3. REGIONAL DISTRIBUTION OF INFLATIONARY PRESSURES IN ROMANIA[1]

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Abstract

Only few papers investigate the difference in the inflation process at a regional level. The authors consider that an analysis of the spatial distribution of food prices may provide important clues on regional inflationary pressures, because the share of these goods in total consumption in Romania is almost 2.5 times higher as compared with the EU average. The existence of territorial differentiation of basic food prices indicates a heterogeneous regional distribution of inflationary pressures. Therefore, we analyzed the correlation between the dynamics of basic food goods prices and the average net nominal salary for NUTS 3 level. Furthermore we examined the correlation between regional disparities of consumers' incomes and food prices. Possible positive outcomes of these correlations could indicate a strong influence of the differential inflationary pressures on regional disparities in living standards.

Keywords: regional disparities, inflationary pressures, food goods, living standards

JEL Classification: R10, E31

Introduction

Inflation persistence has become one of the central issues regarding the modeling of the inflation process. Indeed, the degree of inflation persistence is crucial for the monetary policy, since if the inflation process is less persistent, the task of monetary policy is easier in terms both of sacrifice ratio and of controlling inflation fluctuations

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around a given target. By now quite a large literature investigated the nature of the inflation process. First, some papers explore the nature of inflation persistence across countries, and also across sectors looking at different levels of desegregation. The European Center Bank (ECB) launched a big research project called the "Price Setting and Inflation Persistence Network" in order to better understand the pricing behavior of the single firms, and what is the impact of aggregating these different behaviors on the persistence of the aggregate inflation series (Angeloni *et al*., 2006). Using micro data on consumer prices and sectoral inflation rates from six euro area countries, spanning several years before and after the introduction of the euro, they look at whether the EMU has altered the behavior of retail price setting and/or inflation dynamics.

Altissimo *et al*. (2007) show that the aggregate series inherit the properties of their most persistent component, thus justifying the importance of looking at the different sectoral prices. The same argument, obviously, should also hold when one aggregates geographically, that is, across regions within the same country rather than across sectors.

Only few papers investigate the difference in the inflation process at a regional level. Cecchetti *et al*. (2002) analyze regional US price data to focus on deviations from PPP across the US and the dynamics of relative prices across regions. Beck and Weber (2005) study inflation rate dispersion across US, Japan, Canada and EMU regions and investigate the issue of convergence of regional inflation rates using the distribution dynamics methodology.

Busetti *et al*. (2006) consider the same issue on Italian regional data, but by a different methodology. They consider how unit-root and stationary tests can be used to study the convergence of prices and rates of inflation. They also show how the joint use of these tests in levels and first differences allows the researcher to distinguish between series that are converging and series that have already converged, and they set out a strategy to establish whether convergence occurs in relative prices or just in rates of inflation. Beck *et al*. (2006) use country specific factors as well as idiosyncratic regional components to examine the causes of the inflation dispersion across EMU regions. They find that there is a substantial area wide component, likely related to the common monetary policy in the euro area and to external developments, in particular exchange rate movements and changes in oil prices They also find that disaggregate regional inflation information, as summarized by the area wide factors, is important in explaining aggregate euro area and US inflation rates, even after conditioning on macroeconomic variables.

Vaona and Ascari (2007) investigate the regional inflation persistence, that is, the nature and causes of differences in inflation persistence across regions at a high level of territorial desegregation in Italy (NUTS 3 regions). Italy is a natural candidate for such an investigation, since the Italian regional divide is a well known problem, with Northern Italy being the most developed part of the country, followed by the Centre and then by the South and Islands.

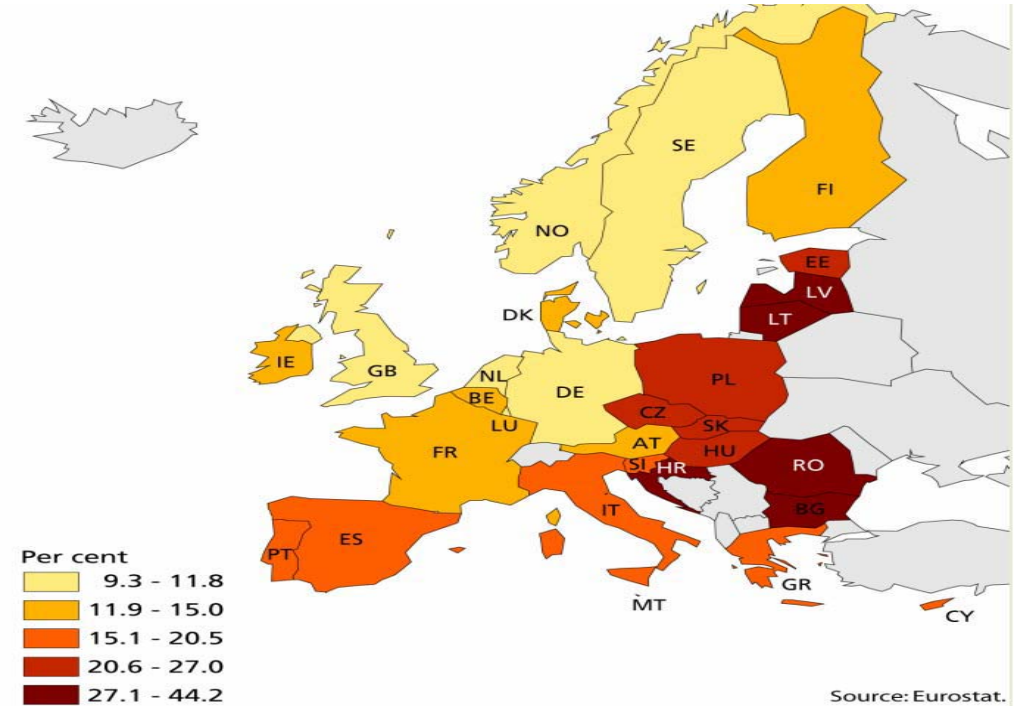
Data base and methodology

Romania is another appropriate candidate for an investigation about territorial inflation persistence due to their significant disparities in regional development. Unfortunately there are not yet prices indexes at the region level. For overcoming this problem we try to use an analysis of prices for some basic food products**.** We used this method because the share of food in total consumption in Romania is almost 2.5 times bigger as compared with the EU average, and about 3-4 times bigger than in most developed countries of the EU (Figure 1).

In these circumstances the dynamics of prices of basic food products should be an appropriate proxy indicator for regional distribution of inflation. Authors focused their analyses on six basic food products: potatoes, dry bean, onion, eggs, milk and sheep milk cheese – most common in Romanians' diet. Furthermore there are statistical data for these food products for local markets, by county residence.

Figure 1

Proportion of household consumption expenditure spent on food and non-alcoholic beverages in the EU (2006)



We proposed to test the correlation between prices variation of basic food products and variation of average net nominal monthly earnings. For this, we used the rate variation of basic food products prices and the rate variation of average net nominal monthly earnings at the level of territorial unit NUTS 3. Given that the results of econometric tests were positive, we also investigated the correlation between

territorial prices variance of these products and territorial variance of average net nominal monthly earnings.

For continuing the analysis, in conditions of lack of territorial price indices and the information necessary to build an ad hoc index of the basic food prices, the authors used a graphic analysis of regional variation of these prices. For this we calculated the cumulative deviations of basic food products prices on local markets from the national average levels, in the period 1993-2007. Separating the extreme quintiles (maximum and minimum) we created a sub-sample of 22 counties that presents significant price deviations from the national average levels for at least one product. Correlating these deviations of the price with the deviations of average net nominal monthly earnings to national average in each county, we have developed a profile of the territorial inflationary pressures distribution.

Empirical results

To analyze the influence of income on basic food prices we tested the correlation between rate variation of prices and the rate variation of average net nominal monthly earnings at the level of territorial units NUTS 3. We used the pooled least squares econometric method on a sample of 40 counties and Bucharest, between 1993 and 2007. First, we used a simple linear regression equation:

$$PX_{i\_j} = aW_j + C + \varepsilon_{ij} \quad (1)$$

where:

PX_{i_j} – rate variation of product i price in county j

W_j – rate variation of average net nominal monthly earning in county j

C – single constant of the sample

ε_{ij} – estimation error

Econometric results are showed in Table 1.

Table 1

Pooled LS estimations between rate variation of price and rate variation of average net nominal monthly earning for some basic food products

Variable	**Potatoes**	Variable	**Milk**
W? [t-stat]	1.009445 [7.190723]**	W? [t-stat]	1.165735 [47.04739]*
C [t-stat]	0.021237 [0.261333]***	C [t-stat]	-0.125872 [-8.775420]***
R squared	0.082902	R squared	0.794648
Variable	**Eggs**	Variable	**Dry Bean**
W? [t-stat]	2.567448 [10.75560]**	W? [t-stat]	1.099687 [21.61132]*
C [t-stat]	-0.619733 [-4.484767]	C [t-stat]	-0.036201 [-1.228967]
R squared	0.168221	R squared	0.449497

Variable	**Onion**	Variable	**Sheep milk cheese**
W?	4.437321	W?	1.165735
[t-stat]	[36.14227]*	[t-stat]	[47.04739]*
C	-1.274501	C	-0.125872
[t-stat]	[-17.93235]*	[t-stat]	[-8.775420]*
R squared	0.695463	R squared	0.794648

*Note: * significant at - 1%; ** significant at - 5%; *** significant at - 10%; n.s. – not significant*

We notice that the results were significant in the econometric analysis with the exception of two items: *potatoes* (R squared = 0.082902) and *eggs* (R squared = 0.168221).

To improve the results we also tested an autoregressive relationship. For that we used a VAR estimation method on pooled least squares with two lags. We found that the previous evolution of income does not affect, significantly, the correlation, but the previous evolution of prices affect the correlation. We used an autoregressive equation:

$$PX_{i\_jt} = \rho_1 PX_{i\_jt-1} + \rho_2 PX_{i\_jt-2} + aW_{jt} + C + \varepsilon_{ij} \quad (2)$$

Econometric results are showed in Table 2.

Table 2

Pooled Least Squares estimations between rate of variation of price and rate variation of average net nominal monthly earning for some basic food products

Variable	**Potatoes**	Variable	**Milk**
PPOT?(-1)	-0.141438	PMLK?(-1)	-0.197564
[t-stat]	[-3.959572]**	[t-stat]	[-6.171951]*
PPOT?(-2)	-0.057995	PMLK?(-2)	0.060207
[t-stat]	[-2.812137]***	[t-stat]	[3.676233]**
W?	0.670017	W?	1.281953
[t-stat]	[5.991371]**	[t-stat]	[26.94051]*
C	0.140008	C	-0.113804
[t-stat]	[2.835427]***	[t-stat]	[-6.349074]***
R squared	0.085233	R squared	0.668586
Variable	**Eggs**	Variable	**Dry Bean**
PEGG?(-1)	-0.203102	PBN?(-1)	0.085485
[t-stat]	[-10.47141]*	[t-stat]	[1.983179]***
PEGG?(-2)	-0.014615	PBN?(-2)	-0.101834
[t-stat]	[-2.705728]**	[t-stat]	[-3.521567]**
W?	1.621835	W?	0.950043
[t-stat]	[30.18007]*	[t-stat]	[11.58530]
C	-0.203319	C	0.006527
[t-stat]	[-8.650734]*	[t-stat]	[0.217537]
R squared	0.653288	R squared	0.316395

Variable	**Onion**	Variable	**Sheep milk cheese**
PON?(-1) [t-stat]	-0.439261 [-18.20402]*	PCH?(-1) [t-stat]	-0.165215 [-5.990195]*
PON?(-2) [t-stat]	-0.183327 [-17.57128]*	PCH?(-2) [t-stat]	0.014151 [0.798817]****
W? [t-stat]	2.880923 [33.69305]*	W? [t-stat]	1.423212 [34.55737]*
C [t-stat]	-0.356511 [-9.225429*]	C [t-stat]	-0.147380 [-9.000026]*
R squared	0.735732	R squared	0.758489

*Note: * significant at - 1%; ** significant at - 5%; *** significant at - 10%; n.s. – not significant*

The econometric tests are improving for three products: milk, onion and sheep milk cheese, but remain insignificant, or get worse for the other three products: potatoes, dry bean and eggs.

In conclusion, variation in prices of basic food products is strongly influenced by the variation of income and the previous evolution of price (up to lag 2), in each county. This last aspect could suggest the existence of significant inertial rigidity in price dynamics.

Because the price variation is strongly correlated with the income variation, made us test the correlation between the territorial distribution of prices and incomes. To test the correlation we used a regression equation of the form:

$$V\_PX_i = aV\_W_i + C + \varepsilon_i \quad (3)$$

where: V_PX_i – price variance of product X

V_W_i – variance of average net nominal monthly earning

The variances were calculated in relation to variations in prices and wages at NUTS 3 level, as compared to the national averages. Our analysis was made on the same period: 1993-2007. Econometric results are presented in Table 3.

Table 3

Correlation between variance of price and variance of average net nominal monthly earning for some basic food products

Variable	**Potatoes**	Variable	**Milk**
V_W [t-stat]	-2.03E-07 [-0.118132]***	V_W [t-stat]	2.55E-06 [42.60602]*
C [t-stat]	0.017571 [1.190544]***	C [t-stat]	0.000724 [1.411329]*
R squared	0.001072	R squared	0.794648
Variable	**Eggs**	Variable	**Dry Bean**
V_W [t-stat]	1.14E-07 [7.314389]*	V_W [t-stat]	1.46E-05 [18.15293]*
C [t-stat]	0.000354 [2.637751]**	C [t-stat]	0.013594 [1.971034]**
R squared	0.804512	R squared	0.962047

Variable	**Onion**	Variable	**Sheep milk cheese**
V_W [t-stat]	3.14E-06 [10.44603]**	V_W [t-stat]	9.35E-05 [16.96433]**
C [t-stat]	0.003364 [1.303762]***	C [t-stat]	0.073702 [1.556333]**
R squared	0.893547	R squared	0.956780

*Note: * significant at - 1%; ** significant at - 5%; *** significant at - 10%; n.s. – not significant*

This time, the econometric results are much better for most products, but there still remains the exception of potatoes (R squared = 0.001072). Also we tested this correlation and using a VAR method. We used the following autoregressive equation:

$$V\_PX_{it} = \rho_1 V\_Px_{it-1} + \rho_2 V\_Px_{it-2} + aV\_W_{it} + C + \varepsilon_{it} \quad (4)$$

This time the results of the econometric tests were improving. However, for potatoes the econometric tests remain insignificant. The authors consider that this exception could indicate the existence of a Giffen phenomenon.

Table 4

Correlation between variance of price and variance of average net nominal monthly earning for some basic food products

Variable	**Potatoes**		Variable	**Milk**	
	V_PPOT	V_W		V_PMLK	V_W
V_PPOT(-1) [t-stat]	-0.144788 [-0.41330]**	4014.764 [1.01506]**	V_PMLK(-1) [t-stat]	-0.821585 [-1.94502]*	-119089.1 [-0.86704]*
V_PPOT(-2) [t-stat]	-0.135036 [-0.38272]***	10151.80 [2.54843]*	V_PMLK(-2) [t-stat]	0.291627 [0.62893]**	215770.4 [1.43107]*
V_W(-1) [t-stat]	-4.63E-06 [-0.18544]***	0.690096 [2.44713]**	V_W(-1) [t-stat]	3.71E-06 [2.65260]**	1.298071 [2.85589]*
V_W(-2) [t-stat]	4.87E-06 [0.14433]**	1.015865 [2.66848]**	V_W(-2) [t-stat]	1.95E-06 [0.93499]***	0.021025 [0.03108]
C [t-stat]	0.028424 [1.21059]**	23.77589 [0.08969]	C [t-stat]	0.001904 [1.93242]	174.8287 [0.54582]
R squared	0.045494	0.994997	R squared	0.991508	0.994127
Variable	**Eggs**		Variable	**Dry Bean**	
	V_PEGG	V_W		V_PBN	V_W
V_PEGG(-1) [t-stat]	0.350503 [1.62198]*	-581993.0 [-0.94173]**	V_PBN(-1) [t-stat]	0.824972 [2.12771]*	28471.75 [4.46262]*
V_PEGG(-2) [t-stat]	-0.165195 [-0.75318]**	-266013.7 [-0.42410]***	V_PBN(-2) [t-stat]	-0.594354 [-1.50601]**	-23525.01 [-3.62255]*
V_W(-1) [t-stat]	9.39E-08 [0.74645]*	0.827664 [2.29946]**	V_W(-1) [t-stat]	6.47E-06 [0.42593]*	0.381593 [1.52613]*

V_W(-2) [t-stat]	7.00E-08 [0.40163]*	0.958454 [1.92226]**	V_W(-2) [t-stat]	1.15E-05 [0.70253]*	1.212097 [4.48993]*
C [t-stat]	0.000207 [1.50430]*	555.7426 [1.41074]*	C [t-stat]	0.014881 [1.37552]**	143.8538 [0.80811]*
R squared	0.938180	0.991822	R squared	0.961268	0.997756
Variable	**Onion**		Variable	**Sheep milk cheese**	
	V_PON	V_W		V_PCH	V_W
V_PON(-1) [t-stat]	-0.041165 [-0.04251]**	-93721.53 [-1.09839]*	V_PCH(-1) [t-stat]	0.123707 [0.39620]*	3261.739 [1.58339]*
V_PON(-2) [t-stat]	-1.250181 [-0.83950]*	-21787.14 [-0.16604]*	V_PCH(-2) [t-stat]	-0.196131 [-0.58776]*	-351.6249 [-0.15972]*
V_W(-1) [t-stat]	5.09E-06 [0.72297]*	1.410718 [2.27472]*	V_W(-1) [t-stat]	0.000229 [3.94201]*	0.852645 [2.22602]*
V_W(-2) [t-stat]	5.25E-06 [0.64713]*	0.645106 [0.90240]	V_W(-2) [t-stat]	-0.000128 [-1.54073]	0.348443 [0.63445]
C [t-stat]	0.004167 [1.25991]	321.9789 [1.10485]*	C [t-stat]	0.078188 [1.53733]*	52.17015 [0.15548]*
R squared	0.910094	0.992518	R squared	0.981603	0.992863

*Note: * significant at - 1%; ** significant at - 5%; *** significant at - 10%; n.s. – not significant*

In conclusion, there is a strong correlation between territorial wage variance and territorial price variance for basic food products. Also previous territorial variances (up to lag 2) have significant influence both for prices and for wages.

A strong correlation between the territorial variance of prices of basic food products and territorial variance of average net nominal monthly earnings made us study the effects of these regional disparities on the standard living of the population. In conditions of lack of territorial price indices and the information necessary for building an ad hoc index of the prices of basic food products, authors used a graphic analysis. For this, we calculated the cumulative deviations of prices on local markets to national average for prices of basic food products analyzed in the period 1993-2007. Separating the extreme quintiles (maximum and minimum) we created a sub-sample of 22 counties that presented significant price deviations from the national average for at least one product. Correlating these deviations of the price with the deviations of average net nominal monthly earnings to national average in each county, we have developed a profile of the distribution of inflationary pressures in the territory.

There are 3 cases:

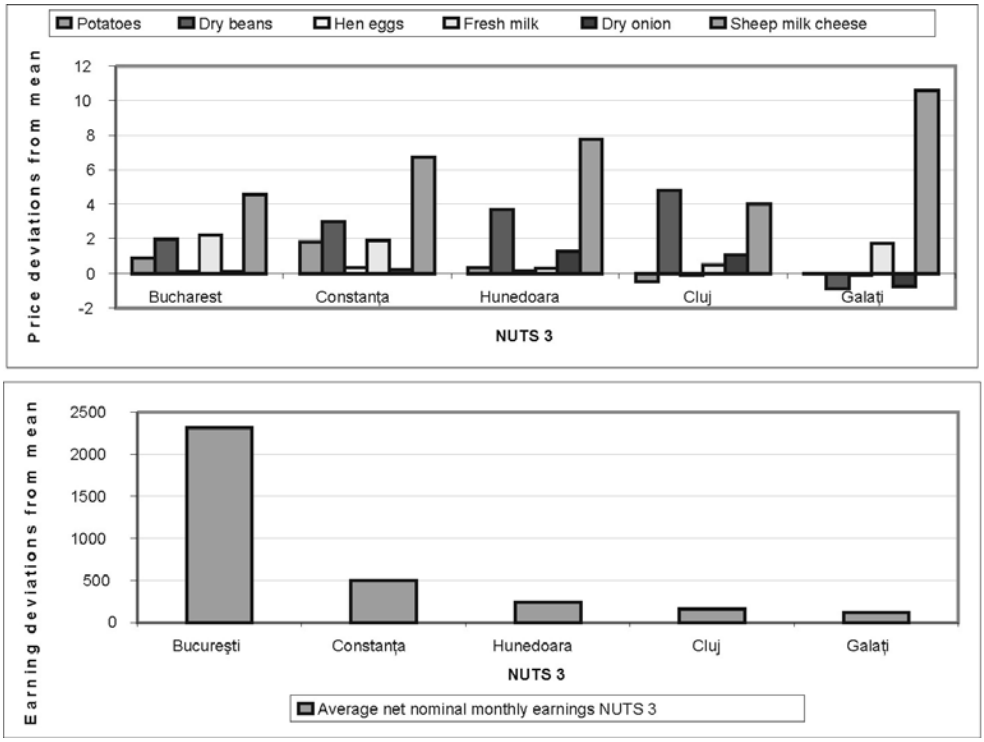
- Positive and of same sense deviations;
- Negative and identical sense deviations (Keynes effect);
- Different sense deviations.

Case 1: Positive and identical sense deviations for basic food prices and average net nominal monthly earnings (Figure 2). Positive deviations of wages

sustain positive deviations of prices. The relevant counties are: Bucharest, Constanța, Hunedoara, Cluj and Galați. This case is concordant with the neo-classical point of view of excess money as the main determinant of inflation.

Figure 2

The counties with positive and identical sense deviation prices and wages



Case 2: Negative and of same sense deviations for basic food prices and average net nominal monthly earnings (*Keynes effect)* (Figure 3). Low level of incomes determines low levels of prices. Relevant counties are: Botoşani, Călăraşi, Iaşi, Neamț, Bacău. Except Călăraşi County, all of them are from the poorest region of Romania - North-East. In this case inflationary pressure is blocked by low level of incomes.

Case 3: Different sense deviations or basic food prices and average net nominal monthly earnings (Figure 4). This case is relevant for the rest of the counties from our sub-sample, but it is more significant for: Bihor, Timiş, Harghita and Covasna). That means there is an important erosion in the purchasing power of the population, especially for these counties. In this situation there are other explanations for the inflationary pressure than in the neo-classical approach.

Figure 3

The counties with negative and identical sense deviation of prices and wages

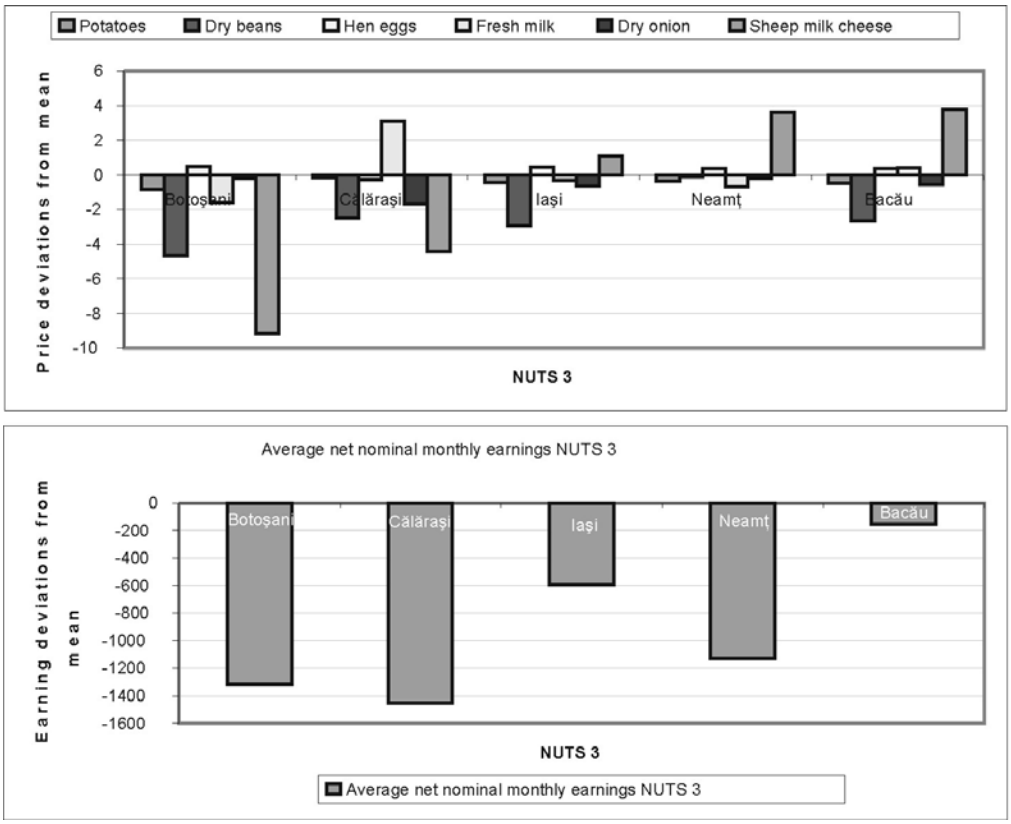
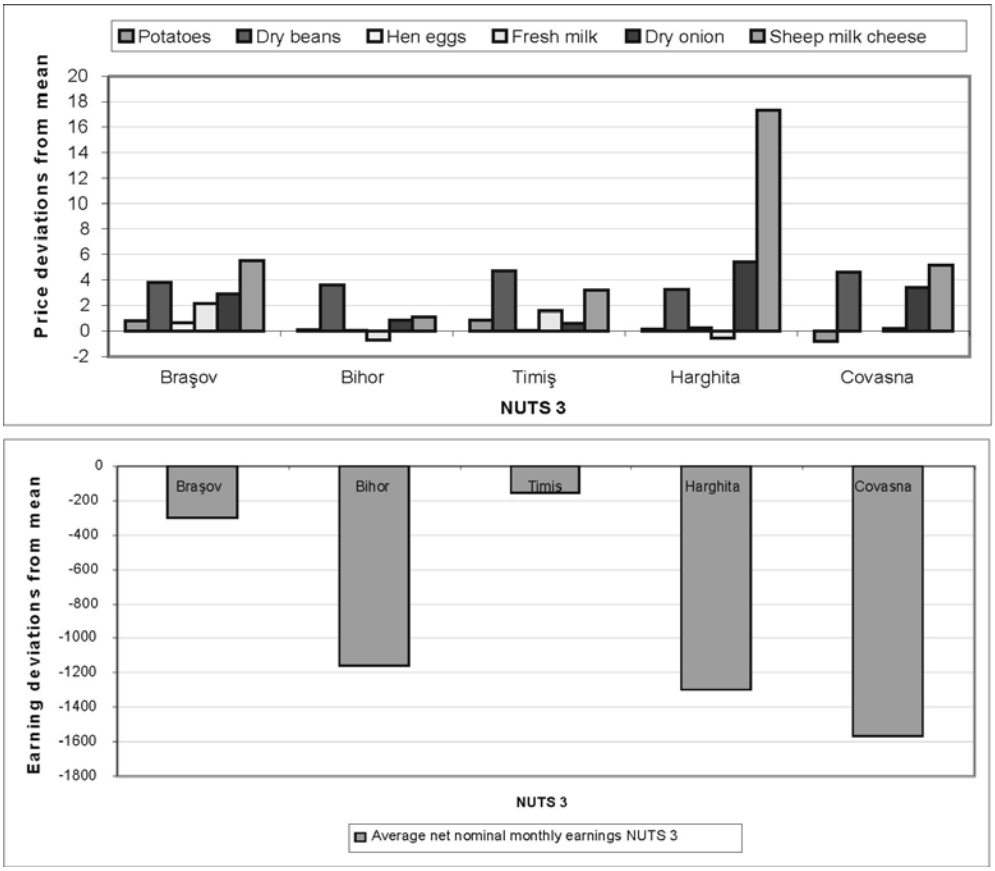


Figure 4

The counties with different sense deviation for prices and wages



Conclusions

- There is a strong correlation between the rate variation of prices and the rate variation of average net nominal monthly earning at the level of territorial units NUTS 3.
- The previous evolution of income does not affect, significantly, the correlation between the rate variation of basic food products prices and the rate variation of average net nominal monthly earning. Instead, the previous evolution of prices affects this correlation.
- The variation of prices of basic food products is strongly influenced by the variation of income and the previous evolution of prices (up to lag 2), in each county.

- There is a strong correlation between territorial wage variance and territorial prices variance for basic food products. Also previous territorial variances (up to lag 2) have significant influence on prices.
- The deviation of average net nominal monthly earnings is mostly negative (in 17 out of 22 counties analyzed).
- High level of basic food prices is preserved at high levels by the positive deviation of wage earnings in the case of some of richest counties of Romania.
- Inflationary pressures eroded the purchasing power of the population in most of the counties analyzed (to note Braşov and Timiş counties).

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