INTERNATIONAL DIFFERENCES IN PRICE LEVELS: AN EMPIRICAL ANALYSIS*

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1 INTRODUCTION

The tentative notion that there are substantial differences in the prices of products in different countries can be easily supported even by our own travel experience. If instead of a single product, one considers all products of a national economy, then one can also talk about differences in national price levels. Equal price levels across nations should be ensured by the law of one price. This is clearly not the case in the real world.[1] On the contrary, one can find the tendency of the poorer countries to have a lower national price level and of wealthier countries to have higher prices. The question is how to explain the differences in national price levels and how to approach accounting for these differences?

The national price level reflects the ratio of the purchasing power parity and the market exchange rate: PL=PPP/e. Initially, it seems

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[1] *See, for example, Engel (1993), Engel and Rogers (1996) for empirical investigation, and UN Statistical Commission and Economic Commission for Europe (1997) or Table A1 in Appendix for recent data.*

reasonable to explain the national price level exclusively through factors that influence the denominator, i.e. the nominal exchange rate. In Croatia, the explanation for fairly high price levels could simply be the following: the price level is high because the exchange rate for the HRK (kuna) is "strong" and the research agenda could be reduced to the search for factors that affect the nominal exchange rate. However, what about the numerator, the purchasing power parity, i.e. the relation between domestic and some foreign prices? The market exchange rate and the purchasing power parity are often affected by the same factors. For example, policy measures that would result in nominal depreciation of the national currency could also lead to higher inflation than in other countries. Depending on the relationship between the two parameters, relative inflation and exchange rate, the national price level will also change. Therefore, it seems more appropriate to focus on explaining both factors at the same time, i.e. on explaining the national price level.

This paper discusses the possible determinants of national price levels. Subsequently, the statistical variables that represent certain determinants were identified, and then the cross-country regression analysis is undertaken. Through the different regression specifications one can get an insight into certain factors that have possibly led to a relatively high price level in Croatia.

2
POTENTIAL DETERMINANTS OF NATIONAL PRICE LEVELS

Theoretical and empirical literature on the explanation of national price levels usually point to real income, natural resources, size and openness of a country and abundance of human resources as important factors. Besides those, the possible influence of foreign trade balance, tourist receipts, fiscal factors and transport costs are considered. The indicators of monetary policy (growth of money supply, inflation rate) are not frequently used, primarily because their impact is considered to be transitory and they can not explain the long-term differences in price levels among different countries. Thus, the analysis is generally directed towards structural factors of influence.

Real income

The real GDP per capita is the key structural variable that, according to most empirical studies, accounts for the major part of international differences in price levels. In theoretical models the positive correlation between the price level and the real income is often considered as a function of relative price of nontradables. The assumption is that the prices of tradables are mainly equalized across countries through international trade, and therefore the differences in total price levels are a result of different price levels of locally traded goods (nontradables).

The first and the best known model that explains the differences in price levels was developed in the pioneering works of Balassa (1964) and Samuelson (1964). The model is based on an empirical observation of higher price level in high-income countries. According to Balassa and Samuelson, the reason for this is not an absolutely higher level of productivity in high-income countries, but their relatively higher productivity in the tradable goods sector, compared to the nontradable sector. Nontradable goods are mainly service-intensive, which leaves less space for the technological superiority of rich countries.

What are the possible effects on price levels of productivity growth in the tradables sector in a small open economy (assuming that the exchange rate is fixed). According to Balassa-Samuelson "differential productivity model", productivity growth in tradables sector would not affect domestic prices because prices of tradables are under the dominant influence of world prices and the fixed exchange rate. However, there would happen some wage growth in that sector. Due to dependency of wages in both sectors, nontradable goods sector must also increase wages. As the productivity growth in the nontradables sector is smaller than in the tradables sector, a wage growth in that sector is only possible through the increase of prices of their products. Thus, prices of tradables are unchanged whereas that of nontradables will increase. This will result in the rise of the aggregate price level, i.e. in the real exchange rate appreciation. Historically, such disproportional growth by sectors has been more prominent in the high-income countries. Therefore, their price level is higher than that of the low-income countries.

Bhagwati (1984) developed a somewhat different theory, which also suggests that a rich country will have a higher price level than the poor one. Unlike the Balassa-Samuelson assumption that rich countries are relatively more productive in the tradable goods sector, this theory assumes that the capital-labor

ratio is higher in rich countries (which is made possible by the assumption about the imperfect mobility of capital and labor). Due to a higher capital/labor ratio and a higher marginal productivity of labor, wage level in rich countries is higher. In poor countries, where labor is abundant, labor-intensive goods and services (nontradables) can be produced at relatively low cost. Therefore, these goods are relatively cheaper in a poor country. Faster development and larger accumulation of capital in the tradables sector will boost wages, in both tradables and non-tradables sector. As non-tradables sector has a slower productivity growth than the expanding sector of tradables, its relative prices will grow. Thus we again reach the same result. Measured by a common currency, price levels in rich countries are higher. Fast-growing economies usually have a relatively higher rise of national price level than the other ones.

Apart from the two main theories that emphasize supply side in quest for explanation why richer countries have higher price levels, there is also the third hypothesis, which emphasizes the role of the demand. Bergstrand (1991) suggests that luxury goods (or, conversely, necessity goods) have an income elasticity higher (lower) than 1. Therefore, the price level could be higher in countries with a higher income per capita because nontradables are considered as a luxury goods, whereas tradable goods are considered as basic goods.

In empirical research, all three aforementioned mechanisms (structure of demand, productivity and capital abundance) are usually considered to be functions of the real GDP per capita. That simply explains why that indicator is regularly used as explanatory variable for international differences in national price levels, regardless of the theoretical background of empirical test.[2]

Openness

Kravis and Lipsey (1987) suggest that the degree of openness of an economy could influence the price level. They consider foreign trade ratio (the share of imports and exports of goods and services in GDP) as an indicator of openness, although they are also testing the share of the foreign trade in the part of GDP that refers to the sector of tradables production. A higher openness of a country should decrease differences in price levels that exist among that country and their trading partners. Trade equalizes not only prices of tradables, but it also

[2] *Some other factors' influence on price level again can be summed under the influence of real income. Clague (1986) in his model of specific factors finds a positive correlation between national price level, natural resources and efficiency parameters. Lacking more appropriate indicators for abundance of natural resources and efficiency level, in his empirical analysis he considers real GDP per capita.*

affects the prices of nontradables by increasing the price for relatively abundant factor, and by lowering the price of relatively scarce factors. If in poor countries labor is relatively abundant and if nontradables industry is mainly labor intensive, price effects of greater openness can be summarized as follows. Among the countries with equally low income, the country with a higher level of openness would have higher prices of nontradable goods, as well as a higher aggregate price level. Among the countries with equally high income, the country with a higher level of openness will have lower prices of nontradables and altogether a lower price level. Thus, the high propensity to foreign trade will lead a country's national price level closer to the world average.

Clague (1988) disputes such arguments, arguing that they do not explain why some countries have a higher foreign trade ratio and others a smaller one. A higher ratio does not necessarily mean a higher degree of free trade just as a smaller share does not indicate a higher degree of autarky. Thus, Kravis and Lipsey's assumption that poor countries with a higher foreign trade ratio have a higher price of labor than poor countries with a smaller ratio does not apply. In general, Clague mentioned that it is hard to find any formal model that would consistently point to such result. Depending on the determinants of openness, different models can have opposite effects on the national price level.

Clague quotes two models of foreign trade. Within the first model, Clague's own specific-factor model, possible determinants of openness are: a) resource abundance, b) resource diversity and c) trade barriers. Two countries with the same population and the same income per capita would have different foreign trade ratio depending on prevailing determinant. With the determinant a) in place, the country with greater resource endowment would have a higher foreign trade ratio, which would then be associated with a higher national price level. With determinant b) in place, the country with more diverse resources would obviously be more self-sufficient, and would have a smaller foreign trade ratio. However, from the model it is not clear how that should affect the national price level. If different trade ratios across countries can be explained by determinant c) then, other things being equal, in the country with higher trade barriers this ratio will be smaller. The country with higher import barriers, (which today are more significant than export barriers) in the specific-factor model will also have a higher price level. In other words, in price level regressions the expected coefficient on foreign trade ratio would be negative. It can be seen that within the specific factor model, association between foreign trade ratio and price level could be positive, zero or negative, depending on whether the differences in ratios between countries are determined by the abundance of resources, resource diversity, or trade barriers.

Another model mentioned by Clague (1988) is the capital-labor model of Bhagwati (1984) in which labor and capital are the only factors of production. In this model, resource variable cannot explain the difference in foreign trade ratio because there are no natural resources in this model. Trade barriers could possibly account for it. In that case, regression coefficient on the foreign trade ratio should be positive. Namely, in equally poor countries, the country with higher trade barriers (and lower foreign trade ratio) would also have lower prices of the abundant factor (labor) and higher prices of scarce factor (capital). As a result relative prices of services will be lower, as well as national price level. Such assumption is in accordance with the previously mentioned Kravis and Lipsey's hypothesis. However, Clague (1988) states that the application of this model to testing the effects of import taxes for countries with fixed exchange rate regime and fixed prices of local goods (which is one of the characteristics of the early phases of transition in many transition countries) could yields a different result.

It can be seen that theory does not provide a clear answer to the question of the expected sign of the regression coefficient for the foreign trade ratio, if real income is one of the explanatory variables in regressions for the price level.

Product share of non-tradables

Kravis and Lipsey (1987, 1988) also use the product share of services to explain the differences in national price levels. Higher share implies a higher price level. This is explained by the rigidity of substitution between tradables and nontradables. Therefore, a higher share of nontradables in GDP reflects the fact that prices of local goods are high. The problem with this variable comes from the fact that relative price of nontradable goods is an endogenous variable, therefore, explanation of this relative price must be provided. Factors explaining prices of nontradables are basically the same as factors that explain the overall price level (for example, real income). Thus, inclusion of the product share of services or nontradables into price level regressions does not contribute much to discovering the factors that affect the national price level.[3]

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[3] *The share of service sector in GDP is truly a function of a real income, but only in the case when the structure of the nominal GDP is considered. If the structure of GDP is considered in real values, i.e. after the corrections for purchasing power parity, then the share of services (nontradable goods) is almost identical for all countries, regardless of the size of the real income and accounts for around 30 percent (Kravis, 1984).*

Country Size

One of the possible variables influencing the general price level is the size of a certain country. If the size of a country is measured by its population size then one can expect that with a larger number of economic agents, there would be less favorable condition for the operation of monopoly or limitation of competitive practice. The price level in that case should be lower.

If, however, the size of a country is considered as an indicator of economies of scale, i.e. if we assume that there would be increasing returns in the production of tradable goods, then a larger economy (provided other factors being constant) has a higher level of income and a relatively higher price of nontradables. Therefore, the general price level will also be higher. Even if we imagine two countries with equally high real income as a consequence of economies of scale in the production of tradable goods, as well as of equal total factor productivity (which is the same for tradable and local goods), the wages will be higher in a larger country due to a relatively higher productivity in tradable goods. Because of that, nontradable goods in that country would be more expensive and the national price level higher.

Transportation costs

Transportation costs could influence the difference between domestic and world prices of tradable goods. However, the effect on prices is different in the case of transportation costs for exported and for imported goods. Domestic prices of imported goods could be higher than world prices for the amount of transportation costs, whereas domestic prices of exported goods could be lower than world prices for the amount of that costs. Net effect depends on the balance of these costs. One of the possible measures of transportation costs in imports is the difference between the value of imports calculated with or without transport costs. Therefore, c.i.f./f.o.b. ratio can be used as a proxy.

In the domestic market, high internal transportation costs (because of underdeveloped infrastructure or natural characteristics of a country) can also cause higher prices due to rising costs of inputs for distributive trade. They can also result in emerging of local monopolies which, in turn, lead to higher price levels, even for tradables. Population density could be the indicator of geographical dispersion of economic agents and of internal transportation costs.

Foreign trade deficit

Although foreign trade deficit cannot be considered as a structural characteristic of a country this variable can have a clear theoretical relation with price level and it can be useful in empirical work (Clague, 1988). If two countries have the same income level per capita, the country with a higher foreign trade deficit will have domestic absorption higher than income and its demand curve will shift to the right. If we assume an upward-sloping supply curve, such a country will have a higher price level.

International tourism

One of the relevant variables for explanation of national price level can be international tourism. If one assumes that foreign tourists consume nontradable goods in the host country, then, out of two otherwise identical countries, the demand curve for the one where foreign tourist spend more, lies to the right of that curve for the other country. Therefore, it could be expected that the consumption of foreign tourists have a positive effect on the price level.

The size of the government sector and fiscal variables

Government expenditures, measured by its share in GDP, could be treated similarly as the size of nontradable goods sector because government services are actually part of that sector. Since the government is supposed to be less rational in business operations than the private sector, in the country in which government services constitute larger part of GDP there could be a higher price level for nontradables, and hence a higher general price level.

Differences in taxation between countries could become a hurdle in equalization of tradable goods prices. In the traditional view on the price effects of taxation, higher taxation of tradables in the presence of an unaccommodating monetary policy would only result in compensatory reduction in prices of nontradable goods, so that the general price level would remain unaffected. The alternative view is that the political and institutional structure of modern economies still causes certain monetary adjustment in the cases of increasing taxation. This opens the space for a positive correlation between the price level and the tax burden, as measured, for example, by the ratio of government's tax revenues to GDP (Kleiman, 1993). However, the true burden of government finance can be underestimated by this measure. Hence, there are reasons to consider total

government expenditures as a share of GDP as an indicator for the upper bound of government intervention. This measure overstates the share of resources drawn by the government from the business sector and population because it includes subsidies and transfer payments, which are actually returned to them. However, the sole existence of such redistribution can be considered as a part of the total fiscal burden.

Government's revenues from indirect taxes can be considered similar to total tax revenues. The difference is that with indirect taxes there is a higher possibility of shifting the burden to the final consumer. Therefore, indirect taxes can have a more significant effect on the price level compared to direct taxes.

Liberalization index

Different components of monetary policy (money supply, inflation rate) as well as economic policies related to international trade and capital flows (the choice and management of exchange rate policy, degree of capital controls) could also influence disparities of price levels in different countries. Therefore, it seems reasonable to consider a specific variable for economic policy in transition countries, the cumulative liberalization index, whose calculation is explained in de Melo et al. (1997). The liberalization index is a weighted average of the estimated degree of market reforms in three areas: a) internal markets (liberalization of domestic prices and the abolition of state monopolies); b) foreign trade (current account convertibility and the liberalization of the foreign trade regimes) and c) privatization (enterprise privatization and banking reform). Cumulative liberalization index is the sum of a country's liberalization indexes for the period 1989-1994. It is expected that the reforms from previous years also have an effect on current performance of the economy.

Considering the complexity of the cumulative liberalization index, its relationship with the national price level is not certain per se, neither by its direction nor by its significance. The liberalization of domestic prices in times when they are kept low by government intervention, other factors unchanged, will lead to the rise in the national price level. This effect will probably be very strong, particularly in countries with initially high level of price control. Abolition of the state monopolies in trade alone could affect the reduction of price level. But, if the monopoly concerned is in trade of goods whose prices were previously under control, breaking the monopoly and the liberalization of domestic prices could lead to increase in price level. A convertible exchange rate and a more open foreign trade regime could lead to higher price level, provided that the non-convertible exchange

rate and foreign trade restrictions have resulted in a significant economic isolation. Breaking the trade isolation for relatively poor transition countries would result in increase in the price of a relatively abundant labor factor and the decrease in prices of the relatively scarce capital factor.[4] It is assumed that a higher degree of privatization in economy leads to a more effective resource allocation, thus such a country would reach a higher productivity and subsequently a higher price level. However, what would be the effects of privatization on the price level if the productivity is assumed to be constant? Out of two countries with the same income per capita, the country with more privatized economy could experience lower degree of monopolistic behavior and a higher degree of internal competitiveness. A lower price level then can be expected in that economy.

With assumed high initial level of price control, rather autarkic economies and positive correlation of privatization and productivity, the overall impact of the cumulative liberalization index on the price level for transition counties could be in the upward direction. The problem in this relationship could arise when real income is included as one of the explanatory variables for the price level. In that case a high degree of correlation between real income and the most of elements which enter into the calculation of the liberalization index is expected. Hence, a significant correlation between real income variables and the cumulative liberalization index can also be expected.

3
EMPIRICAL ANALYSIS

Presented theoretical considerations build a background for the regression analysis of the determinants for the national price levels. A fairly large number of different variables are tested, which could explain why some countries have a high price level and others have a low one. The transition countries of Central and Eastern Europe are of particular interest due to their specific economic and regional development. A special emphasis is given to the case of Croatia in an attempt to explain why Croatia has a fairly high national price level.

[4] *The openness effect in the case when trade barriers are the main determinant of openness.*

3.1 Data and some descriptive statistics

Results of the European Comparison Program (ECP) for 1993 (UN Statistical Commission and Economic Commission for Europe, 1997) set statistical basis for the analysis of the determinants of the price level.[5]

ECP data contain detailed information about price levels and income for 39 countries, out of which 24 are industrialized OECD counties and the remaining 15 are the transition countries of Central and Eastern Europe. ECP provides a useful insight into the structure of the price levels as well as into nominal and real GDP by the breakdown on 54 analytical categories. Some categories provided by the ECP, such as collective consumption of government and trade balance for goods and services, can be used as individual explanatory variables in regressions for the price level.

Based on theoretical considerations and availability of data, the following variables have been chosen in order to test their influence on the price level: real GDP per capita, real GDP per person employed, product share of tax revenues, and government expenditure, population density, openness, revenues from tourism, current transfers and income revenues from abroad (balance of payments figure). Table 1 shows some descriptive statistics for variables used in regressions. Number of observations indicates the number of countries for which data was available for a certain variable. For each variable, unweighted mean and standard deviation is shown, as well as minimum and maximum value.

[5] *The first impression of most readers of this paper will be that a paper with information from 1993 is completely inappropriate to the late 1990-ies situation and that their use will not lead to reliable results. However, although problems with these data exist, we think that the results accomplished will be very illustrative even for the current situation. The reason why we opted for the analysis of the figures for 1993 is simply that they were the latest data available from the primary statistical source relevant for comparison of price levels and income (ICP/ECP project results). Data from some other sources that cover later years are unreliable or are simply extrapolated from the data used here from 1993. ICP/ECP research for 1996 is being finalized and at the moment we only have the preliminary figures at our disposal for the overall GDP. The first analysis of those figures shows similar results as for 1993. Some regression analyses with figures for 1996, which will be mentioned in footnotes later in the paper, show that the main conclusions of this analysis do not change by using figures for 1996.*

Table 1

NUMBER OF OBSERVATIONS, MEANS AND STANDARD DEVIATIONS (UNWEIGHTED), MINIMUM AND MAXIMUM FOR MAIN VARIABLES

Variable	Number or observations	Mean (unweighted)	Standard deviation (unweighted)	Minimum	Maximum
Price level (PL)	39	66.8	35.4	6.5	139.1
Real GDP per capita (YPC)	39	66.0	38.1	11.6	143.0
Collective government consumption (CCG)	39	8.8	2.2	4.4	14.4
Foreign trade deficit of goods and serv.(DEF)	39	-0.1	7.1	-18.2	16.3
Cumulative liberalization index (CLI)	15	3.0	1.1	0.8	4.2
Population (POP)	39	30.7	50.2	0.3	257.6
Population density (POPDENS)	39	104.4	92.4	2.3	368.4
Real GDP per person employed (YPE)	36	60.5	30.9	11.4	105.5
Tax revenues (TAX)	27	38.8	7.5	22.7	50.3
Government expenditures (GEXP)	37	44.6	9.4	25.9	66.4
Government revenues (GREV)	15	38.7	10.0	17.1	52.3
Indirect tax (TIND)	27	12.0	3.6	4.2	18.1
Openness – (U+I)/GDP (OPEN)	37	76.3	38.5	16.7	182.2
Revenues from transfer and income from GDP (TRF)	37	8.1	10.0	1.1	45.7
Revenues from tourism (TOUR)	37	2.6	2.1	0.1	10.9

Source: See Appendix.

Figures on price level and real GDP are expressed as percentage of the Austrian level, i.e. Austria = 100. All fiscal variables are shown as share of GDP. Openness is measured by a share in GDP of the sum of imports and exports of goods and services. Revenues from international tourism as well as transfer and income revenues from abroad are also shown as a share of GDP. In the calculation of shares, both the numerator and the denominator were expressed in current nominal values (in national currency or in US dollars), and presented as percentages. Population and population density are given in absolute values. The cumulative liberalization index for transition countries has been taken from de Melo et al. (1997). In cases when comparative data were not available for all countries, regressions have run by taking fewer countries into account. Detailed data description as well as data sources can be found in the Appendix.

3.2 Regression results for the sample of 39 countries

Real income - the key explanatory variable

Previous studies for the national price level conducted for countries on a different level of development showed that real income per capita is the most influential variable (Kravis and Lipsey, 1987, 1988; Clague, 1986, 1988; Kleiman, 1993). The results of the price level regression on income are summarized in Table 2. One can see a rather strong association. As equation (1) shows, GDP per capita alone explains over 80 percent of variations in national price levels in the sample of 39 countries.[6] Regression coefficient of 0.84 suggests that for each 1 percent, for which real income per capita in some country is lower than the Austrian income, the price level in that country could be lower by about 0.84 percent of the Austrian price level. Figure 1 shows actual and regression values for the price levels depending on real income per capita.

If differences in the price levels are a consequence of differences in productivity then GDP per person employed could be a better explanatory variable for the price level than GDP per capita. However, equation (2) does not confirm that view. Although GDP per person employed is significant in explaining

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[6] *Regression equation (1) re-run with preliminary data from 1996 gives the following results:*
PL (96) = 10.06 + 0.83 YPC (96)
(1.98) (12.75) Adj. R^2 = 0.809.
Comparison with the results for 1993 reveal similarities, both concerning value of regression coefficients and the "goodness of fit" as measured by adjusted R^2.

variations in price levels, adjusted R^2 is smaller than in equation (1) suggesting that the differences in income, more than the differences in labor productivity cause the variability of price levels by countries.[7]

Furthermore, it seems that the price effect of real income is not linear. As can be seen from equation (3), inclusion of both linear and square terms of real income gives improved estimates (higher adjusted R^2) compared to simple linear relationship. Coefficient on income is positive and significant, and coefficient on squared income variable is significant, but of negative sign. Both coefficients taken together suggest that the growth of real income at its lower level strongly and positively affects national price level, but at higher levels of income, further income growth leads to a slower growth of price level.

Table 2

REGRESSIONS OF THE PRICE LEVEL ON INCOME

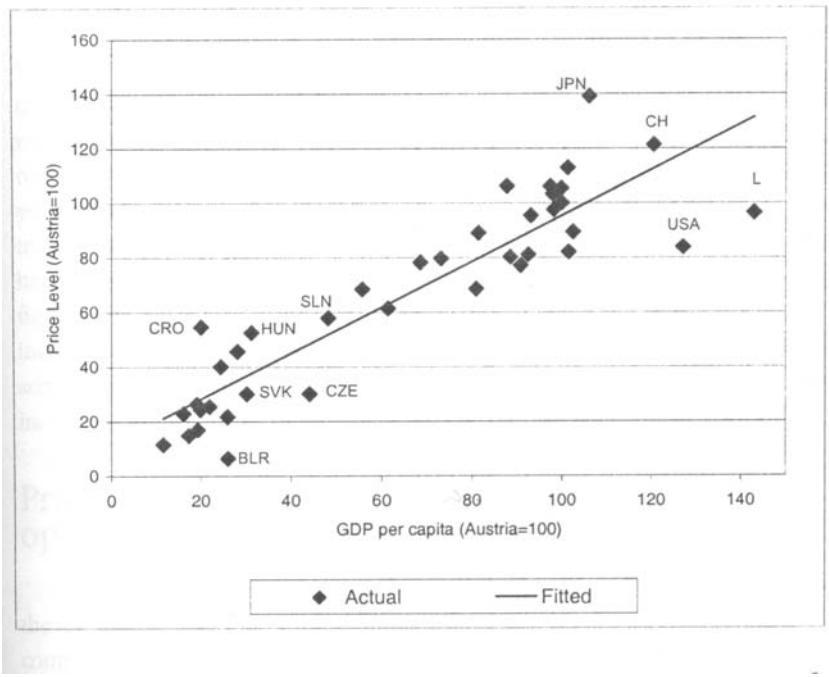
Equation number	**(1)**	**(2)**	**(3)**
Dependent variable	**PL**	**PL**	**PL**
Constant	11.47 (2.30)	10.59 (1.64)	-5.24 (-0.70)
YPC	0.84 (12.80)		1.58 (5.88)
YPC^2			-0.01 (-2.82)
YPE		0.96 (10.12)	
Adjusted R^2	0.811	0.743	0.841
Standard error of estimate	15.39	17.36	14.12
F-statistics	163.84	102.40	101.29
Number of observations	39	36	39

Notes: Figures in parentheses are t-values.
t_{10} with 30 degrees of freedom is 1.310.
t_{05} with 30 degrees of freedom is 1.697.
t_{01} with 30 degrees of freedom is 2.457.
PL= national price level. YPC = real GDP per capita.
YPE = real GDP per person employed.

[7] *This result could be seen as a kind of support for significance of demand side in explanation of the national price level, which is particularly emphasized by Bergstrand (1991).*

Figure 1

ACTUAL AND REGRESSION VALUES FOR THE NATIONAL PRICE LEVEL



Regardless of some improvements in explanatory power of nonlinear regression specification we will proceed with linear relation between the price level and income. The use of nonlinear specification would not contribute to the essence of understanding international price level differences.[8]

The difference between the actual price level and the regression value for the price level represents the regression residual. Residuals from equation (1) are shown in Table 3. The largest absolute difference was found for the United States, Japan, Luxembourg, Sweden, Croatia and Belarus. Japan, Croatia and Sweden have actual price levels substantially higher than expected by equation (1), whereas Luxembourg, the United States and Belarus have it considerable lower than expected. Such an "unpleasant" notion for Croatia is additionally strengthened when relative deviation is considered. Actual national price level in Croatia is shown to be 48 percent higher than expected with respect to its real income. This is also the largest relative upward departure from regression value among all the countries from the sample.

[8] *Log-linear equation specification has also been tested, with and without squared income term. The results were somewhat less powerful than those from equations presented.*

Table 3

RESIDUALS FROM REGRESSION EQUATION (1)

COUNTRY	RESIDUAL	COUNTRY	RESIDUAL	COUNTRY	RESIDUAL	COUNTRY	RESIDUAL
Germany	12.92	Spain	9.36	New Zealand	-10.84	Bulgaria	-4.34
France	3.75	Portugal	-1.58	Japan	38.62	Croatia	26.45
Italy	-7.97	Austria	4.64	Canada	-14.52	Slovakia	-6.70
Netherlands	5.82	Sweden	21.15	USA	-34.20	Slovenia	5.99
Belgium	-7.96	Finland	9.34	Poland	8.16	Ukraine	-11.08
Luxembourg	-34.94	Switzerland	8.74	Czech Republic	-18.37	Moldova	-9.60
United Kingdom	5.42	Iceland	9.60	Hungary	14.96	Estonia	-3.76
Ireland	6.90	Norway	10.12	Russia	-11.40	Latvia	-2.07
Denmark	16.44	Turkey	10.66	Romania	-1.19	Lithuania	-10.66
Greece	10.20	Australia	-10.45	Belarus	-26.78		

Although real income could be considered as powerful variable in explaining national price level, caution in conclusions is still needed. Due to a strong significance of the income variable, regression residuals are sensitive to the possible statistical discrepancies in the calculation of GDP. This could particularly be applied to Croatia because 1993 was a year of hyperinflation. Similar problems could be also find for some other transition countries. The problem of the gray economy should be stressed here as well. Some countries include estimates of gray economy in GDP figures and others do not.[9] Croatian national account statistics does not include the gray economy, although it is surely not negligible. It could account for even more than 25 percent of the registered GDP.[10] Finally, real income is not the only variable that affects the national price level.

Price level effects of the population size, openness and some fiscal variables

A population enters regression as an indicator of the size of the economy and therefore influence the price level through the internal competitiveness mechanism or through the mechanism of economy of scale. In the former case influence on the price level should be negative and in the latter case it should be positive. Equation (4) from Table 4 shows that when income per capita is included in the regression population enters with negative sign but also as statistically insignificant. In that case population size possibly works quite poorly through the mechanism of internal competitiveness. Maybe economy of scale works as price level determinant in general, but it does not work if measured by the population size.

Previous studies show that openness (product share of the sum of exports and imports of goods and services) could be important in explaining differences in national price levels (Kravis and Lipsey, 1987). In regression (5), in which real income per capita is also one of explanatory variables, openness enters with a negative sign, and it is significant at the 5 percent level (one-sided t-test). Theory claims that it is possible that influence of openness on the price level could be negative, zero or positive, depending on the determinants of openness. The negative coefficient on openness gives some room for the argument that barriers to free trade could determine openness in the majority of sample countries.

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[9] *On the treatment of gray economy in the calculation of GDP for transition countries, as it was reported for the ECP, see United Nations, Statistical Commission and Economic Commission for Europe (1997).*

[10] *See Bićanić and Ott (1997).*

It seems, however, that the size of the economy as determinant of openness should also be considered. If the size of the economy (population size) is included along with the variables of income and openness as an explanatory variable, as in equation (6), resulting regression specification proves rather satisfactory.[11]

Besides a large positive and highly significant coefficient on the real income, statistical significance of coefficients on openness and population size has increased compared to previous equations. All these three explanatory variables explain around 84 percent of variations in the price levels for the 32 countries from the sample.[12]

Regression coefficients on openness and population size are negative and statistically significant on the 1-percent level (one-sided t-test). This result suggests that of two countries with the same income per capita and the same size of population, a more open country is expected to have a lower price level.[13] Out of two equally well off and open countries, a country with larger population is expected to have a lower price level.[14]

There are some other variables of international transactions for which theoretically sound reasons exist to be included in regressions for national price levels. In our analysis, however, they have regularly proved to be insignificant, and sometimes have "wrong" sign. In that way we tested foreign trade deficit (goods

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[11] *If the size of a country is the determinant of openness, its inclusion in regression together with the variable of openness is questionable. However, the coefficient of correlation between these two variables (-0.53) does not reveal a particularly strong link. Therefore, a decision was made to keep the specification that includes both variables. Empirical research on the determinants of openness, which could be a first step for the current analysis, is out of the scope of this paper. Those interested in the determinants of Croatian exports can see Vujčić, Drinovac and Galinec (1997).*

[12] *The sample does not include Belarus and Moldova due to the lack of appropriate data from the balance of payments statistics for 1993 (not even for 1994, the year considered acceptable in the case of Ukraine and Russia).*

[13] *Apart from the indicator of openness used here, which takes into account imports and exports, the product share of exports, as well as the product share of import ware examined as openness variable. Price effect of both, exports and imports could be important. The price of imports could represent the upper bound for the prices of domestic substitutes, and the prices of export goods, if there is no discrimination of domestic market, could be close to world prices. Regressions run with imports share instead of the sum of exports and imports yielded significant coefficient on imports with negative sign, both in the equation where it was present only with the income variable on the right-hand side, as well as in the equation with income and population as other explanatory variables. In the later case, coefficient on imports was significant on the level of 1 percent, and adjusted R^2 for regression was 0.846. Exports share enters regression with the negative coefficient, rather significant.*

[14] *Regression with the population density instead of population size was also tested as the explanatory variable. However, in regressions of price level on real income and population density, the density appeared with the coefficient that was not statistically significant.*

and services) as well as transfers and income from abroad, both expressed as a share in GDP. However, their coefficient fails to be significant. For a somewhat differently defined variable of openness (the combined sum of all credit and all debit items from the current account of the balance of payment, expressed as a share in GDP), the regression coefficient was significant, but the overall statistical characteristics of the regression were inferior to the one with standard definition of openness.

Equation (7) shows result of regression in which revenues from international tourism enters as an explanatory variable. The coefficient on tourism variable is not significant on standard levels, but one can note that it has a hypothesized positive sign. Such specification is promising what will be proved a little bit later with a sub-sample of transition countries.

Table 4

PRICE LEVEL REGRESSIONS FOR OPENNESS, POPULATION SIZE AND TOURISM REVENUES

Number of equation	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable	PL	PL	PL	PL	PL	PL	PL
Constant	12.10 (2.42)	26.82 (3.16)	38.01 (4.31)	34.64 (.65)	19.12 (4.06)	35.04 (3.02)	41.80 (3.75)
YPC	0.85 (12.74)	0.76 (11.09)	0.77 (12.07)	0.77 (12.10)	1.07 (11.07)	0.60 (4.94)	0.71 (5.76)
OPEN		-0.01 (-1.80)	-0.21 (-3.01)	-0.22 (-3.03)			-0.19 (-2.22)
POP	-0.05 (-1.05)		-0.13 (-2.63)	-0.12 (2.26)	-0.17 (-3.10)		-0.12 (-2.20)
TOUR				1.07 (0.96)			
YOPEN					-0.0036 (-3.31)		
DUMMY						-21.07 (-2.23)	-5.90 (-0.56)
Adjusted R^2	0.811	0.812	0.840	0.840	0.847	0.829	0.837
Standard error of estimate	15.37	14.53	13.40	13.42	13.11	14.63	13.55
F-statistics	82.72	79.04	64.20	48.27	67.57	93.17	47.24
No. of observations	39	37	37	37	37	39	37

Notes: Figures in parentheses are t-values.
t_{10} with 30 degrees of freedom is 1.310.
t_{05} with 30 degrees of freedom is 1.697.
t_{01} with 30 degrees of freedom is 2.457.
PL = national price level. YPC = real GDP per capita.
POP = population size. OPEN = openness. TOUR = revenues from tourism.
YOPEN = YPC OPEN. DUMMY = dummy variable for countries in transition.*

Besides the openness and real income per capita, some authors (Kravis and Lipsey, 1987) also tried to include the interaction term, the product of these two variables. The logic behind this was found in the fact that the direction of price effect of the openness can depend on the level of real income per capita. In poor countries they expect that a higher degree of openness leads to a higher price level, and the opposite can happened in relatively rich countries. The openness in their regressions enters with the positive coefficient and the interaction term enters with a negative coefficient. The combined effect of both variables determines the overall impact of openness. Kravis and Lipsey report that only on higher levels of income openness can reduce national price level.

Table 4 shows that the coefficient on openness in our analysis enters with significantly negative sign. This, according to Kravis and Lipsey, would be "wrong" or unexpected effect for the poor countries. Hence the attempt to confirm Kravis-Lipsey's arguments was made by including the interaction term. The coefficient on that term in equation (8) is still negative, which suggest that the price effect of openness is weaker for the poor countries than for the rich countries. However, real income now shows a larger effect than in similar equation (6), while constant is reduced. Compared to equation (6), equation (8) has a somewhat higher R^2 and a lower standard error of estimate. However, regression equation (6) gives us a clearer and simpler explanation of variations in national price levels.

In regard to fiscal variables, a significant price level effect of the tax share, government expenditure share, or the collective consumption of government share (variable that include expenditures on the military, the police, the judiciary, and government administration) has not been identified. Based on the results of the ICP research for 1980, Kleiman (1993) reports on significant influence of certain fiscal variables on the price level. Therefore, we can speculate that our failure to confirm such an effect primarily depends on the different sample of countries, and possibly, on the limited comparability of government finance statistics for transition countries.

Regional effects - transition countries

Although price level regressions shown in Table 4 points to important determinants of the price level in general, it is also possible that there are certain specific determinants which work only with the certain groups of countries. Roughly speaking, there are two different groups of countries in our sample. On the one side stand developed and stable economies of the OECD countries, and on the other side there are transition countries with a rather unstable economic structure, which was still adjusting to the market economy.

Impact of some specific characteristics of transition countries can be assessed by including the dummy for transition countries in the price level regression.

Equation (9) reveals that in transition countries, apart from the real income per capita, there are some specific determinants which act in a way so that transition countries have a lower price level by about 20 index points than other (OECD) countries, Austria = 100. As an interesting individual illustration of such relationship can be presented comparison between price levels in Turkey and Slovakia. Although both countries had similar income levels in 1993, Turkey had a price level of about 45 percent of the Austrian price level and Slovakia only 30 percent..

Significance and large effect on price level of transition dummy, as shown in equation (9), suggests that it would be desirable to explore the price level determinants specifically for the economies in transition.

3.3 Regression results - transition countries

Income as an explanatory variable

In Table 5 are given results of the price level regressions for the sample of 15 transition countries of Central and Eastern Europe. Variables that were tested are basically the same as for the entire sample of countries. Real income per capita was still powerful in explaining variations in price levels, either as the only explanatory variable or in cases when other explanatory variables are added.

As can be seen from equation (11), magnitude of real income effects on price level is still large, but income alone explains merely 24 percent of the variations in price levels in transition countries, which is by far less than with the full sample of countries (81 percent).[15] To some extent, that is expected since mostly poor countries were extracted from the full sample. Variations in real

[15] *The regression specification of the equation (11) re-run with the preliminary data for 1996 yields the following result:*
PL (96) = 14.74 + 0.54 YPC(96)
(2.28) (2.84) Adj. R^2 = 0.809
Compared to the equation (11) results, the explanatory power of this equation is higher, while the coefficient on the real income is substantially lower. That could point to the conclusion that transition countries are becoming more and more similar in regard to the price level effects of income. Weaker income effect in transition countries then in wider sample of countries suggests that in these countries some other structural factors affect the price level more strongly.

income in transition countries are smaller than for the full sample of countries. Therefore, those variations can not explain the differences in price levels so strongly. In equation (11) a sample of only 15 countries was examined. It is a small sample and it is possible that one or two countries with a striking "discrepancy" of real income and prices lead to less powerful regression results.

Table 5

PRICE LEVEL REGRESSIONS: COUNTRIES IN TRANSITION

Number of equation	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Dependent variable	PL	PL	PL	PL	PL	PL	PL	PL
Constant	8.01 (0.82)	-15.22 (-1.21)	38.24 (2.58)	18.24 (1.05)	11.69 (1.44)	35.51 (3.13)	29.12 (2.65)	-9.21 (0.99)
YPC	0.84 (2.31)	0.58 (1.76)	0.70 (2.16)	0.49 (1.58)	0.47 (1.47)	0.44 (1.68)	0.85 (3.58)	0.50 (1.67)
CCG		3.09 (2.45)		2.16 (1.78)				
OPEN			-0.19 (-2.01)	-0.16 (1.86)		-0.19 (-2.58)	-0.17 (-2.48)	
POP			-0.20 (-2.02)	-0.15 (-1.65)		-0.13 (-1.69)	-0.15 (-2.18)	
TOUR					2.73 (2.53)	2.57 (2.71)		
CRODUMMY							26.80 (3.10)	
CLI								8.67 (3.14)
Adjusted R^2	0.236	0.448	0.400	0.516	0.479	0.648	0.697	0.546
Standard error of estimate	13.74	11.68	11.23	10.08	10.46	8.60	8.03	10.59
F-statistics	5.33	6.68	3.66	4.20	6.52	6.52	7.77	9.41
No. of observations	15	15	13	13	13	13	13	15

Notes: Figures in parentheses are t-values.
t_{10} with 9 degrees of freedom is 1.383.
t_{05} with 9 degrees of freedom is 1.833.
t_{01} with 9 degrees of freedom is 2.821.
PL = national price level. YPC = real GDP per capita.
CCG = collective consumption of government. OPEN = openness. POP = population size.
TOUR = revenues from tourism. CRODUMMY = dummy variable for Croatia.
CLI = cumulative liberalization index.

Nevertheless, the comparison of regression (11) run for the transition countries with regression (1) run for the full sample of countries reveals that coefficients on real income are very similar, and the values of constants do not substantially differ. Only the adjusted R^2 differs, and it is lower than in the equation (1).

Collective consumption of government, openness and the size of the economy

Introduction of collective consumption of government[16] into regression equation as an additional independent variable improved the explanatory power of equation; adjusted R^2 is higher, standard error of estimate lower and the F-statistics improved. Coefficient on collective consumption of government has a positive sign and it is highly significant. This result suggests that in transition countries a higher degree of government consumption lead to a higher price level. This is in accordance with our expectation based on the assumption that the government is less rational in spending than private agents and that prices in the nontradables sector, where majority of state purchasing is done, are thus higher. Collective consumption of government can also be considered as an indicator of taxation in economy, i.e. an indicator of the amount of the funds that the government has taken from the economy. If business sector is able to shift the tax burden onto the final consumer, the price level will be even higher. The possibility of shifting forward also depends on the degree of internal competitiveness in an economy. As transition countries are still building a competitive environment for business operations, that could explain why this variable is not significant for the overall sample of countries (where developed market economies prevail), but it is significant in transition countries.

Openness and the size of the economy can be useful in explaining the price levels in transition countries, as shows equation (13). The coefficients on these two variables are statistically significant, just as they were significant for the whole sample of countries.[17] The signs are both negative, which means that, other things being equal, the more open and the more populated transition countries are expected to have lower price levels. Although adjusted R^2 is now higher than in equation (11), when income was the only explanatory variable, the F-statistics suggests possible problems with the significance of the regression specification (13).

Equation (14), in which explanatory variables are: real income per capita, openness, the size of a country and collective consumption of

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[16] *Collective consumption of government includes only a part of the total government expenditures. It consists of expenditures on services in which final user cannot be identified. Thus it includes expenditures on the army, the police, the judiciary and the government administration, while, for example, expenditures on health and education are not a part of collective consumption of government.*

[17] *Due to the lack of data, the regressions were run for 13 transition countries, without Belarus and Moldavia.*

government shows how all three variables could work in explaining the differences in the price levels among the transition countries. The coefficient on the real income has been decreased, just as its statistical significance. Even without a deeper analysis such a result can be ascribed to a multicolinearity problem.[18] Apart from smaller t-ratios for each of the variable in comparison with equations (11)-(13), F-statistics is improved, and shows statistical significance of the chosen group of explanatory variables at a 5-percent level.

Revenues from international tourism

Equation (15) shows that revenues from international tourism might help to account for variation in the price levels in transition countries. As expected, its coefficient is positive, and statistically significant. This could mean that suggested mechanism relating the price level to revenues from tourism work: higher revenues from international tourism increase aggregate demand, particularly in the nontradable goods sector, which accordingly rise prices in that sector, as well as prices in general.

Regression specification (16) gives promising results. As explanatory variables for national price levels we test the following ones: real income, openness, population size and revenues from international tourism. All the coefficients have expected signs, but the significance of the real income and population size is somewhat poorer, although acceptable on the 10 percent level for a one-sided t-test. The four aforementioned variables according to the equation (16) explain about 65 percent of the price level variations among transition countries of Central and Eastern Europe. It is interesting that a rather strong influence on price level is ascribed to the revenues from international tourism. The quantitative interpretation based on the equation (16) indicates that, holding other variables constant, each percent of tourism revenues share in GDP for the transition countries would yield a price level rise of approximately 2.6 percent of the Austrian price level.

Such a strong influence of the tourism revenues seems doubtful. It can be seen from the values for tourism variable for transition countries (see Table A2 in Appendix) that Croatia, by far, has the highest share (around 10 percent). The question that arises from this is whether the share of tourism is some sort of dummy variable for Croatia. The specification of the regression equation

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[18] *Correlation coefficients between all pairs of variables do not show that this problem is particularly prominent, since those coefficients are not exceptionally high. The highest coefficients exist between openness and the population size, -0.56 and between real income per capita and collective consumption of government, 0.38.*

(17) is similar to equation (16), but instead of the tourism variable, dummy variable for Croatia was introduced. The result show that compared to equation (16), all the coefficients remain significant, and explanatory power of the overall specification is increased. The coefficient on the real income variable is substantially increased, from 0.44 to 0.85, while the coefficients on openness and population size are not greatly altered. A rather high coefficient on the dummy variable for Croatia in equation (17) suggest that, considering the real income, openness and the size of the country, Croatia has a clearly higher price level than can be expected for one transition countries. The dummy variable, however, does not explain such situation.

Cumulative liberalization index

The cumulative liberalization index is another variable expected to be helpful in explaining variations in price levels in transition countries. This variable is considered as a policy variable, because it shows the depth of the structural and institutional reforms in transition countries regarding the internal markets, external trade and the facilitation of private sector entry. Equation (18) shows a strong positive significant price level effect of this variable. The sole statistical properties of this regression are rather good, but the problem remains how to interpret the results. The regression coefficient on liberalization index indicates that with continuation of reforms the difference between price levels in transition and developed countries (in this case Austria) should decrease. However, the cumulative liberalization index does not precisely explain why it should happen. There can only be speculation that liberalization of prices, i.e. decrease of the degree of administrative control of prices is probably the strongest mechanism, since other elements that make up the cumulative liberalization index could not yield such result. Liberalization of foreign trade in fact brings lower prices (see interpretation of the effects of openness), and the price effect of privatization is dubious and most likely small in size. The cumulative liberalization index is highly correlated with the other variables used in equations (11)-(17). Correlation with real income is 0.36, with public services spending $r = 0.73$, with revenues from tourism $r = 0.56$ and least with openness $r = 0.013$. This, on the one hand, hinders its inclusion into the regression equations together with correlated variables, but on the other hand suggests that those variables in certain combination also could explain a strong association between the cumulative liberalization index and the national price level.

Regression equation residuals

Table 6 show residuals, or the difference between actual and regression values for the price level, which accompanied the equations (11)-(18). It is particularly interesting to observe residuals for Croatia.

For each of the equations Croatia has positive values of residuals (except in equation (17) with dummy for Croatia), sometimes rather high. This indicates that, compared to expectations based on such equations, the actual price level in Croatia is higher. Mostly positive residuals are also associated with Poland, Hungary and Slovenia. Negative residuals are reported for Czech Republic and Slovakia.

Residuals based on equation (11) show that Croatia with respect to its real income per capita has "too high" a price level, and this deviation goes up for about 30 index points (Austria =100). In equation (12), after inclusion of the collective consumption of government, deviation is significantly reduced. This could mean that one of the significant factors of Croatian "expensiveness" is rather high government consumption. In equation (13), the size and openness of a country do not contribute greatly to reducing residuals for Croatia.[19]

Equation (14) could be considered as a rather good regression specification for transition countries. Although regression residual for Croatia is now lower than for equation (13), the price level in Croatia is still higher than what could be expected. One more factor that could account for the price level in Croatia is tourism or more precisely, revenues from international tourism. It appears in equations (15) and (16). If tourism is taken into account together with real income, openness and population size (as in equation 16), actual and regression value for price level for Croatia are almost the same, meaning that tourism has strong effect on price level in Croatia. However, it is possible that the tourism variable partially acts a dummy variable for Croatia. Even if this is truth, we cannot exclude entirely international tourism as an important factor explaining the price levels in transition countries. Finally, as residuals show, the cumulative liberalization index together with real income, as in equation (18), explains price level in Croatia in a better way than in the case when real income is the only explanatory variable. The same applies to the sample of transition countries.

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[19] *Reduction in the sum of squared residuals for regression (13) compared to regression (12) could be partially a result of exclusion of Belarus and Moldavia (both countries had large negative residuals from equation (12)).*

Table 6

RESIDUALS IN THE PRICE LEVEL REGRESSIONS: COUNTRIES IN TRANSITION

Number of equation	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Poland	11.52	11.25	0.96	1.94	16.14	6.84	3.88	1.13
Czech Republic	-15.08	-20.63	-14.04	-17.24	-16.31	-13.94	-14.46	-14.21
Hungary	18.29	5.30	7.41	0.32	17.47	9.27	10.04	10.46
Russia	-8.04	-6.20	4.20	1.45	-4.76	1.58	2.16	1.32
Romania	2.19	9.27	-11.63	-4.99	3.24	-7.61	-7.33	6.04
Belarus	-23.42	-15.11	NA	NA	NA	NA	NA	-6.67
Bulgaria	-0.97	2.05	-7.39	-4.37	-4.57	-7.26	-4.02	-1.46
Croatia	29.83	14.34	23.07	13.21	3.56	2.27	0.00	19.33
Slovakia	-3.36	-6.52	-3.62	-5.45	-5.63	-2.89	-1.97	-5.99
Slovenia	9.26	17.59	8.66	15.70	7.33	8.27	8.06	6.76
Ukraine	-7.69	3.20	-7.17	-0.62	-6.54	-4.90	-4.85	8.46
Moldova	-6.19	-10.77	NA	NA	NA	NA	NA	-19.01
Estonia	-0.38	1.31	-0.33	0.79	-5.16	-0.80	2.70	-1.82
Latvia	1.32	-1.61	-1.01	-2.92	1.44	3.45	2.76	2.76
Lithuania	-7.28	-3.47	0.90	2.19	-6.20	5.72	3.03	-7.09
Residuals squared sum	2453.35	1636.97	1134.22	812.31	1093.71	591.23	516.03	1346.85

Note: NA- data not available

3.4 Some limitations of the results

There is a need to add a few notes of warning on possible limitations of the results acquired. The latest available and officially published results for the international comparison of price levels and income levels within ICP/ECP framework are those for the years 1990 and 1993. In 1990 many of transition countries did not exist as independent countries, and those that did exist operated in significantly different conditions than those whose characteristics we are trying to research. Comparison for 1996 is in progress, and its results are still not completely available. Thus, the only possible database for the regression analysis of price levels in transition countries was ECP cross-country base for 1993. Apart from transition countries in Central and Eastern Europe, countries of the OECD were included in the sample. A much bigger sample of countries could be examined, which would then probably improve some statistical properties of equations, but it would create new problems regarding certain regional specificity.

In 1993, transition countries had a rather unstable economic structure. Regions price levels were frequently changing due to high and variable inflation rates in the majority of countries as well as discrepancy in price liberalization, exchange rate and foreign transactions. In such conditions it is hard to "spot" regularities, i.e. to find structural determinants of national price levels. Besides, for a more complete analysis, it is necessary to have information on a large set of economic indicators. For transition countries in 1993 statistical data are incomplete and sometimes unreliable. The gray economy, probably largely present in transition countries, could also affect the results. However, some characteristics of the transition economies do not change so rapidly. The real income level, as a key explanatory variable for price level, is a rather stable indicator of economic structure.

The most serious limitation of our analysis, specifically concerning sub-sample of transition countries, is small number of observations. Therefore, results are sensitive to specification and sample changes. It is a problem that cannot be resolved at the moment.

4
SUMMARY OF RESULTS AND EVALUATION

International price comparisons indicate that there are large differences in price levels among countries. Such outcome is not in accordance with the law of one price or the absolute variant of purchasing power parity. This paper was intended to explore factors influencing international variation in price levels, particularly in transition countries and in Croatia.

Real income per capita has proved to be the key explanatory variable for the differences in national price levels, just as in many previous studies. This variable itself accounts for more than 80 percent of variations in price levels for a targeted sample of 39 countries. The openness, represented by the product share of the imports and exports of goods and services, shows certain importance in explaining price levels differences that was additionally strengthened when observed together with the size of a country, measured through the population size. Coefficients on both variables enter with a negative sign indicating that, other things being equal, a larger or a more open country could have a lower price level. Theoretically, the direction and the mechanism for the price level effects of openness are ambiguous. Empirical results shown in this paper suggest that

openness is negatively associated with the price level, but inclusion of interactive term between income and openness indicates that such effect is smaller for poorer countries.

As for the fiscal variables, no significant influence on price level has been found in a sample of 39 countries. That is fairly unexpected result considering the fact that some earlier studies (Kleiman, 1993) report the existence of such relation. It can be speculated that our observation is due to different sample or poor comparability of the government finance statistics in transition countries.

The regression analysis of the full sample shows the significance of dummy variable for transition countries, which points to the need to examine specific characteristics of transition countries regarding the determinants of the national price level.

Empirical results after narrowing the sample to transition countries show that interregional variations in price levels are now less strongly explained by income, but that leaves space for a stronger influence of other factors. Collective consumption of government seems to work in a way that in a transition country with a higher level of such consumption, a higher price level should be found. One of the possible explanations why this kind of relationship was not found for the larger sample of countries is a higher degree of competitiveness and a smaller possibility of shifting the tax burden onto the final consumers (through higher consumer prices) in developed countries.

Openness and the size of economy might be helpful in explaining the variations in price levels for transition countries. Revenues from international tourism also show certain success in explaining the difference in price levels in transition countries. A rather strong association between revenues from tourism and the price level seems doubtful since this result, due to small sample problem, could be dominated by the actual data for Croatia. A degree of liberalization of the economy is found to have positive effect on the price levels in transition countries. Expectations based on the regression indicate that with continuation of reforms the difference between the price level in transition and developed countries should decrease. However, the cumulative index of liberalization, as a common denominator of a larger number of economic characteristics of an economy, does not specify which factors should produce such outcome.

Price level regressions for the subs-sample of transition countries could help explain relatively high national price level in Croatia. Considering real income effect only, the actual price level in Croatia is far higher than expected by our regressions. Some other regression specifications show that

high government expenditure, revenues from international tourism, openness and a relatively small size of the domestic economy could be factors which have led to a rather high price level in Croatia. These findings, of course, do not exclude potentially important effects of some other factors, which could not be identified through a simple regression analysis. It can be speculated that some short-term factors also had an impact on the price level. The extent of capital inflow, choice of exchange rate regime as well as overall economic policy can influence national price level.

Considering the exchange rate policy, it is commonly said that the national currency, kuna in the case of Croatia, is overvalued or undervalued. The problem with such statement is the choice of equilibrium exchange rate. Regression values for price levels that stem from regression analysis could be interpreted as a kind of the norm to which national price level should tend, but only if a stronger theoretical foundation and a stronger empirical confirmation were found. Such norm could serve as an estimate of the long-run equilibrium price level, and the deviation from the norm could help in monitoring and analyzing developments in current account balance.

Some limitations should be noted in regard to results of the regression analysis presented in this paper. It could be said that the cross-country regression analysis for just one year, 1993, is not reliable enough to draw clear conclusions regarding determinants of price levels, particularly in transition countries. Such warning is additionally strengthened by the fact that previous studies showed sensitivity of results on sample selection (compare e.g. Clague, 1986 and Clague, 1988).

Relatively poor statistical data regarding the structure of transition economies presents certain difficulty. For example, considering the fact observed by previous studies that some countries are steadily "expensive" or "cheap" for a number of years, it would be interesting to examine the impact of the variables from previous years. Unfortunately, availability of longer time series for transition countries is limited.

Multicolinearity among the many variables tested makes it difficult to find correct association between the national price level and its determinants. It can be seen from the regressions run, especially with the full sample, that adding a new variable in addition to real income gives only small improvement in the explanatory power of regression equation. Most of the variables added gain their statistical significance at the expenses of significance of real income. This indicates a system link between these variables.

Many other factors could have an impact on the national price level, but were not tested here. Thus, it still remains to test the impact of some other elements of taxation (subsidies and transfers), trade barriers, custom "bureaucracy" (complicated border inspection, possible corruption of the customs officers), monopolized market and legal insecurity (lack of transparency or the inability to sanction non-payments). Political situation in a country can also be reflected on the price level through the risk premium of a country, which is important for the price of foreign debt or insurance premiums for goods traded.

Due to all these notices, regression results presented in this paper should be observed as a one of possible explanations of international variations in price levels. This analysis cannot provide correct quantitative assessment of the equilibrium national price level. However, we believe that it has pointed to certain factors that should be taken into account when the equilibrium price level and equilibrium exchange rate are considered.

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APPENDIX

Table A1

PURCHASING POWER PARITY, CURRENT EXCHANGE RATE, NATIONAL PRICE LEVELS AND REAL GDP PER CAPITA FOR OECD COUNTRIES AND COUNTRIES IN TRANSITION IN CENTRAL AND EASTERN EUROPE

	Purchasing power parity (ATS=1)	Current exchange rate (ATS=1)	Price level (Austria=100)	Real GDP per capita (Austria=100)
	(1)	(2)	(3)	(4)
Luxembourg	2.867	2.971	96.5	143.0
USA	0.07212	0.08597	83.9	127.1
Switzerland	0.1541	0.127	121.3	120.5
Japan	13.29	9.56	139.1	106.1
Belgium	2.658	2.971	89.5	102.5
Canada	0.09109	0.1109	82.1	101.5
Denmark	0.6293	0.5574	112.9	101.3
Austria	1	1	100.0	100.0
Norway	0.6127	0.6098	105.4	99.9
France	0.4753	0.4869	97.6	98.2
Iceland	5.996	5.811	103.2	97.9
Germany	0.1508	0.1421	106.1	97.4
Netherlands	0.1523	0.1597	95.4	93.1
Italy	109.6	135.2	81.1	92.5
Australia	0.09758	0.12646	77.2	90.8
United Kingdom	0.04599	0.05725	80.3	88.5
Sweden	0.7113	0.6695	106.2	87.7
Finland	0.4381	0.4915	89.1	81.4
New Zealand	0.10904	0.15913	68.5	80.9
Ireland	0.04678	0.05872	79.7	73.1
Spain	8.57	10.946	78.3	68.5
Portugal	8.483	13.827	61.4	61.4
Greece	13.47	19.71	68.4	55.7
Slovenia	5.631	9.726	57.9	48.2
Czech Republic	0.7549	2.5056	30.1	30.2
Hungary	4.157	7.907	52.6	31.2
Slovakia	0.7954	2.646	31.1	30.2
Turkey	431.7	944	45.7	28.1
Belarus	13.72	210.87	6.5	26.0
Russia	16.65	76.44	21.8	25.9
Poland	625.3	1560.2	40.1	24.4
Bulgaria	0.6069	2.3821	25.5	21.9
Croatia	167.7	306.4	54.7	20.0
Estonia	0.2771	1.1364	24.4	19.9
Latvia	0.01333	0.0582	22.9	16.1
Lithuania	0.05835	0.3436	17.0	19.3
Romania	17.17	65.24	26.3	19.1
Ukraine	62.23	417.66	14.9	17.3
Moldova	0.01655	0.1429	11.6	11.6

Source: UN Statistical Commission and Economic Commission for Europe (1997)

Table A2

VALUES OF MAIN VARIABLES USED IN REGRESSIONS FOR COUNTRIES IN TRANSITION

	YPC	CCG	OPEN	POP	TOUR	CLI
Poland	24.40	9.69	44.80	38.46	0.17	4.14
Czech Republic	44.10	13.08	119.40	10.33	4.99	3.61
Hungary	31.20	14.38	66.90	10.29	3.09	4.11
Russia	25.90	9.13	49.90*	148.52	0.86*	1.92
Romania	19.10	6.86	47.90	22.76	0.76	2.29
Belarus	26.00	7.05	NA	10.36	NA	1.07
Bulgaria	21.90	8.41	99.10	8.47	2.85	2.90
Croatia	20.00	14.23	102.55	4.78	10.90	3.98
Slovakia	30.20	11.12	128.30	5.33	3.48	3.47
Slovenia	48.20	8.95	116.30	1.99	5.80	4.16
Ukraine	17.30	5.47	94.30*	51.93	0.48*	0.80
Moldova	11.60	9.98	NA	4.35	NA	3.92
Estonia	19.90	8.67	141.60	1.50	3.00	2.93
Latvia	16.10	9.84	130.90	2.59	0.69	2.45
Lithuania	19.30	7.93	182.20	3.73	0.78	2.72

*Notes: *1994. NA-data not available. Sources: see in Appendix.*
YPC = real income per capita (Austria=100),
CCG= collective consumption of government (share in GDP),
OPEN = openness (share of import-export sum in GDP),
POP= population (in millions),
TOUR= tourism (share of revenues from international tourism in GDP),
CLI= cumulative liberalization index

DATA SOURCES

National price levels, nominal (in national currency) and real (according to the purchasing power parity) GDP per capita were taken from UN Statistical Commission and Economic Commission for Europe (1997). The data were available for 39 countries in 1993 (24 OECD countries and 15 countries in transition of Central and Eastern Europe). Values are given as index numbers, Austria = 100.

Population (in millions), *population density* and *collective consumption of government* (all measured as a share of GDP) were also taken from UN Statistical Commission and Economic Commission for Europe (1997).

GDP per person employed in 1993 was calculated as real GDP divided by the total number of employed persons (data taken from the IMF International Financial Statistics Yearbook 1997).

Tax revenues of the OECD countries were taken from the OECD, OECD Statistics 1965-1995.

The *variable of openness* was measured as the sum of imports and exports of goods and services in relation to GDP. Data source was IMF Balance of Payments Statistics Yearbook 1997, except for Croatia, where it was calculated as foreign trade (taken from the balance of payments, source Bilten HNB, February 1998) divided by dollar value for GDP. This later figure for Croatia was calculated by applying the current exchange rate for dollar to the nominal GDP expressed in domestic currency (source for both data is UN Statistical Commission and Economic Commission for Europe, 1997). Data for Ukraine and Russia are actually related to 1994, and were calculated on the bases of figures taken from the IMF International Financial Statistics Yearbook 1997.

The *share of revenues from international tourism in GDP* was calculated by relating the revenues from international tourism (source: IMF Balance of Payments Statistics Yearbook 1997) to GDP figures (source: UN Statistical Commission and Economic Commission for Europe 1997. Both variables were expressed in US dollar terms. Data on tourism receipts for Ukraine and Russia are those for 1994, as well as the data for GDP, which were taken from IMF International Financial Statistics Yearbook 1997. For Croatia this variable was constructed from the same sources as the variable of openness. In IMF BoP Statistics and IMF IFS data were not available for Belarus, and the data for Moldova were available only for 1995 on. Therefore, these two countries have been excluded from the sample in cases when regression specification requires openness and tourism variable.

Cumulative liberalization indexes for countries in transition were taken from Melo et al. (1997).