CURRENCY CRASH AND EXCHANGE RATE PASS-THROUGH: A TALE OF TWO CRISES IN SERBIA

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Abstract

This paper demonstrates that two completely different inflation outcomes: high and low, in the

aftermath of the currency crises in Serbia in the 1980s and in 2008-2009, respectively, can be

explained by two distinct economic policy stances, which could be traced back to different

institutional environments. Thus large second-round effects of currency depreciation on inflation

are detected in the former crisis in contrast to the latter and the reported estimates suggest that

these effects are propelled by monetary accommodation and wage indexation. A side result is

that exchange rate pass-through into prices is moderate and slow in Serbia in the 2000s,

remaining unchanged even upon the currency crash of 2008-2009, and that concurs with recent

evidence for developing economies.

1. Introduction

Serbia, along with a number of other emerging markets, has experienced two large balance-of-payment (BoP) crises that have led to currency crashes, albeit with starkly different inflation outcomes. The crisis of the 1980s, which Serbia (within the former Yugoslavia) 'shared' with Latin American economies, triggered high inflation that in a number of countries, including Serbia, spilled over into hyperinflation. On the contrary, the currency crash in 2008-2009 left inflation low in most emerging economies including Serbia.

This paper attempts to explain the two completely opposite effects that large currency depreciation has on inflation by exploring two currency crises in Serbia, one in the 1980s and the recent one in 2008-2009. The conjecture we start from derives from an open economy model as advanced by Edwards (2006), which shows that wage indexation and/or an accommodative absorption policy can significantly enhance the initial pass-through from exchange rate depreciation into inflation. Thus different labor market configurations and policy responses might explain the contradictory impact that currency depreciation has on inflation. Accordingly, we estimate pass-through from exchange rate into price level, both initial and cumulative ones, while suggesting that the difference between them should capture second-round effects. Then we explore whether the size of these effects could be related to policy response and the functioning of the labor market, and more generally traced to the different institutional set-ups.

The paper is organized as follows. First econometric evidence is supplied (sections 2 to 4), and then the findings are related to institutional background in Serbia (sections 5). Specifically, section 2 explores exchange rate pass-through in the currency crash of the 1980s, while estimating the second-round effects of currency depreciation on inflation, and examining whether they can be related to wage indexation and monetary accommodation. In section 3, the responsiveness of inflation to currency depreciation in the 2000s is thoroughly examined including the impact of the currency crash of 2008 – 2009 on the size and speed of exchange rate pass-through. Section 4 assesses wage indexation and monetary accommodation in the two crises by estimating exchange rate pass-through into wages and money supply respectively. The obtained econometric evidence is then traced back to institutional set-ups, policy responses, and particularly to the monetary and wage-setting regimes behind the two episodes (section 5). Section 6 concludes.

2. Former Yugoslavia in the 1980s: Soft Budget Constraint and External Debt Crisis

Like a number of developing Latin American countries, Serbia (still within the former Yugoslavia) was also hit by the foreign debt crisis in the early 1980s. This crisis as well as the ensuing BoP one triggered an exchange rate depreciation causing a full scale currency crash.

Currency started to depreciate in the early1980s losing almost 50% nominally per year, accelerating to, for example, over 70% in one year through September 1983 (see Figure 1). When hit by a BoP crisis at the beginning of the 1980s, the real exchange rate depreciated almost 70% through 1984, before it started to recover again (see Figure 1). This indicates that Yugoslavia had experienced a full-fledged currency crisis in the first half of the 1980s.

Figure 1 about here

Title of Figure 1: Evolution of inflation, money, currency depreciation and real exchange rate in Yugoslavia (January 1980 – July 1991)

Triggered by large depreciation, inflation build up started at the beginning of the 1980s, subsequently accelerated, and finally turned into a short-lived hyperinflation in the last quarter of 1989 (see Figure 1). The inflation was briefly contained in 1990 by fixing a nominal exchange rate, albeit at the expense of sharp real appreciation (see Figure 1); nevertheless it started again in 1991. The latter coincided with the disintegration of the former Yugoslavia, which formally began in mid-1991. Average monthly inflation and currency depreciation were as high as 7% and money growth above 6% throughout this period, although they all varied considerably (cf. Figure 1).

Against the environment of the Yugoslav inflation explained above, the following structural cointegrated system is identified and estimated: [1, 2]

$$p = 0.77w + 0.28e + u \quad (1)$$

$$m = 0.93w + u' \quad (2)$$

The variables are logs of the retail price index (p), the wage rate (w), the exchange rate (e) and the money supply (m). The exchange rate (e) and the wage rate (w) turned out to be weakly exogenous in the first and second equation respectively. Thus a shock in the exchange rate, triggered by the BoP crisis, starts up a price-wage spiral (cf. eq. 1), while the money supply (m) accommodates wage (w) increases (cf. eq. 2).

The cointegration estimate of exchange rate pass-through into prices is 0.28, which is relatively low for a high inflation episode such as the one we are looking at. On the other hand, the corresponding pass-through from wages to prices is a quite high 0.77, pointing to strong interactions between wages and prices. However, since the wage rate is endogenous in eq. 1, initial shock in the exchange rate triggers wage change that feeds back into price increase leading to larger overall (equilibrium) pass-through. As the sum of cointegrating coefficients on wage rate (0.77) and exchange rate (0.28) is not significantly different from one, the overall (equilibrium) pass-through might be complete i.e. equal to one.[3,4] We now check this by estimating cumulative pass-through coefficients.

Cumulative pass-through is assessed using the exchange rate and price level impulse response functions, while employing both standard and structural VAR models. Namely, the identified structural cointegrated system above (1) and (2) suggests similar contemporaneous, short-run relations between corresponding variables. Upon testing, the following two structural VAR models are not rejected by the data, where the estimated contemporaneous relations between corresponding variables read as follows:[5]

$$p = 0.22w + 0.09e + u_1 \qquad (3)$$
$$(7.33)\ (2.25)$$

$$w = 0.14e + u_2 \qquad (4)$$
$$(1.40)$$

$$m = 0.15w + u_3 \qquad (5)$$
$$(1.67)$$

and

$$p = 0.11e + u_4 \qquad (6)$$
$$(2.75)$$

$$w = 1.23p + u_5 \qquad (7)$$
$$(7.23)$$

$$m = 0.15w + u_6 \qquad (8)$$
$$(1.67)$$

Note: *t*-ratios are in parentheses

Both specifications capture well the inflation dynamics of the 1980s and concur with the structural cointegrated system above. Nevertheless, it seems that the second specification, besides being statistically superior, gives a better explanation of the inflation dynamics in the 1980s. Namely, it plausibly implies that an initial shock in the exchange rate passes through into prices, and subsequently wages index to the latter. A side result from the estimated contemporaneous relations is an assessment of the short-run exchange rate pass-through being 0.09 and 0.11 over a month.

Estimates of cumulative pass-through, reported in Table 1 are the ratios of respective impulse responses (p_{t+j}/e_{t+j}), and they are obtained using both estimated structural VAR models alongside ordinary ones. [6]

Table 1 about here

Title of Table 1:

Cumulative pass-through from exchange rate to prices: Impulse response (p_{t+j}/e_{t+j}), January 1980 – July 1991

Pass-through estimates are almost identical across various VAR specifications, thus suggesting the robustness of the estimates. The short-run pass-through, over one month, of 0.14 is close to the corresponding estimates obtained above. The size of the pass-through increases rapidly over time, thus being 50% for three months and becoming almost complete, i.e. equal to 1, over 18 months. Thus the conjecture above, that small initial impact of exchange rate on prices (0.28) is enhanced via resulting increase in wages leading to complete overall (equilibrium) pass-through

is borne out by the obtained estimates. These findings indicate the presence of considerable second-round effects.

3. Serbia in the 2000s: Pursuing Transition and Experiencing Currency Crisis in 2008-2009

As other emerging European countries in the 2000s, Serbia also received large inflows of foreign capital, however on a relatively much higher scale, as shown by its huge current account deficit - above 15% of the GDP.[7] The latter is comparable only to deficits in Bulgaria and the Baltic countries. Great capital inflows led to additional appreciation of domestic currency in Serbia, but also in other emerging European countries.[8] After the outbreak of the world financial crisis in September 2008, and the consequent sudden stop of the capital inflows, currency sharply depreciated against the Euro in a number of emerging European countries. Thus in Serbia currency depreciated nominally 22.6% in the five months from October 2008 through February 2009. In the same period, currency depreciated in Poland 30.9%, Hungary 20.4%, Romania 19.4%, Czech Republic 11.2% etc. Nevertheless sharp depreciation did not trigger inflation.[9] Since most of these economies also experienced a considerable loss in foreign currency reserves, these episodes may qualify as currency crashes.

To wit, currency crises are defined in floating regimes as substantial depreciation e.g. more than 15% (Reinhart and Rogoff, 2008) or 25% (Frankel and Rose, 1996) annually, while in the case of managed float – as considerable depreciation combined with loss of central bank foreign currency reserves (Kaminsky, Lizondo and Reinhart, 1996, and Calvo, 2006). Serbia suffered both a large currency depreciation of 22.6% and a loss of its foreign currency reserves equal to 13%, hence it underwent a full-blown currency crisis in 2008 – 2009.

Against the backdrop described above, we shall examine the size and speed of exchange rate pass-through in Serbia in the 2000s. The relation used for the 1980s (eq. 1) will be now augmented with the price of oil in USD (*p\$oil*) since it has varied significantly throughout the 2000s, greatly affecting inflation in emerging economies, while the other relation (eq. 2) is skipped as it broke down in the 2000s.[10]

An assessment of the pass-through coefficient is obtained using cointegration analysis. The monthly sample employed starts in July 2001 in order to avoid impact on price level of large administrative price adjustments and extensive tax reform in the first half of 2001; it ends in August 2009, thus encompassing the large currency depreciation triggered by the sudden stop in the last quarter of 2008. Results, obtained using the Johansen (1996) cointegration procedure, are given in Table 2.

Table 2 about here

Title of Table 2:

Cointegration among the price level (*p*), exchange rate (*epe*), wage rate (*w*) and price of oil (*p\$oil*) July 2001- August 2009

Note to Table 2: *epe = e + pe*, i.e. the log of dinar/euro exchange rate (*e*) plus the log of foreign (EU) price level (*pe*). Cointegration analysis is performed within a partial VAR model such that wages and oil prices are treated as weakly exogenous variables. Weak exogeneity of these two variables is detected in the first step of the cointegration analysis when an ordinary VAR model is used. Cointegration space accounts for the break in the trend function such that includes non-zero values 1,2,... from 2008:7 on. A constant term enters the VAR model unrestrictedly. There are three lags in the VAR model. The model contains eleven dummy variables. Seven of them take a non-zero value 1 for 2002:7, 2004:12, 2005:1, 2006:7, 2006:10,11, 2008:10,11 and 2009:5, while four of them account for transitory blips, such that they take non-zero values 1/ -1 for the following months: 2007:3/4; 2008:1/4 and values -1/ 1 for 2007:10/11;

2008:12/2009:1,2. The 5% critical values for the trace test are simulated using CATS in RATS (Dennis, 2006). Critical values are: 32.21 (r=0) and 16.53 (r≤1).

The tests reported above show the presence of cointegration, giving the following estimate of a long-run price equation:

$$p = 0.24epe + 0.32w + 011p\$oil + 0.01t\ (2008.07) - 0.146\ + u''\qquad (9)$$

Thus cointegrating price relation (3) holds throughout the 2000s including the currency crash of October 2008 – February 2009, albeit with a trend variable (*t*) from July 2008 onwards.

Moreover, a thorough inspection of the estimated relation (3) indicates that its coefficients are stable. Stability of cointegration parameters is assessed by two recursively computed tests: one that tests that sub sample of cointegration parameters are equal to the full sample cointegration parameters (cf. Figure 2), and the max test of constant cointegration parameters (cf. Figure 3) (cf. Hansen and Johansen, 1999, Juselius, 2006).

Figure 2 about here

Title of Figure 2: Recursively computed test to determine if sub sample cointegration parameters are equal to the full sample cointegration parameters

Note to Fig. 2: X stands for the model with the original variables while R denotes results based on variables corrected for short-term dynamics and interventions (cf. Juselius, 2006). The 5% critical value is associated with χ_5^2 distribution.

Figure 3 about here

Title of Figure 3: Recursively Computed Max Test of Constant Cointegration Parameters

Note to Fig. 3: X stands for the model with the original variables while R denotes results based on variables corrected for short-term dynamics and interventions (cf. Juselius, 2006). The 5% critical value is provided by simulation in Dennis (2006) since the distribution of this test-statistic is non-standard.

Values of both test-statistics are divided by the respective 5% critical value, and hence the obtained magnitudes that are less than one suggest parameter stability. It follows that the null hypothesis implying the constancy of cointegration parameters throughout the whole sample cannot be rejected (Figures 2 and 3).

Thus the cointegration estimate of exchange rate pass-through into domestic prices turns out to be low in Serbia in 2000s: 0.24. In addition the estimated pass-through coefficient, as demonstrated in Figures 2 and 3 above and particularly in Fig. 4 below, remains stable even in a period of sharp currency depreciation (October 2008 – February 2009) in Serbia. Namely, estimates of the pass-through coefficient presented in Fig. 4 indicate that its value does not change for the sample excluding the period of crisis (i.e. through summer 2008) and the one that includes it (i.e. through summer 2009).

Figure 4 about here

Exchange rate depreciation, besides spilling over directly into price level, can also trigger second-round effects, thus enhancing its impact on domestic prices. This cumulative pass-through of exchange rate into prices can be captured by their respective impulse response functions obtained from the estimated VAR model containing variables entering the cointegrating relation above. Results are reported in Table 3.

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Table 3 about here

Title of Table 3:

Cumulative pass-through from exchange rate to prices: Impulse response (p_{t+j}/e_{t+j}), July 2001–August 2009.

Note to Table 3: Estimates are derived from a VAR model of order 4 that contains five impulse dummy variables (that take only non-zero value 1 for: 2002:7, 2003:4, 2005:1, 2006:7 and 2008:10/11 respectively) and seasonal dummy variables for December and January. Additionally, another dummy is included that takes values -1 for 2008:12, 1 for 2009:1/2 and 0 otherwise.

Estimates of cumulative pass-through in the 2000s show that it is modest, slow and incomplete. Thus in a year's time less than 30% depreciation has been passed into price increase, while it reaches 60% only after four years. Moreover, estimates of cumulative pass-through are not that different from the long-run one obtained within cointegration framework (0.24): at a one-year horizon they are very close: 0.28 vs. 0.24, and they still do not deviate strongly after two years. These comparisons of respective pass-through estimates suggest that the impact of second-round effects is not strong in Serbia in the 2000s.

4. Assessing the Role of Wage Indexation and Monetary Accommodation in the Two Currency Crises

Comparing the size of the exchange rate pass-through obtained in the two currency crises that Serbia has experienced shows that while the cointegration estimates are almost equal in both episodes, the cumulative ones diverge sharply (see Table 4). As to the latter, the results show that in the 2000s, the cumulative impact of depreciation is slow and incomplete, which is quite the

opposite of the swift and complete cumulative pass-through in the 1980s. This suggests that second-round effects were small in the former episode, while hugely pronounced in the latter.

Table 4 about here

Title of Table 4: Exchange Rate Pass-through in Two Currency Crises

The large discrepancy between the cointegration and cumulative pass-through estimates in the 1980s could be due to wage behavior and monetary policy that triggered sizeable second-round effects. Specifically, it can be shown, within an open economy model (e.g. Edwards 2006), that if currency depreciation sets off a raise in wages and/or a accommodative absorption policy, prices of nontradables will increase and therefore the total pass-through from exchange rate into domestic prices will go up.[11] We shall explore whether this is the case in the 1980s episode by assessing the degree of wage and money supply accommodation to exchange rate depreciation. A large impact of exchange rate depreciation on wages and money supply would point to pronounced wage indexation and monetary accommodation respectively, leading to large second-round effects.

Technically cumulative pass-through from the exchange rate into wages and money supply over different time horizons are calculated from the very same VAR models already used for determining pass-through into the price level (cf. Table 1). The results are reported in Tables 5 and 6.

Table 5 about here

Title of Table 5:

Pass-through from exchange rate into wages: Impulse response (w_{t+j}/e_{t+j}),

January 1980 – July 1991

Table 6

Title of Table 6: Pass-through from exchange rate into money supply: Impulse response (m_{t+j}/e_{t+j}), January 1980 – July 1991

The obtained results are almost uniform across various VAR specifications and orderings, showing that wages and money supply react strongly to exchange rate depreciation. Thus, exchange rate pass-through into wages is almost the same as into prices, and the impact on the money supply is only somewhat lower (cf. Tables 5 and 6). All this indicates the presence of widespread wage indexation and monetary accommodation in the 1980s.

In the 2000s, second-round effects sharply decreased as the cumulative pass-through was close to the cointegration one (see Table 4). The latter indicates that accommodative policy has been significantly reduced.

In support of the above, we obtained that, in the 2000s, cumulative impact of exchange rate on wages is just 10% over one year, and one third over two years (see Table 7). Moreover, estimates suggest that an exchange rate shock does not spill over completely into wages even after four years. These results hold notwithstanding large and rapid depreciation during the currency crash of 2008-2009. This low wage accommodation in the 2000s greatly contrasts with corresponding wage adjustments in the 1980s: 80% in a year's time, and complete (104%) over two years (see Table 5).

Table 7 about here

Title of Table 7:

Pass-through from exchange rate to wages: Impulse response (w_{t+j}/epe_{t+j}), July 2001 – August 2009

Note to Table 7: Estimates are derived from VAR model of order 4 that contains five impulse dummy variables (that take only non-zero value 1 for: 2002:7, 2003:4, 2005:1, 2006:7 and 2008:10/11 respectively) and seasonal dummy variables for December and January. Additionally, another dummy is included that takes values -1 for 2008:12, 1 for 2009:1/2 and 0 otherwise.

5. Two Currency Crises: Institutional and Policy Background

Econometric evidence presented above supports our conjecture that wage indexation and monetary accommodation can account for starkly different inflation outcomes in the aftermath of the two currency crises considered. We now turn to examine whether monetary and wage setting regimes and, more broadly, the policy and institutional backdrop of the two episodes can explain diverse money supply and wage responses upon currency crash.

Institutional set-ups in Serbia during the 1980s (within former Yugoslavia) and the 2000s respectively differ widely. Yugoslavia in the 1980s, with its labor-managed market economy, can be envisaged as a country in early transition.[11] Serbia in the 2000s had undertaken extensive structural reforms that put in place a full-fledged market economy.

The main features of the Yugoslav labor-managed system, relevant for its monetary and wage setting regimes in the 1980s, were socialization of losses instead of risk-bearing by individual firms, inefficient and unusually rigid labor market (cf. Estrin and Uvalic, 2008, and Estrin, 1991), and endogeneity of money supply that basically validated firm's wage, price and

investment decisions (cf. Tyson, 1980). Thus when BoP crisis hit Yugoslavia at the beginning of the 1980s, the consequent sharp and swift depreciation led to inflation. Namely, neither labor market nor financial accountability of firms was in place to contain the wage rise, hence making leeway for a wage-price spiral. Domestic banks were forced to validate this wage indexation, and support firms that would otherwise go bankrupt thus causing large unemployment and social unrest.[13] However, since sudden stop had dried up the inflow of foreign loans previously used to support the economy, banks had now to resort to the central bank credits to socialize the losses of the enterprise sector in order to prevent widespread bankruptcy.[14] Faced with a crisis that lasted the whole decade, the government didn't opt for structural reforms to address it, but rather to keep the system going while monetizing its losses (i.e. quasi-fiscal deficit) with ever increasing money supply. Consequently, a dependent central bank was forthcoming to domestic banking sector demands for additional loans, hence rising money supply to accommodate the wage-price spiral and finance the enterprise sector's quasi-fiscal deficit.[15] Obviously, all this led to high and persistent inflation that lasted the entire decade of the 1980s.[16]

Thus the aforementioned stylized facts on institutions, policies and related monetary and wage setting regimes in the 1980s, do support our econometric evidence that suggests the presence of monetary accommodation and wage indexation (see section 2). Moreover, the policy response to and dynamics of the crisis in the 1980s, outlined above, concur with econometric evidence indicating large and swift pass-through from exchange rate into wages and money supply (see section 4).

As a latecomer, Serbia commenced comprehensive economic reforms at the beginning of the 2000s, which included macroeconomic stabilization, trade and price liberalization, privatization, bank restructuring, fiscal and labor market reforms etc. After almost a decade-long period of

abundant inflow of capital in the 2000s, Serbia again experienced a sudden stop and consequent currency crash in 2008 - 2009. However, due different institutional set-up the impact of this crisis sharply differs from the one in the 1980s.

Wage indexation was muted this time since large and swift currency depreciation during the 2008 – 2009 crisis (see section 3) had not set off increase in wages. Thus nominal depreciation of 22.6% in five months (October 2008 to February 2009), was followed by a moderate increase in the average nominal wage of only 3.5% during all of 2009.[17] This concurs with econometric evidence, obtained for the whole 2001-2009 sample (see Table 7 above) indicating a small pass-through from exchange rate into wage rate. Increased financial accountability and a relatively flexible labor market precluded the emergence of a wage-price spiral in the private sector. The main adjustment in this sector to the BoP crisis took place through an increase in unemployment, and just partly by containing wage rise: the unemployment rate had risen from 14% in 2008 (April) to 20.1% in 2010 (April) while the average wage in the private sector increased 6.5% nominally over 2009.[18] On the contrary, in the public sector due to the absence of an effective (flexible) labor market, the main adjustment took place via a drop in real wages (and pensions) as government froze nominal wages and pensions in the wake of the crisis. This impeded wage (and pension) indexation, demonstrating even further the sharp turnaround in government policy stance compared to that of the 1980s.

The monetary response to the 2008-2009 crisis, contrary to that of the 1980s, was not accommodative. Broad money (M2) abruptly reversed its trend in 2008-2009 by sharply decreasing the nominal growth compared to pre-crisis dynamics: from approximately 40% per year to 15%. This severe slowdown in M2 growth was mainly due to a rapid halt in bank lending in 2009, itself caused by a sudden stop in foreign capital inflow, and some withdrawal of

domestic deposits from the banks. The banks' response was mitigated by regional coordination, the so-called Vienna initiative, which prevented outflow of capital. The National bank of Serbia, on its part responded to sharp currency depreciation by swiftly increasing its policy interest rate by two percentage points to 17.75% in November 2008 and by keeping it very high through March 2009 (16.50%) i.e. until the exchange rate had stabilized. Accordingly, both the Central bank and the banking system in Serbia reacted with monetary contraction to the crisis in 2008-2009. Again this stands in sharp contrast to the monetary policy and banking sector reaction to the crisis in the 1980s.

The findings above that refer to the period of the crisis support econometric estimates for the 2000s that are mainly based on a pre-crisis sample (see section 3 and Table 7 in section 4). Thus as the aforementioned discussion suggests, the obtained moderate and slow pass-through from exchange rate into wages during the 2000s (cf. Table 7) still holds during the 2008-2009 crisis. This is also confirmed by a crude estimate of the corresponding pass-through coefficient into wages obtained as the ratio of wage increase in 2009 over currency depreciation during the currency crash (22.6). The estimate for the whole economy is : $3.5/22.6 = 0.15$, while for private sector: $6.5/22.6 = 0.29$, and they are both broadly in line with those reported in Table 7 for the period from 12 to 18 months.

Moreover, the cointegration estimate of exchange rate pass-through into price level (0.24), which is also dominantly based on the pre-crisis sample (see Table 2), is likewise vindicated by developments during the 2008 -2009 crisis. Thus stability analysis (cf. Fig. $2 - 4$,) suggests that pass-through coefficient as well as the whole price (cointegation) relation have not exhibited a structural break during the crisis period. This concurs with the discussion above showing that large depreciation (22.6%) has not sparked high inflation (only 6.6% over 2009). Thus a crude

estimate of the pass-through coefficient after the currency crash for 2009 is 6.6/22.6 = 0.29, and it is very close to the cointegration estimate of 0.24, but also to cumulative estimates over one year : 0.28 and 0.26 (see Table 3).

6. Conclusions

This paper finds that totally opposite inflation patterns--high and low, in the aftermath of currency crashes in the 1980s and in the 2008-2009 respectively--can be attributed to a change in the economic policy regime in Serbia. Specifically, it has been found that differences in policy responses and the functioning of the labor market can explain the two contradictory inflation outcomes. Namely, the second-round effects of currency depreciation on inflation in Serbia are found to be large in the aftermath of the crash in the 1980s, while they are practically nonexistent in the recent episode. Thus, while the cointegration estimates of the pass-through coefficient from exchange rate into price level are similar in both episodes, the cumulative one, capturing second-round effects, is much higher in the 1980s episode. It has been shown that these high second-round effects come from a large and swift pass-through of currency depreciation into money growth and wage increase respectively, as demonstrated by the estimates of the corresponding cumulative pass-through coefficients. Accordingly, the findings indicate the presence of an accommodative monetary policy and wage indexation in the Serbian currency crash in the 1980s, and their absence in the aftermath of the 2008 -2009 crash. These results also concur with predictions of an open economy model (cf. Edwards 2006).

In comparative perspective, our findings concur with those for a set of emerging European economies: Hungary, Slovenia, Poland and Czech Republic, where the link between the size of

exchange rate pass-through and nature of macroeconomic policy has been also discovered (See Coricelli et al., 2006, and Brezigar-Masten and Masten, 2009). Thus it is shown that Hungary and Slovenia, while pursuing accommodative monetary policy aimed at real exchange rate targeting, exhibit complete exchange rate pass-through, while the opposite case is that of Czech Republic with non-accommodative monetary policy and consequent low pass-through (Poland is somewhere in between).

A complementary finding of this paper, that the magnitude of pass-through decreases with inflation obtained for Serbia over time (i.e. the 2000s vs. the 1980s), agrees with cross-country result obtained for a set of new member states of the EU indicating positive relation between the degree of exchange rate pass-through and inflation (Maria-Dolores, 2009). This Taylor's (2000) hypothesis has been also vindicated for other emerging economies where the observed decline in pass-through (cf. Frankel et al. 2005, and Choudhri and Hakura, 2006) has been related to decrease in long-run inflation (cf. BIS 2002).

ENDNOTES

[1] Cf. Johansen, 1996, and Juselius, 2006.

[2] See Petrovic and Mladenovic, 2000, Table 4, p.504.

[3] The hypothesis is accepted: chi2(1)=0.24(0.62), within the cointegration subsystem of three variables (prices, wages and exchange rate) with exchange rate being weakly exogenous.

[4] This implies that the exchange rate changes feed fully into wages, which we found to be the case (see table 5 below). We thank referee for stressing the relevance of coefficient on the wage rate for determination of overall exchange rate pass-through.

[5] See Petrovic and Mladenovic, 2000, pp. 509 and 510.

[6] Thus pass-through over j months is calculated as p_{t+j}/e_{t+j}, where p_{t+j} and e_{t+j} are respectively impulse responses of the price level and the exchange rate to the initial exchange rate shock.

[7] Large capital inflows in emerging Europe is documented and analyzed in Abiad et al. 2009, Berglof et al. 2009, and *Wither Growth in Central and Eastern Europe?*, Bruegel Blueprint 11, 2010. Cf. *Quarterly monitor of economic trends and policies in Serbia*, 2007 – 2011.

[8] However, Slovenia and Hungary tried to prevent currency appreciation by implicitly targeting real exchange rate that led to accommodative monetary policy. Cf. Coricelli et al., 2006, and Brezigar-Masten and Masten, 2009.

[9] It might be that only above certain threshold value currency depreciation spills over into inflation. Evidence for Croatia (Tica and Posedel, 2009) lends some support for this conjecture, where point estimate of threshold monthly depreciation is found to be 5.91%, albeit with huge 95% confidence interval running from 2.7% to 21.8%. Average monthly depreciation in the episodes above are somewhat below (except Poland) 5.91% threshold value.

[10] Cf. IMF, 2008, chapter 3.

[11] Cf. Edwards, 2006, pp. 5 and 6.

[12] For a recent review of the Yugoslav system and the related labor-management theory see Estrin and Uvalic (2008), and also Estrin (1991). Thus in hindsight Bergson's (1967) early perception that 'market socialism has been materializing … as successor not to capitalism but to central planning under socialism' (p. 571) proves to be correct.

[13] Interestingly, the similar pattern emerged early in Russia's transition. Thus, after the 1987 enterprise reform, wages rose sharply and firms started to rely more heavily on direct central bank credits (cf. Sachs, 1995). In addition, a correlation was found between wage growth and lagged credit growth to the enterprise sector in Russia (cf. Wolf, 1993), supporting the aforementioned stylized facts.

[14] Large inflows of capital in the 1970s are shown by huge increase in Yugoslavia's external debt: from US$2 billion in 1970 to US$18 billion in 1980. See Estrin and Uvalic, 2008, p. 667.

[15] Hence endogeneity of money supply that Tyson (1980) detected even before the 1980s crisis.

[16] Cf. Petrovic and Mladenovic (2000).

[17] Data sources in this section are: Statistical Office of the Republic of Serbia, National Bank of Serbia, and *Quarterly monitor of economic trends and policies in Serbia*, 2008-2009.

[18] Labor Force Survey is conducted twice a year: in April and in October.

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