Original scientific paper
UDC: 336.748.12
338.53
330.567.2

Measuring the distributional effects of inflation in Croatia by using the LES approach*

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Abstract

This paper deals with distributional effects of price changes in period from 2000 to 2007. Even though in this period we can observe relatively low inflation rates, the goal of the research is to determine whether there are possible negative effects of price changes on income inequality in Croatia. The approach bases on the application of linear expenditure system (LES) on the aggregate data, i.e. deciles of household income groups. The results show that overall inflation rate does not determine distributional effects in Croatia. In some years, changes in prices present higher burden for lower income groups, while in other years, higher income groups are worse off. It seems that redistributive effect primarily depends on the structure of price changes. Therefore we need further research on this issue.

Key words: *Inequality, inflation, linear expenditure system, Croatia*

JEL classification: *D12 D31 H31 H23*

1. Introduction

The paper deals with redistributive effects of inflation in Croatia in period from 2000 to 2007. Even though rise of prices is very sensitive political issue, there is relatively little empirical research that can be found in literature such as Muellbauer (1974), Shorrocks and Marlin (1982), Slottje (1987), Slesnick (1994), Bulir and Gulde (1995), Creedy and Van de Ven (1997), Bulir (2001), Easterly and Fisher (2001). In addition,

* Received: 22-10-2008; accepted: 15-12-2008

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[2] *The presented results are part of the research project (Strategy of socieconomic relations of the Croatian society, No. 081-0000000-1264) supported by the Ministry of Science, Education and Sports of the Republic of Croatia.*

there are not many new papers on this topic. It is not likely that such state comes from the lack of interest in such topic. One of the reasons for such case is similar like in majority socio-economic issues – lack of data. Another could be in fact that developed and emerging economies for a longer period did not have problems with high inflation. Therefore, one might conclude that welfare effects are negligible. The results of previously mentioned studies go in line with this conclusion.

The approach to measurement of welfare effects of inflation in this paper relies on application of linear expenditure system. The LES utility function is estimated using data for the year 2007. Therefore, the results enable us to observe effects of alternative sets of proportionate price changes on household welfare based on year 2007. This methodology focuses on rise of prices of particular commodity groups and determines the most important one for redistributive policy goals. Inflation effects come from the fact that prices of all goods do not vary by the same dynamics. Therefore, the final effect will depend on the level of rise of prices of particular goods and capability of households to shift away from the goods that are relatively more expensive.

In the second part of the paper, after introduction, we present the estimation framework. Third part gives a brief description of data derivation. This study uses aggregate data from Results of Households Budget Survey and detailed Consumer price index (CPI) data provided by Croatian Central Bureau of Statistics (CBS). The results and discussion in the forth part do not show clear-cut positive or negative effect of inflation in Croatia. This effect depends on the extent of differential inflation of prices of "necessities" and "luxuries". However, the overall level of prices was low in the period observed. In case of higher inflation, effects might substantially differ. Conclusion offers some proposals for future research.

2. Estimation framework

When reviewing the empirical approaches, three main strands can be isolated. First, research based on cross-country data on inflation and inequality (Bulir and Gulde, 1995, Bulir, 2001, Easterly and Fisher, 2001); second, research based on mathematical models (Cysne et al., 2005); and third, research based on time series dataset of particular country (Muellbauer, 1974, Creedy and Van de Ven, 1997). In addition, studies differ by the fact that part of them analyzes effects of inflation on income distribution and other analyzes effects on consumption inequality. In spite of the fact that the concept of permanent income leads to equalization of income and expenditure, for the short-term effects of inflation, it is more appropriate to use consumption as the representative of the living standard. Therefore, this paper pursues such avenue. Besides that, examination of effects of inflation on income distribution is more oriented towards macroeconomic setup of the inflation process (see Sarel,

1997)[3]. The approach for determining the effects of inflation on consumption inequality in this paper relies on utilization of the linear expenditure system (LES).

Even though Stone (1954) describes the linear expenditure system methodology half of century ago, there are not many empirical studies on the topic of redistribution effects of inflation that uses that approach. Majority of the studies cover welfare effects of inflation in Australia, United States, Canada and United Kingdom. Therefore, the empirical framework used in this research comes from several studies such as Muellbauer (1974), King (1981), Frisch (1959), Creedy and van de Ven (1997), Creedy (1998).

The linear expenditure system (LES) is in form of the following additive utility function

$$U = \sum_i \beta_i \log(x_i - \gamma_i) \tag{1}$$

where x_i denotes the consumption of the i th good and γ_i committed consumption, with constraints $x_i > \gamma_i$, $0 \leq \beta_i \leq 1$ and $\Sigma_i \beta_i = 1$. From the maximization of utility subject to the budget constraint $y = \Sigma_i p_i x_i$ we can obtain linear expenditure function for each good, i of the form[4]

$$p_i x_i = \gamma_i p_i + \beta_i \left(y - \sum_j p_j \gamma_j \right) \tag{2}$$

Committed consumption refers to a certain amount of the total income of consumers that is used for acquiring basic goods. The remaining income distributes over the set of available commodities according to respective values of marginal propensities to consume.

By differentiation of each expenditure function from equation (2), the own price elasticity of demand for the i th good, e_{ii}, is given by

$$e_{ii} = -\frac{\beta_i}{p_i x_i} \left(y - \sum_{j \neq i} p_j \gamma_j \right) \tag{3}$$

[3] Another issue that seriously jeopardizes the results of cross-section empirical framework is problem of different statistical basis of national accounts and statistical bureaus (Atkinson and Brandolini, 2001).

[4] The expression $y - \sum_j p_j \gamma_j$ refers to the term "supernumerary income" which denotes difference between disposable income and committed consumption. Due to constraints of the linear expenditure system, "supernumerary income" has to be positive and that rules out inferior and complementary goods.

which can be simplified as

$$e_i = \frac{\beta_i \, y}{p_i x_i} \tag{4}$$

If we utilize the definition of w_i , we can write

$$e_i = \frac{\beta_i}{w_i} \tag{5}$$

From the household budget data, the expenditure weights or budget shares, w_i, can be calculated for each commodity group. This can be done from either using the aggregate data of by grouping the individual households by income. When using individual household data authors usually have to employ labor-intensive methods of smoothing the budget data in order to avoid occurrence of negative elasticities. These weights can be used to find, for each total expenditure group, the set of total expenditure elasticities, e_i. After calculating the e_i s, the corresponding values of β_i can be determined by using (5).

Another variable important for the application of the model are own-price elasticities. They are necessary for calculation of committed expenditure, $p_i\gamma_i$, for each commodity group and total expenditure or income group. Matrix of own-price elasticities, e_{ii}, can be obtained by using a "Frisch parameter", ξ, determined by Frisch (1959). This parameter denotes the elasticity of marginal utility of total expenditure with respect to total expenditure. If δ_{ij} denotes the Kroneker delta, such that $\delta_{ij} = 0$ when $i \neq j$, and $\delta_{ij} = 1$ when $i = j$, then Frisch showed that the elasticities can be written as

$$e_{ij} = -e_i w_j \left(1 + \frac{e_j}{\xi}\right) + \frac{e_i \delta_{ij}}{\xi} \tag{6}$$

so that own-price elasticities are

$$e_{ii} = e_i \left\{ \frac{1}{\xi} - w_i \left(1 + \frac{e_i}{\xi}\right) \right\} \tag{7}$$

The use of upper term ensures that all additivity and homogeneity restrictions necessary for the application of the LES model are satisfied. Additivity within this context refers to the marginal social rate of substitution between two persons' expenditures is independent of all other persons' expenditures (see Muellbauer, 1974, p.42). In another words, the sum of the expenditures given by the system is identically equal to total expenditure. Homogeneity implies that for each commodity

the sum of the total expenditure (or income) elasticity and all the price elasticities equals zero (Stone, 1954, p.513).

In order to obtain committed expenditures we can rearrange equation (4) by using $x_i = \frac{p_i w_i}{y}$, so that

$$p_i \gamma_i = \frac{y w_i (1 + e_{ii})}{1 - \beta_i} \tag{8}$$

Expressions derived so far in the paper present necessary tool for obtaining the welfare effects of inflation, assuming that all consumers face same prices. We will determine these effects by calculating "equivalent" variations, and "equivalent incomes". For the understanding of their significance for the welfare measurement, we expose details on their calculation further in the text.

Derivation of the expenditure function begins from indirect utility function, $V(p,y)$[5], which expresses utility as a function of prices and income:

$$V^* = \left(y - \sum_j p_j \gamma_j \right) \prod_i \left(\frac{\beta_i}{p_i} \right)^{\beta_i} \tag{9}$$

if we use the term A as

$$A = \sum_i p_i \gamma_i \tag{10}$$

and term B as

$$B = \prod_i \left(\frac{\beta_i}{p_i} \right)^{\beta_i} \tag{11}$$

expression (9) can be presented as

$$V^* = \frac{(y - A)}{B} \tag{12}$$

[5] See Creedy (1998) for details on the form of indirect utility function.

By using the terms A and B we can further proceed to derivation of "equivalent" variations, and "equivalent incomes".

The expenditure function presents the minimum expenditure required to achieve utility U at prices p, written as $E(p,U)$. It is given by using equation (9) so that

$$E(p,U) = A + BU \tag{13}$$

The term $\frac{A_1}{A_0}$ presents Laspreyes type of price index and equals $\frac{\sum_i p_{1i}\gamma_i}{\sum_i p_{0i}\gamma_i}$, using the committed consumption of each good as the weight. Due to the fact that this expression gives higher weights to goods with low expenditure elasticities (see Muellbauer, 1974, p.39), in the literature it is called as a price index of "necessities".

Furthermore, since data on actual prices are not available we have to use proportional changes in prices denoted by $\dot{p}_i$ and from $p_{1i} = p_{0i}\left(1 + \dot{p}_i\right)$ we have

$$\frac{A_1}{A_0} = 1 + \sum_i s_i \dot{p}_i \tag{14}$$

where

$$s_i = \frac{p_{0i}\gamma_i}{\sum_i p_{0i}\gamma_i} \tag{15}$$

The term $\frac{B_1}{B_0}$ simplifies to

$$\frac{B_1}{B_0} = \prod_i \left(\frac{p_{1i}}{p_{0i}}\right)^{\beta_i} \tag{16}$$

which is interpreted as a weighted geometric mean of price relatives. It is sometimes referred to as reflecting the price of "luxuries" because of the fact that marginal propensity to consume out of total expenditure is used as weights (see Muellbauer, 1974, p.39). For wealthier individuals this value is higher and such commodities have higher expenditure elasticities.

Derivation of equivalent variations, EV, relies on expressions (14) and (16). The equivalent variation is the difference between the total expenditure level after change of prices and the minimum expenditure required to achieve utility after change of prices at the pre-change prices. From definition and by some rearranging we have

$$EV = y_1 - A_0\left[1 + \frac{B_0}{B_1}\left(\frac{y_1}{A_0} - \frac{A_1}{A_0}\right)\right] \tag{17}$$

King (1981) brings additional measure of welfare changes of inflation, equivalent income. Equivalent income is value of income, y_i, that at certain referent set of prices, p_i gives the same utility as the actual income level.

The equivalent income is minimum expenditure necessary to achieve the actual utility level, at referent set of prices:

$$y_e = A_r + \frac{B_r(y - A)}{B} \tag{18}$$

where subscript r denotes referent prices. By expanding the expression for A and B we have

$$y_{1e} = A_0\left[1 + \frac{B_0}{B_1}\left(\frac{y_1}{A_0} - \frac{A_1}{A_0}\right)\right] \tag{19}$$

After derivation of measures of redistributive effects of price changes, the next section elaborates derivation of the dataset.

3. Data

All data for the period from 2000 to 2007 that were necessary for obtaining the results come from the Croatian Central Bureau of Statistics (CBS). Data come from two sources. First source are data on Consumer price index and price changes on particular commodity groups presented in table 1. This data come from the online database of the CBS on Consumer Price Indices (First releases). We use CPI data as average annual changes in prices. It can be observed that price changes of commodity groups show significant variability through the period. In some years, prices of some commodity groups had double digits.

Second source of data comes from annual Results of Households Budget Survey. These results present spending patterns of Croatian households grouped in deciles according to the amount of their income. This approach differs from other studies that used the LES approach (i.e. Creedy and Van de Ven, 1997). Muellbauer (1974) used aggregate data as well. However, expenditure groups in his dataset base on household data for two years. Creedy (1997) used detailed data on households for the year 1989 in order to obtain necessary parameters. On the other hand, Creedy and Cornwell (1997) used results of Australian Household Expenditure Survey on 14 different commodity groups and 30 income (total expenditure) categories. This research

bases on household expenditure by deciles of household sample. Data organized in that way are more convenient for the welfare analysis from the arbitrary set of income (expenditure) groups that mentioned studies pursue. In addition, problem when aggregating the data on individual households is in much higher variability of the consumption structure. This results in occurrences of large number of negative elasticities. Authors usually correct this problem by smoothing the household budget shares. By using the aggregate data this problem is less likely to occur.

Table 1: Percentage price changes by commodity groups

- annual average of rate

Year / Commodity groups	2000	2001	2002	2003	2004	2005	2006	2007
Food and nonalcoholic beverages	5.3	3.9	0.6	1	1.4	4.6	2.5	3.3
Alcoholic beverages and tobacco	16.2	5	1.4	1.2	5.2	6.2	1.7	3.1
Clothing and footwear	6.3	3.3	2.8	0.6	-0.5	0.5	2.3	5.2
Housing, water supply, electricity and other fuels	19.5	9.2	1.5	1.7	3.9	4.4	7.8	2.6
Furniture, furnishings, household, maintenance	4.1	0.8	-2.6	-1.1	-0.4	2.4	2.4	2.1
Health	-6.6	8.5	8.3	9.5	3.5	3.2	7	1.9
Transport	8.9	9.5	8	3.4	3	2.1	2.6	2.6
Communications	6.3	23.2	9.8	2.3	-0.3	-0.3	0	-0.2
Recreation and culture	1.7	5.2	1.9	0.7	3.4	2.7	0.8	2.1
Education	-1.1	13.6	1.7	3	-3.6	3.9	3.1	1
Catering and accommodation services	1	2.8	4.7	2.1	3.7	2.2	3.2	2.2
Miscellaneous goods and services	3	3.1	5.6	1.05	2	1.9	2.6	3.7
CPI	6.2	4.9	2.2	1.5	2.1	3.3	3.2	2.9

Source: Central Bureau of Statistics of Republic of Croatia, First releases

In estimating the redistributive effects of inflation in Australia Creedy and Van de Ven (1997) had problem of different classification of commodity groups between publications of the Consumer Price Index and Household Expenditure Survey. In this research, the problem is in different classification of data on CPI in period from 2000 to 2007. Table A1 in the appendix present differences in classification of consumer price indices used in this research. Data from the Results of Households Budget Survey follow the same classification in the period.

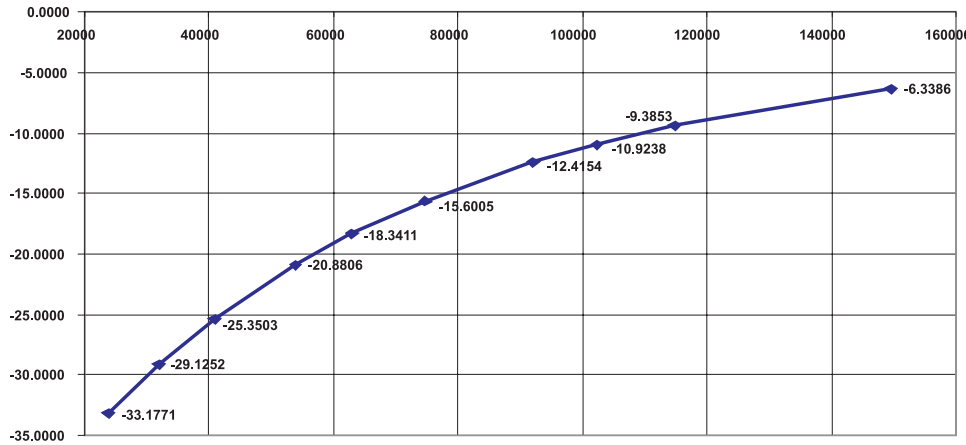
Important element for application of the LES model is the "Frisch parameter". This parameter cannot be derived from the household expenditure data. The term refers to the elasticity of marginal utility with respect to total expenditure and Frisch (1959) brings it in empirical literature. Usually, empirical studies use different values of Frisch parameter for each expenditure group. The empirical problem is that there is still no definitive agreement about the values of that parameter. Several studies confirm negative Frisch values (Lluch and Williams, 1975, Creedy and Van de Ven, 1997).

Usual approach for determining the Frisch values is to specify a certain pattern using the a priori assumptions (see Creedy and Van de Ven, 1997, p. 136). These assumptions base on previous work. Such approach is present in this study as well. We base Frisch values of Croatian economy on the flexible specification used by Lluch and Williams (1975), Creedy and Van de Ven (1997), Creedy and Cornwell (1998):

$$\log(-\xi) = a - \alpha \log(y + \theta) \qquad (20)$$

Estimates of the Frisch values start with certain values and than by experimentation with range of alternatives (Creedy and Van de Ven, 1997, p.136). For the estimation of the Frisch parameter, we apply maximum likelihood estimation on a hypothetical set of data and initial values for parameters a, α, θ. These values are 25, 1.3 and 10000 respectively. Even though the choice of the parameter values relies on previous research, the fact is that these values are arbitrary (in other studies as well). The choice of initial parameter values in optimization problem might have significant effects on optimization outcomes; however, this is one of the limitations of this approach. Figure 1 presents Frisch values by expenditure deciles.

Figure 1: Frisch values applied in the LES model



Source: Author's calculations

The next section exposes the results of estimation of welfare changes due to inflation for Croatian economy.

4. Results and discussion

Although the second part of the paper describes the LES methodology, it is useful to go briefly through the process of calculation of equivalent variations and equivalent income that are necessary for determination of the welfare effects.

As a first stage, we had to derive values of budget shares (w_i), income elasticities (e_i) and marginal propensity to consume (β_i) for all income groups. Elasticities and budget shares (for the year 2007) derive from the household data. Income elasticities are derived exactly by the procedure thoroughly described by Creedy (1998, p. 146). For the derivation of elasticities raw budget shares were used. Due to higher level of aggregation, there was no problem with occurrence of negative elasticities. Income elasticities are presented in table A2.

After obtaining budget shares and income elasticities, we estimate β_i (table A3) by using relation (5). Finally, by using Frisch values (figure 1) we calculate the own-price elasticities (table A4). After that, we use equation (12) to calculate committed consumption (table A5) necessary for the estimation of measures of welfare effects of inflation. By taking into account values of income elasticities and commited consumption presented in tables A2 and A5 as in Muelbauer (1974) it can be concluded that food and housing turn out to be a "strategic" commodity.

By using expression (17) it is possible to calculate equivalent variations presented in table 2. We express variations as ratios of total expenditure in order to present redistributive effects more clearly. Distributional effects can be observed by reading down the columns for each year. It can be seen that inflationary effects are more pronounced at the beginning of period due to higher inflation rate. In year 2003 inflation was on lowest level and therefore redistributive changes were minimal. However, regarding the direction of redistributive changes the conclusions are not clear-cut. Such results correspond with Creedy and Van de Ven (1997). In some years, inflation is more progressive (i.e. 2001, 2002) and in other is regressive (2000, 2004, 2005, 2006). In 2003 and 2007 the redistributive effects on expenditure groups are mixed. However, we can conclude that there are no significant negative effects of inflation on welfare in this period. Such findings confirm results of other studies that there are no significant redistributive effects in case of low level inflation (see Bulir, 2001).

Table 2: Equivalent variations (by income deciles)

Year / Number of deciles	2000	2001	2002	2003	2004	2005	2006	2007
1	0.0746	0.0604	0.0213	0.0148	0.0208	0.0368	0.0349	0.0287
2	0.0724	0.0612	0.0231	0.0154	0.0208	0.0361	0.0345	0.0289
3	0.0721	0.0615	0.0251	0.0161	0.0212	0.0353	0.0336	0.0289
4	0.0718	0.0628	0.0282	0.0164	0.0209	0.0334	0.0323	0.0287
5	0.0696	0.0619	0.0279	0.0151	0.0200	0.0327	0.0307	0.0290
6	0.0699	0.0630	0.0288	0.0156	0.0202	0.0323	0.0309	0.0287
7	0.0692	0.0625	0.0308	0.0156	0.0192	0.0308	0.0295	0.0295
8	0.0668	0.0619	0.0298	0.0150	0.0184	0.0303	0.0295	0.0295
9	0.0666	0.0621	0.0306	0.0156	0.0191	0.0299	0.0296	0.0287
10	0.0644	0.0656	0.0313	0.0159	0.0192	0.0293	0.0294	0.0285

Source: Author's calculations

Equivalent income values presented in table 3 were calculated by using (19) with help of the fact that $y_{1e} = y_1 - EV$. However, it is difficult to read welfare effects from the table. Therefore, figure 2 presents comparison of quintile shares and inflation rates in the period analyzed. Equivalent income provides dataset for calculation of quintile shares.

Table 3: Equivalent income (by income deciles)

Year / Number of deciles	2000	2001	2002	2003	2004	2005	2006	2007
1	14761.8	19487.6	21274.9	21369.3	21578.0	23229.9	21305.8	23284.2
2	20838.7	25565.3	27446.7	27446.5	27547.6	30452.0	30929.3	31142.4
3	29825.0	31967.8	35842.4	38402.9	36603.4	38239.7	37021.5	39808.8
4	37820.0	41610.9	46349.6	46746.0	48039.4	49471.5	46852.5	52450.2
5	45701.7	47515.0	54364.7	52820.7	58689.7	56448.6	61451.2	61229.9
6	53629.8	57878.0	66043.7	66018.7	69516.2	66242.0	71454.5	72643.7
7	60790.0	72234.8	73278.3	77099.9	83963.0	77884.1	79763.5	89465.5
8	72480.1	78934.7	85294.2	91955.5	95104.3	92255.8	92437.5	99357.6
9	89806.8	87738.0	99592.9	104599.5	105539.6	109833.8	106430.3	111594.2
10	128831.5	120070.3	126139.2	134265.4	144146.9	139738.2	134369.8	145323.9
TOTAL	556485.4	585003.3	637628.6	662727.3	692732.2	685800.7	684021.7	728307.4

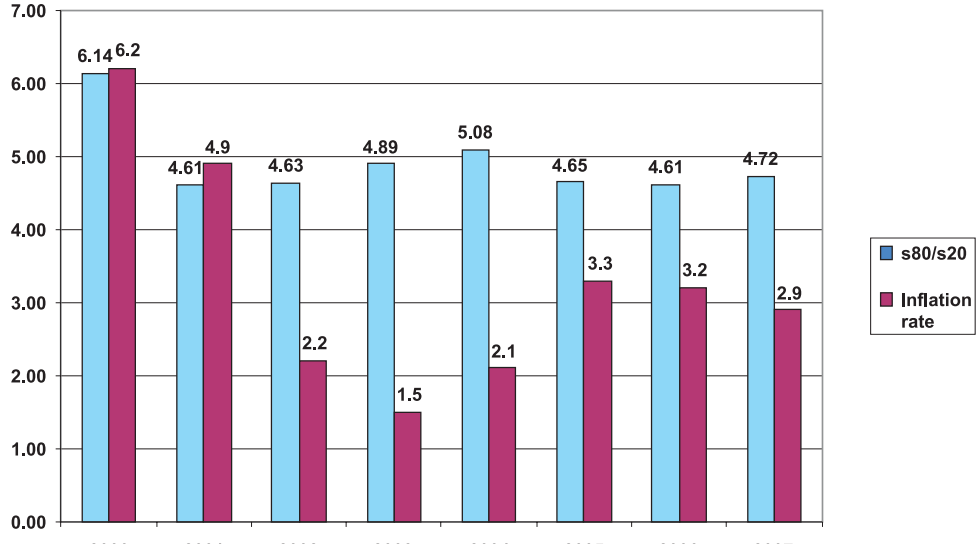
Source: Author's calculations

Comparison of the quintile shares and inflation rate through the period from 2000 to 2007 show no substantial changes in terms of wealth redistribution in the country. Values of the quintile shares roughly match data from the World Development Indicators - 4.2 for the year 2005 (the World Bank, 2008) and CBS - 4.8 for the year 2006.

One of the reasons for insignificant redistributive effect could be in fact that inflation was relatively stable and on low level in this period. However, it is hard to determine if such stable level of inequality results from progressive taxation, government transfers and increase in employment and wages that counteracted the rise of prices[6].

Figure 2: Comparison of quintile shares and inflation rates in the period 2000 – 2007

- in percentage (%)



Source: Author's calculation, CBS

The estimated measures show that redistributive effects of inflation in Croatia do not depend on the level of overall inflation rate. The key factor is in structure of price changes. If rise of prices affects more "necessities" then the redistributive effect is regressive. The nonlinear effect of inflation determined in some research

[6] That would be beneficial for lower income groups. It is considered that rich individuals are better able to protect themselves from inflation. The argument is that this happens due to number of reasons. They have better access to financial instruments that can provide hedge against inflation; low-income groups have relatively more cash in respect to total income; government transfers are not fully index and indexation usually lags, minimal wage regulation does not follow the inflation dynamics and so on (compare with Easterly and Fisher, 2001, p. 160).

might be explained by the possibility that higher inflation leads to decrease of elasticities of necessities and shifts the value of marginal propensity to consume towards necessities. This results from decline in real wages, higher unemployment[7] and state of uncertainty where consumption of luxuries is postponed. It is likely that higher overall inflation rate puts more pressure in higher prices of commodities with inelastic demand – this is the source of nonlinearity. However, that is the topic for future research.

5. Conclusion

The results of this research show that there are no significant negative effects of inflation on welfare in the period analyzed. Such findings confirm the results of other studies that there are no significant redistributive effects in case of low level inflation**.** In some years inflation more heavily burdens low incomes and in other higher ones. Therefore, the reasons of progressive or regressive effect can be found in the raises of prices within the particular groups of commodities. In addition, it can be concluded that food and housing turn out to be crucial commodities in terms of welfare effects of inflation. Rise in prices of these groups of commodities would substantially increase inequality. Also, it would be worthwhile to compare these results obtained by aggregate data with similar analysis that uses detailed data on households from the CBS. This could lead to further refinement of the results by enabling exclusion of durable goods, exploiting variability of budget shares and calculation of within-group inequality. In addition, there is obvious non-linear pattern present in income and price elasticities, therefore, development of non-linear expenditure system methodology would be beneficial in terms of improvements of the results.

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[7] Higher rates of inflation usually related to worsening of macroeconomic conditions in the country lead to rise of unemployment. Significant increase of unemployment would have high negative effects both on income distribution (through the pressure of labor surplus) and on the expenditure distribution (by lowering the disposable income of households).

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Mjerenje redistribucijskih učinaka inflacije u Hrvatskoj primjenom LES modela

Saša Drezgić[1,2]

Sažetak

Rad se bavi distribucijskim učincima promjena cijena u razdoblju od 2000. do 2007. godine. Iako se u ovom razdoblju mogu primijetiti relativno niske stope inflacije, cilj istraživanja je utvrditi moguće negativne učinke promjena cijena na dohodovnu nejednakost u Hrvatskoj. Pristup se zasniva na primjeni linearnog sustava potrošnje na agregirane podatke, dohodovne skupine kućanstava po decilima. Rezultati pokazuju da opća stopa inflacije nema utjecaja na distribucijske učinke u Hrvatskoj. U pojedinim godinama promjene u cijenama predstavljaju veći teret za niže dohodovne skupine dok je u drugim godinama opterećenje veće za gornje dohodovne skupine. Čini se da redistributivni učinak u prvom redu ovisi o strukturi promjena cijena. Zato su potrebna daljnja istraživanja problema.

***Ključne riječi**: Nejednakost, inflacija, linearni sustav potrošnje, Hrvatska*

***JEL klasifikacija:** D12, D31, H31, H23*

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[2] *Classification of Individual Consumption by Purpose*

Appendices

Table A1: Structure of Consumer price index according to COICOP[8]

Expenditure group	2004-2007	2000-2003
Food and alcoholic beverages	Bread and cereals, meat, fish, milk, cheese and eggs, oils and fats, fruit, vegetables, sugar, jam, honey, chocolate and confectionary, food products; coffee, tea and cocoa, mineral waters, soft drinks and juices	Fresh vegetables, fresh fruits, fresh eggs, fresh fish, cereal products, processed and canned vegetable, processed and canned fruit, fresh meat, processed and canned meat products, milk, fat, other food products, beverages
Alcoholic beverages and tobacco	Spirits, wine, beer, tobacco	Beverages, tobacco
Clothing and footwear	Clothing materials, garments, other articles of clothing and accessories, cleaning, repair and hire of clothing, footwear	Textile fibers and fabrics, finished textile products, footwear, leather products,
Housing, water, electricity, gas and other fuels	Actual rentals for housing, materials and services for the maintenance and repair of the dwelling, water supply, refuse collection, electricity, gas, liquid fuels, solid fuels, heat energy	Electricity and lightning, fuel, liquid fuels and lubricants, construction material
Furnishings, household equipment and routine maintenance of house	Furniture and furnishings, carpets and other floor coverings, repair of furniture, furnishings and floor coverings, household textiles, household appliances, glassware and tableware utensils, tools and equipment for house and garden, goods and services for household maintenance	Furniture, dishes and tableware, electrical household appliances, other household articles, ready made articles for housekeeping, floor coverings
Health	Medical products, appliances and equipment, medical services, except hospital services, hospital services	Medicines
Transport	Purchase of vehicles, operation of personal transport equipment, transport services	Transport equipment, parts of transport equipment, transport services
Communication	Postal services, telephone and telefax equipment and services	Postal and telecommunication services
Recreation and culture	Audio-visual, photographic and information processing equipment, other major durables for recreation and culture, other recreational items and equipment, gardens and pets, recreational and sporting services, cultural services, books, newspapers and stationery, package holidays	Products for culture, products for entertainment, education and culture services
Education	Education	Products for education, education and culture services
Catering and accommodation services	Catering services, accommodation services	Crafts services
Miscellaneous goods and services	Personal care, personal effects, social protection, insurance, financial services, other services	Personal and other services, financial and other services, social care

Source: Central Bureau of Statistics of Republic of Croatia, First releases

[8] Classification of Individual Consumption by Purpose

Table A2: Total income (expenditure) elasticities (by income deciles and expenditure groups)

TOTAL PERSONAL CONSUMPTION	1	2	3	4	5	6	7	8	9	10
Food and nonalcoholic beverages	0.967101	0.848788	0.675164	0.608873	0.70681	0.748708	0.776175	0.611675	0.321874	0.375062
Alcoholic beverages and tobacco	0.555055	1.224818	1.616392	0.994701	0.645678	0.58148	0.687483	0.554656	0.637906	0.491829
Clothing and footwear	1.450802	1.845489	1.698668	2.063533	1.963498	1.348944	2.552064	2.06345	0.899949	1.083018
Housing, water supply, electricity and other fuels	0.939631	0.789867	0.574545	0.449549	0.661237	0.66008	0.367329	0.811778	0.758185	0.512156
Furniture, furnishings, household, maintenance	0.268336	0.34568	1.099444	0.978446	1.157749	1.505274	0.660446	1.310226	1.895787	1.09561
Health	1.425697	1.334104	0.972535	0.861636	0.778669	0.558389	0.714878	0.951176	1.739744	2.190308
Transport	0.529062	2.728158	3.201716	1.412276	1.249845	2.228114	0.64431	0.527961	1.697145	0.921735
Communications	1.246916	1.058115	0.947232	1.289974	1.237336	0.942923	1.192192	1.317849	1.17095	1.397192
Recreation and culture	1.024791	0.959293	0.903588	1.64275	1.622555	1.00391	1.323934	1.576755	1.725478	1.952187
Education	14.33753	2.40036	1.836292	3.691447	1.930201	0.592021	3.32192	3.585305	2.037767	1.426667
Catering and accommodation services	1.536583	1.18672	1.522059	2.305585	1.996226	1.508216	1.786341	1.472526	1.206971	1.810419
Miscellaneous goods and services	1.875971	1.368321	0.979964	1.731439	0.942621	0.361457	1.567645	0.971776	0.966075	1.423499

Source: Author's calculations

Table A3: Marginal propensity to consume (by income deciles and expenditure groups)

TOTAL PERSONAL CONSUMPTION	1	2	3	4	5	6	7	8	9	10
Food and nonalcoholic beverages	0.4217	0.3660	0.2703	0.2210	0.2431	0.2505	0.2402	0.1889	0.0902	0.0918
Alcoholic beverages and tobacco	0.0222	0.0416	0.0725	0.0463	0.0296	0.0239	0.0276	0.0210	0.0232	0.0160
Clothing and footwear	0.0444	0.0651	0.0794	0.1047	0.1322	0.0971	0.1959	0.2070	0.0877	0.1077
Housing, water supply, electricity and other fuels	0.1900	0.1565	0.1031	0.0711	0.0957	0.0959	0.0446	0.0961	0.0884	0.0536
Furniture, furnishings, household, maintenance	0.0161	0.0156	0.0495	0.0470	0.0534	0.0784	0.0367	0.0646	0.1150	0.0680
Health	0.0464	0.0497	0.0379	0.0308	0.0192	0.0125	0.0151	0.0196	0.0366	0.0637
Transport	0.0186	0.0805	0.2050	0.1457	0.1149	0.2601	0.0945	0.0621	0.2371	0.1265
Communications	0.0550	0.0506	0.0429	0.0612	0.0635	0.0488	0.0593	0.0699	0.0622	0.0817
Recreation and culture	0.0489	0.0462	0.0421	0.0756	0.0929	0.0575	0.0759	0.0969	0.1123	0.1630
Education	0.0078	0.0072	0.0048	0.0169	0.0146	0.0039	0.0227	0.0364	0.0254	0.0198
Catering and accommodation services	0.0209	0.0190	0.0228	0.0495	0.0538	0.0462	0.0579	0.0545	0.0430	0.0795
Miscellaneous goods and services	0.1079	0.1020	0.0696	0.1302	0.0871	0.0251	0.1297	0.0830	0.0788	0.1287

Source: Author's calculations

Table A4: Own-price elasticities (by income deciles and expenditure groups)

TOTAL PERSONAL CONSUMPTION	1	2	3	4	5	6	7	8	9	10
Food and nonalcoholic beverages	-0.43860	-0.38451	-0.28969	-0.24367	-0.27229	-0.28646	-0.28767	-0.23433	-0.12140	-0.14553
Alcoholic beverages and tobacco	-0.03854	-0.0819	-0.13162	-0.09172	-0.06375	-0.06030	-0.0814	-0.07075	-0.08963	-0.09238
Clothing and footwear	-0.08621	-0.12434	-0.14109	-0.19322	-0.22512	-0.17516	-0.36122	-0.35679	-0.17522	-0.26013
Housing, water supply, electricity and other fuels	-0.21297	-0.17936	-0.12345	-0.0911	-0.12826	-0.13419	-0.07285	-0.16331	-0.16203	-0.13010
Furniture, furnishings, household, maintenance	-0.02404	-0.02728	-0.09070	-0.09163	-0.11316	-0.16729	-0.08791	-0.17681	-0.29378	-0.22907
Health	-0.08739	-0.09320	-0.07484	-0.07079	-0.06085	-0.04786	-0.07184	-0.10492	-0.21521	-0.38724
Transport	-0.03421	-0.16661	-0.3054	-0.20348	-0.17522	-0.36577	-0.14147	-0.10740	-0.37505	-0.25350
Communications	-0.09056	-0.08509	-0.07868	-0.11921	-0.12668	-0.10632	-0.14960	-0.18211	-0.17916	-0.28411
Recreation and culture	-0.07831	-0.07761	-0.07627	-0.14829	-0.17316	-0.11819	-0.17445	-0.22723	-0.27548	-0.42081
Education	-0.43660	-0.08904	-0.07693	-0.19070	-0.11830	-0.04167	-0.28417	-0.35267	-0.23704	-0.24040
Catering and accommodation services	-0.06621	-0.05900	-0.08149	-0.15447	-0.15681	-0.13844	-0.19347	-0.18197	-0.16610	-0.34241
Miscellaneous goods and services	-0.15835	-0.14418	-0.10560	-0.20236	-0.13397	-0.04771	-0.23960	-0.16453	-0.17361	-0.32440

Source: Author's calculations

Table A5: Committed consumption (by income deciles and expenditure groups)

	1	2	3	4	5	6	7	8	9	10
Food and nonalcoholic beverages	10141.14	13415.21	15959.13	19009.39	20838.27	23801.02	26717.55	29821.71	31066.31	34417.33
Alcoholic beverages and tobacco	941.4023	1042.533	1719.438	2391.125	2785.839	2959.644	3487.298	3682.889	3899.181	4494.521
Clothing and footwear	701.3004	1058.755	1786.307	2468.218	3788.58	4913.369	5617.858	8322.833	10119.69	12320.43
Housing, water supply, electricity and other fuels	4706.975	6175.795	7185.138	8350.815	8786.327	10401.96	10846.72	11214.6	12301.45	14388.07
Furniture, furnishings, household, maintenance	1423.642	1428.393	1763.471	2468.835	2723.407	3514.804	4840.509	4439.425	5557.894	7670.759
Health	746.2519	1138.392	1536.118	1849.208	1488.341	1614.362	1836.655	1919.482	1968.841	2844.773
Transport	826.8017	856.6539	2291.316	5190.248	5398.1	7477.489	12804.7	11444.84	13137.92	17526.79
Communications	1017.611	1476.689	1786.659	2402.353	3015.304	3636.297	4139.166	4771.24	5333.257	6812.525
Recreation and culture	1108.46	1492.043	1841.476	2286.751	3288.771	4007.88	4717.703	5377.012	6096.664	8638.303
Education	7.433132	88.43681	100.2603	203.3168	426.452	469.5387	460.3144	697.8957	1122.199	1605.098
Catering and accommodation services	310.0908	492.8362	577.0878	1030.964	1514.056	2069.277	2556.963	3276.92	3567.066	4688.816
Miscellaneous goods and services	1299.837	2276.001	2797.951	3722.176	5519.721	5072.769	6658.449	7954.741	8398.637	10481.8
TOTAL PERSONAL CONSUMPTION	23230.95	30941.74	39344.35	51373.4	59573.17	69938.41	84683.88	92923.58	102569.1	125889.2

Source: Author's calculations