indebtedness (our data are of dubious quality), the role of demography, as well as a host of microeconomic features such as the health and retirement systems, the industrial structure and the performance of the banking and financial systems. Better econometric procedures are needed to cope with the endogeneity of some of the explanatory variables and the general validity of the regressions.

The objective of these refinements ought to be the elimination of the dummy variables. These variables capture unmeasured effects which are crucial when it comes to produce estimates of the equilibrium dollar wage. At this stage, the quantitative size of the dummy effects is too large to feel comfortable.

In the end however, a number of lessons emerge. Even if they ought to be taken with a grain of salt, the robustness and degree of significance of our estimates suggest that they deserve careful consideration.

1. We confirm that the massive real appreciation observed in most transforming economies represents a correction from the initial undervaluation. This result, initially established in our previous paper, confirmed by Krajnyák and Zettelmeyer (1997), is further strengthened.
2. Most countries have seen their equilibrium real exchange continuously appreciate as a result of the transformation process. There are important exceptions, though, partly due to deteriorating indebtedness.

3. Thus, there is no guarantee that dollar wages ought to continuously rise. Now that the catch-up phase is mostly over, a new period starts. Further gains depend on a deepening of the transformation process.

4. The exchange rate policy remains complicated in transition countries. The range of uncertainty regarding the equilibrium exchange rate remains uncomfortably wide. This calls for some flexibility.

5. The case for flexibility is further enhanced by two developments. First, the generalized reduction of the rate of inflation means that the need for such a nominal anchor recedes. Second, continuous opening of the capital account increases the scope for large and sudden swings in capital movements.

## References

- Balassa, Bela (1964) "The Purchasing Power Parity Doctrine: A Reappraisal," *Journal of Political Economy* 72, 584-596.
- Barro, Robert and Jong-Wha Lee (1993) "International Comparisons of Educational Attainment", *Journal of Monetary Economics* 32(3), p. 363-94.
- Begg, David (1998) "Disinflation in Central and Eastern Europe: the experience to date" in: C. Cottarelli & G. Szapary (eds.) *Moderate Inflation: The Experience of Central and Eastern Europe Transition Economies*, IMF and National Bank of Hungary.
- Bruno, Michael (1985) "Sharp Disinflation Strategy: Israel 1985", *Economic Policy* 2, p. 379-408.
- Calvo, Guillermo, Leo Leiderman and Carmen Reinhart (1993) "Capital Inflows and Real Exchange Rate Appreciation in Latin America: the Role of External Factors", *IMF Staff Papers* (40), March.
- Edwards, Sebastian (1989) *Real Exchange Rates, Devaluation, and Adjustment*, MIT Press, Cambridge, Mass.
- Freeman, Richard B. (1994) "A Global Labor Market? Difference of Wages Among Countries in the 1980s", unpublished paper, Harvard University.
- Grafe, Clemens and Charles Wyplosz (1997) "The Real Exchange Rate in Transition Economies", paper presented at the Third Dubrovnik Conference On Transition Economies, June 25-28, 1997.
- Halpern, László and Charles Wyplosz (1997) "Equilibrium Exchange Rates in Transition Economies", *IMF Staff Papers* 44(4), p. 430-460.
- Krajnyák, Kornélia and Jeromin Zettelmeyer (1998) "Competitiveness in Transition Economies: What Scope for Real Appreciation?", *IMF Staff Papers*, 45(2) 309-362.
- Lipschitz, Leslie and Donough McDonald (1992) "Real Exchange Rates and Competitiveness. A Clarification of Concepts, and Some Measurements for Europe," *Empirica* 19, No. 1, 37-69.
- Rodrik, Dani (1999) "Democracies Pay Higher Wages" *Quarterly Journal of Economics*, forthcoming.
- Sachs, Jeffrey D. and Andrew M. Warner (1995) "Economic Reform and the Process of Global Integration" *Brookings Papers on Economic Activity* 1, p. 1-95.

Samuelson, Paul A. (1964) "Theoretical Notes on Trade Problems," *Review of Economics and Statistics* 46, 145-154.

Sinn, Stefan (1990) *Net External Asset Positions of 145 Countries: Estimation and Interpretation*, Kieler Studien, vol. 234, Tübingen: Mohr (Siebeck).

Williamson, John (1985) *The Exchange Rate System*, Policy Analyses in International Economics, Institute for International Economics, Washington, D.C.

Wyplosz, Charles (1999) "International Financial Instability", forthcoming in I. Kaul, M. Stern and I. Grunberg (eds.) *International Development Cooperation and Global Public Goods: Towards Sustainable Development in the 21<sup>st</sup> Century*, Cambridge University Press, New York, forthcoming.

## Data Appendix

### Data sources

- Average monthly dollar wage in manufacturing: ILO Yearbook of Labour Statistics*, 1997, for 1997 own computation using different issues of *Planecon Report*.
- GDP at 1987 constant dollar purchasing power parity: Penn World Tables 5.6, World Development Indicators*, 1998, for 1997 own computation using different issues of *Planecon Report*.
- Age dependency ratio (dependents to working-age population): World Development Indicators*, 1998, for 1991-4 linear interpolation using 1990 and 1995 data, for 1997 linear extrapolation using 1995-6 data.
- Openness (ratio of exports plus imports to GDP): World Development Indicators*, 1998, for 1997 own computation using IMF's *International Financial Statistics*, July 1998.
- Share of general government consumption in GDP: World Development Indicators*, 1998, for 1997 own computation using IMF's *International Financial Statistics*, July 1998 (line 91f).
- Ratio of net foreign assets in the domestic banking system to GDP: World Development Indicators*, 1998, IMF's *International Financial Statistics*, 1997, July 1998 (line 31n).
- Ratio of net foreign assets outside the domestic banking system to GDP: 1970-1987 Sinn, S.: Net External Asset Positions of 145 Countries*, Institute for World Economy, University of Kiel, 1988-1997 own computations using cumulated balances of current accounts starting from net external asset position in 1987.
- Share of private sector credits to GDP: World Development Indicators*, 1998, IMF's *International Financial Statistics*, 1997, July 1998 (line 32d).
- Democracy: Freedom House index*, see Rodrik (1999).

### Countries and data years of estimation:

Algeria, 1970, 1975; Armenia, 1995; Australia, 1970, 1975, 1980, 1985, 1990, 1995; Austria, 1975, 1980, 1985, 1990, 1995; Bangladesh, 1975, 1980; Barbados, 1970, 1975, 1990; Barbados, 1975, 1990; Belgium, 1970, 1975, 1980, 1985, 1990, 1995; Bolivia, 1970, 1975, 1980, 1985, 1990; Botswana, 1985, 1990, 1995; Bulgaria, 1980, 1985, 1990, 1995; Burundi, 1975, 1980, 1985; Cameroon, 1980; Canada, 1970, 1975, 1980, 1985, 1990, 1995; Chile, 1970, 1975, 1980, 1985, 1990, 1995; China, 1985, 1990, 1995; Colombia, 1975, 1980, 1985; Costa Rica, 1975; Costa Rica, 1980, 1985, 1990, 1995; Cyprus, 1975, 1980, 1985, 1990; Czech Republic, 1995; Denmark, 1970, 1975, 1980, 1985, 1990; Dominican Republic, 1970, 1975, 1990, 1995; Ecuador, 1970, 1975, 1980, 1985, 1990; Egypt, Arab Rep., 1970, 1975, 1985, 1990, 1995; El Salvador, 1990, 1995; Estonia, 1995; Fiji, 1970, 1975, 1980, 1985, 1990, 1995; Finland, 1970, 1975, 1980, 1985, 1990, 1995; France, 1970, 1975, 1980, 1985, 1990; Gambia, The, 1985; Germany, 1970, 1975, 1980, 1985, 1990, 1995; Ghana, 1975, 1985, 1990; Greece, 1970, 1975, 1980, 1985, 1990, 1995; Guatemala, 1980, 1985,

1990; Guyana, 1970, 1975, 1980; Honduras, 1975, 1980; Hungary, 1970, 1975, 1980, 1985, 1990, 1995; India, 1970, 1975, 1980, 1985, 1990; Ireland, 1970, 1975, 1980, 1985, 1990, 1995; Israel, 1970, 1975, 1980, 1985, 1990, 1995; Italy, 1970, 1975, 1980; Jamaica, 1990; Japan, 1970, 1975, 1980, 1985, 1990, 1995; Jordan, 1980, 1985, 1990, 1995; Kenya, 1970, 1975, 1980, 1985; Korea, Rep., 1970, 1975, 1980, 1985, 1990, 1995; Latvia, 1995; Lithuania, 1995; Malawi, 1970, 1975, 1980, 1985, 1990, 1995; Malaysia, 1990, 1995; Mexico, 1970, 1975, 1980, 1985, 1990, 1995; Morocco, 1970, 1975, 1980, 1985, 1990; Myanmar, 1970, 1975, 1980, 1985; Netherlands, 1970, 1975, 1980, 1985, 1990, 1995; New Zealand, 1970, 1975, 1980, 1985, 1990, 1995; Nicaragua, 1970, 1975, 1980, 1990, 1995; Nigeria, 1975, 1980; Norway, 1970, 1975, 1980, 1985, 1990, 1995; Pakistan, 1970, 1975, 1980, 1990; Panama, 1990, 1995; Papua New Guinea, 1975, 1980; Paraguay, 1985, 1990, 1995; Peru, 1970, 1975, 1980, 1985, 1990, 1995; Philippines, 1970, 1975, 1980, 1990; Poland, 1980, 1985, 1990, 1995; Portugal, 1975, 1980, 1985, 1990, 1995; Romania, 1980, 1985, 1990; Russian Federation, 1995; Sierra Leone, 1970, 1975, 1980, 1985; Singapore, 1970, 1975, 1980, 1985, 1990, 1995; Slovak Republic, 1995; Slovenia, 1995; South Africa, 1970, 1975, 1980, 1985, 1990; Spain, 1970, 1975, 1980, 1985, 1990; Sri Lanka, 1970, 1975, 1980, 1985, 1990, 1995; Swaziland, 1990; Sweden, 1975, 1980, 1985, 1990, 1995; Switzerland, 1970, 1975, 1980, 1985, 1990, 1995; Syrian Arab Republic, 1970, 1975; Thailand, 1985, 1990, 1995; Turkey, 1970, 1975, 1990, 1995; United Kingdom, 1970, 1975, 1980, 1985, 1990, 1995; United States, 1970, 1975, 1980, 1985, 1990, 1995; Venezuela, 1970, 1975, 1980; Zimbabwe, 1990, 1995.

**Table 1. The dollar wage**  
Panel data, 85 countries, 1970-95

	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	OLS	OLS	GMM
Constant	-3.14** (-7.65)	-3.20** (-7.76)	-3.90** (-10.60)	-3.04** (-7.71)	-3.24** (-7.13)
Trend	0.24** (13.42)	0.24** (12.93)	0.21** (12.18)	0.24** (13.36)	0.22** (12.11)
GDP per capita	0.76** (13.56)	0.76** (13.35)	0.84** (13.75)	0.72** (12.85)	0.77** (11.77)
Age dependency ratio	0.75** (3.10)	0.76** (3.27)	0.74** (3.44)	0.80** (3.25)	0.93** (3.76)
Gov. consump. (% of GDP)	0.42** (5.30)	0.45** (5.75)	0.52** (6.09)	0.48** (5.76)	0.43** (5.45)
Openness	0.10* (2.03)	0.09 (1.91)	0.04 (0.86)	0.09 (1.90)	0.11* (2.09)
Net foreign asset position	0.32** (3.35)	0.33** (3.31)	0.34** (3.35)	0.34** (3.31)	0.30** (3.11)
Non banks (% of GDP)					
Net foreign assets position	-0.52** (-3.81)	-0.50** (-3.50)	-0.56** (-3.46)	0.52** (-3.39)	-0.51** (-3.82)
Banks (% of GDP)					
Credit to private sector (% of GDP)	0.41** (4.28)	0.43** (4.52)	0.62** (6.26)	0.55** (4.75)	0.45** (4.31)
Democracy			0.34* (2.30)		
Regional dummies					
- Planned economies	-0.33* (-2.21)	See note			-0.29* (-1.99)
- OECD	0.52** (4.93)	0.51** (5.06)		0.53** (4.95)	0.64** (5.11)
- Former Soviet Union	-1.07** (-3.13)	-1.05** (-2.88)		-1.13* (-3.48)	-0.96 (-2.88)
Adjusted R <sup>2</sup>	0.86	0.86	0.84	0.87	0.85
Akaike	-1.34	-1.49	1.47	1.31	
Schwartz	-1.49	-1.31	1.60	1.53	
Ramsey RESET	16.5**	15.8**	20.21**	19.23**	
Jarque-Bera	47.1**	51.5**	40.55**	25.3**	
White Heteroskedasticity	1.48	1.37	1.45	1.00	
N. observations	330	330	312	330	288

Source: see data appendix.

Notes: All variables are in logs except for net asset position (% of GDP) and credit to the private sector (ratio to GDP) because these series include nonpositive entries. All regressions with White's heteroskedasticity-consistent estimator. Not reported: dummy for 1980 (columns 1,2,3). t-statistics in parentheses. One (two) stars indicate that the coefficient is significant at the 5% (1%) confidence level.

Column (2): period dummies for planned economies: 1970: -0.58\*\* (-4.33); 1975: -0.47\*\* (-5.04); 1990: -0.63\*\* (-3.80); 1995: -0.37\* (-1.97).

Column (4): Slope-shift coefficients for planned economies: GDP: -0.01 (-0.08); Age dependency: -2.76 (-1.57); Government consumption: -0.55\*\* (-2.95); Openness: -0.09 (-0.51); net foreign asset position of non-banks: -0.00 (-0.08); net foreign asset position of banks: 0.73\* (2.06); credit to private sector: -1.44\*\* (-3.92).

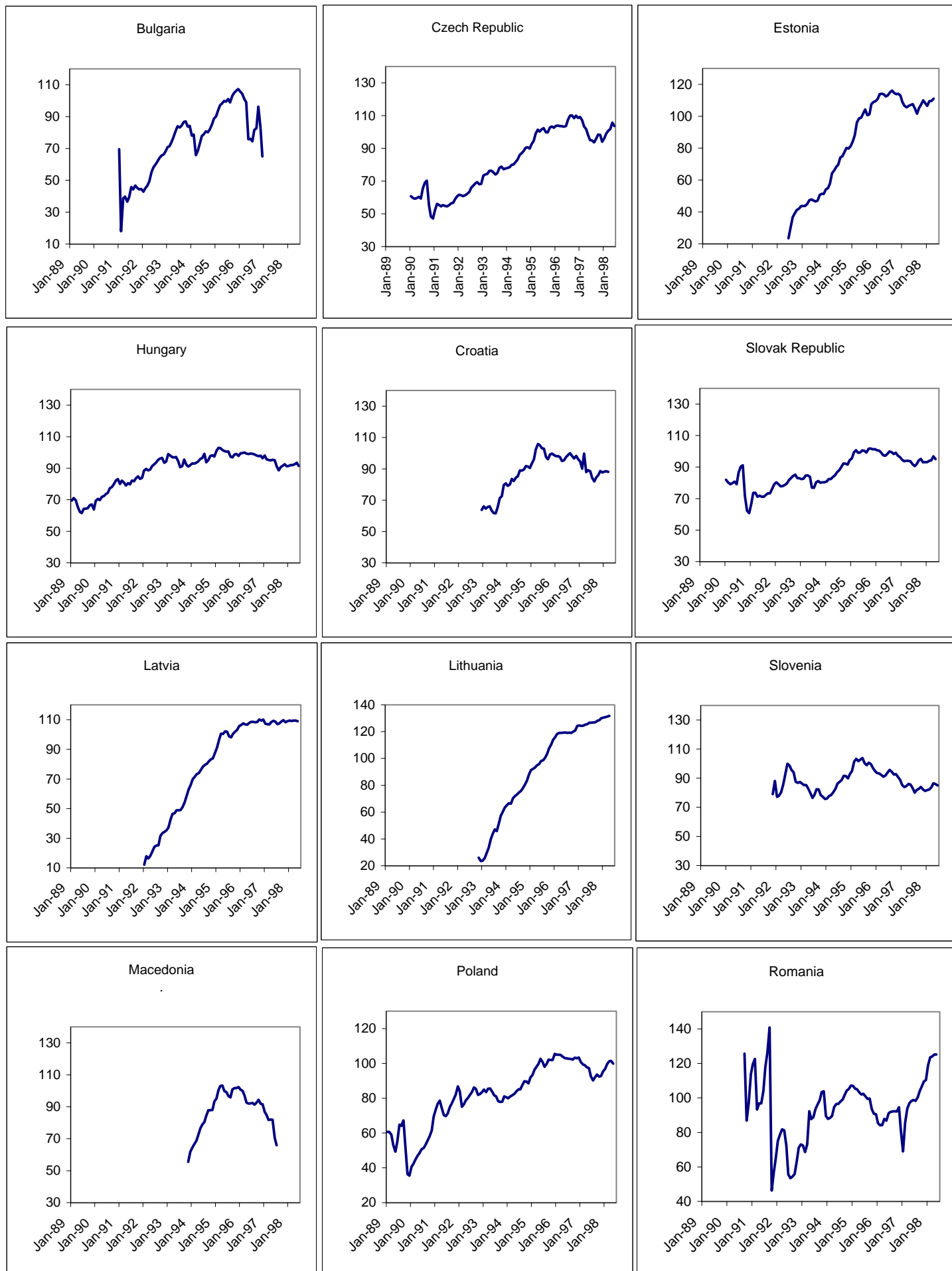
Column (5): GMM using as instruments the ratio of value added in agriculture to industry, M2/GDP, secondary school enrolment as well as time and regional dummies. Endogenous variable: GDP per capita. J-statistic= 0.04.

**Table 2. The dollar wage: stability across sample**  
Panel data, 85 countries, 1970-95

	(1) Non planned economies	(2) Planned economies	(3) Non planned economies (1985-95)
Constant	-3.05** (-7.40)	-4.85* (-2.26)	-3.53** (-5.33)
Trend	0.23** (12.46)	0.33** (4.24)	0.16** (3.21)
GDP per capita	0.73** (12.45)	1.02** (4.62)	0.87** (9.66)
Age dependency ratio	0.84** (3.18)	-1.20 (-0.64)	1.05** (2.84)
Gov. consump. (% of GDP)	0.47** (5.71)	-0.42 (-1.64)	0.31** (3.28)
Openness	0.09 (1.88)	0.01 (0.02)	0.11 (1.55)
Net foreign asset position Non banks (% of GDP)	0.32** (3.21)	0.01 (0.02)	0.30** (3.14)
Net foreign assets position Banks (% of GDP)	-0.53** (-3.51)	0.48 (1.25)	-0.61** (-4.50)
Credit to private sector (% of GDP)	0.58** (5.82)	-0.49 (-1.21)	0.60** (4.79)
Regional dummy: OECD	0.53** (4.95)		0.58** (3.92)
Adjusted R <sup>2</sup>	0.86	0.70	0.89
Akaike	-1.49	-1.56	-1.69
Schwartz	-1.35	-1.09	-1.48
Ramsey RESET	13.8**	2.85	3.34*
Jarque-Bera	69.8**	0.68	4.3
White Heteroskedasticity	1.50**	1.25	2.45**
N. observations	302	28	144

*Source and notes:* see Table 1.

**Figure 1, Real Exchange Rates**  
(CPI deflated vis a vis US\$; 1995=100)



**Figure 2. The Nontraded-Traded Price Ratio**  
(Index: 1995=100)

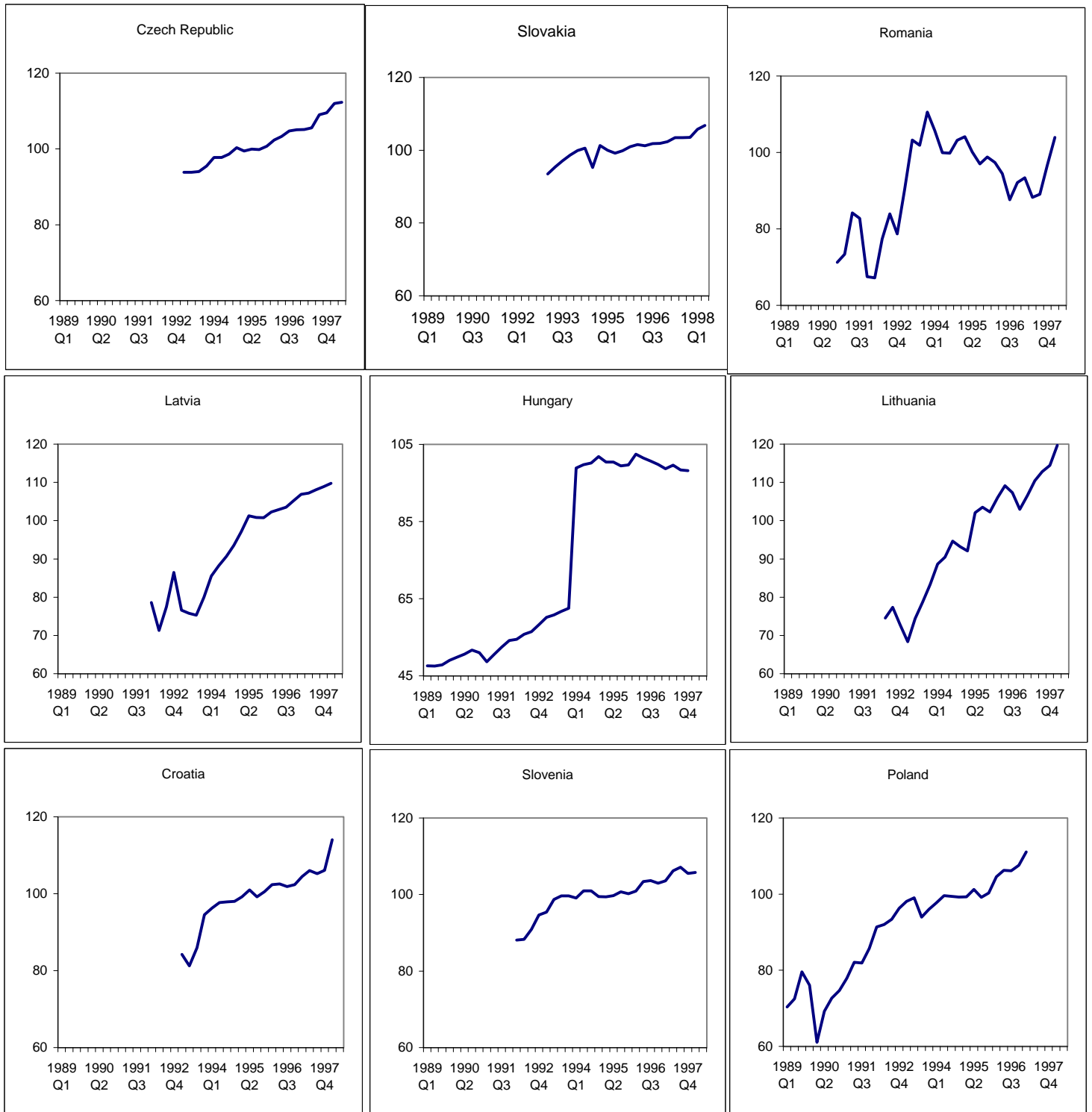


Figure 3. Equilibrium Dollar Wages

