5. THE INTERACTION OF STRUCTURAL CHANGES WITH INFLATION IN THE PRESENCE OF SYMETRIC AND ASYMETRIC ECONOMIC BEHAVIOURS – EVIDENCE FROM A GENERAL DYNAMIC INTERSECTORAL MODEL

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Abstract

The paper analyzes the structural changes–price changes binomial in passing from symmetric to asymmetric economic behaviors. The results are in line with the ones obtained in Dobrescu (2009) indicating that the structural production impulse has a higher impact on inflation than the inflational impulse on the sectorial production structure.

The introduction of a behavior change, namely asymmetric wage formation mechanisms at the sectorial level indicate how the elimination of the connection between wages and profits in one of the sectors, leads to changes in the relations between output and prices and in the causal mechanism of output and price formation. Consequantly a change in one behavior carries with it an entire array of modifications due to the spread of the behavior change through the network of interdependencies.

Key words: general dynamic intersectoral model, symmetric and asymmetric behaviors, structural inflation

Jel Classification: C15, C63

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1. Introduction

The paper analyzes the impact of structural changes on inflation in passing from symmetric to asymmetric behaviors. The structural behavior mechanism analyzed is represented by the wage formation mechanism. The relation between the relative price changes and the sectorial production changes is analyzed for two cases: one when all the firms in the economy have the same wage formation mechanism and the other where the mechanism is different.

The paper is structure in four chapters.

The second chapter presents the impact of structural factors on the economic variables of interest. The focus is on inflation due to the characteristics of the analyzed structural factors, namely the wage formation mechanism and the relative sectoral change in output. A large space is dedicated to the presentation of the structural changes – price changes binomial as it was defined in Dobrescu (2009).

The third chapter presents the model focusing on the blocks of the model and on the specific behavior functions of the agents.

The fourth chapter builds two scenarios analyzing the impact of the changes in the consumers' preferences on inflation in passing from symmetric to asymmetric behaviors which are reflected in the wage formation mechanisms. The relation between the relative price changes and sectorial production changes is analyzed for the two scenarios.

2. The impact of structural factors on the economic indicators

2.1. General perspective

The different ways to quantify and theoretically define structural changes led to different approaches to analyze the structural component and its impact on inflation. Hicks (1974) and Tobin (1972) focused on the nominal wage rigidity mechanism. In this respect, the behavior of wages reflects structural realities specific to the labour market (labour contract etc). This has in turn an impact on inflation by the a-syncronicity between the dynamics of labour productivity and nominal wages. Dobrescu (2009) analyzed structural inflation from the perspective of the relation between the modification of the weights of different sectors in the total production and the changes in the prices calculated as a ratio between the sectorial price index and the total aggregated price index. Balke and Wynne (1996) showed that the sectorial technological changes are reflected in the transversal distribution of price changes. Sheedy (2005) analyzed the impact of a shock (changes in the oil price) on the firm's costs which led to price adjustments with different lags. In this approach the shocks that affect the economy are structural because they reflect the structure of the firms in the economy and the differences in their behavior.

The paper follows the logic of Dobrescu (2009) in the sense that it analyzes the binomial structural changes – price changes. We used the procedure suggested by Dobrescu (2009).

The novelty of the paper consists in the analysis of the structural changes – price changes binomial in the context of passing from symmetric to asymmetric behaviors. The analyzed behavior is represented by the wage formation mechanisms. In the case of symmetric behavior, all of the firms have the same mechanism. In the case of asymmetric behavior there are two mechanisms of wage formation. A percent of the firms adopt the first mechanisms while the rest of the firms adopt the second one. In this context, an adjustment of the binomial structural changes – price changes is register because the modification in the wage formation mechanism for the representative firm in one of the sectors carries with it an entire array of modifications due to the spread of the behavior change through the network of interdependencies.

2.2. The structural changes – price changes binomial

Dobrescu (2009) analyzed the concept of structural changes from the perspective of the reallocation of production factors between different economic sectors. The weight of different sectors in the aggregated output is analyzed. The changes in the relative prices are defined as a ratio between the sectorial price index and the aggreagated price index. The relation between the two changes reflects the connection between the downward rigidities of prices and the downward rigidities of production. The two of them form a strong binomial relation. With the same token, the downward rigidites of prices is strongly connected with nominal wage rigidities and the rigid adjustment of employment.

The interconnections presented above describe a complex mechanism which relates indicators and specific behaviours of nominal and real economy. They describe the formation of structural inflation.

The approach of Dobrescu (2009) explicitly relate the behvior of real economy with the nominal economy suggesting a hypothesis that the relative sectorial changes in production and relative prices changes binomial can be considered a strong interdependent relation.

The technical implication of this hypothesis suggests the way to verify it. If the relative sectorial changes in production (y) and the relative prices changes (x) are interdependent then the relations y=f(x) and x=f(y) should have the same logical value. Consequantly the econometrical testing should indicate the sincronous validation or invalidation of the relations.

The analysis used a a database represented by the inut-output tables for the Romanian economy, in the period 1989-2005. The statistical data is detalied for 105 brances of the economy. The production is aproximated by the gross value added (GVA) and the prices by the gross value added deflator.

In order to test the validation of the relations indicated above, namely y=f(x) and x=f(y), the results of the Granger causality were analyzed. The relations “wrp does not Granger cause wrq” and “wrq does not Granger cause wrp” where tested, were wrq and wrp represents the variation in production and prices corected by the relative weight of the analyzed sector in the aggregated index.

The results of the tests (see Dobrescu 2009) indicated the presence of a structural component of inflation and the fact that the relative sectorial changes in production and relative prices changes binomial reflects a strong interdependent relation. From

this perspective an impulse generated by the structural changes causes a varation of prices. The results of the Granger causality suggests the validation of the inverse relation, namely the price impulses generate changes in the weights of the sectors in output. To test the intensity of the two relations Dobrescu (2009) tested the specific coefficients of the equations:

$$\mathrm{wrp_i} = \mathrm{a1_i} + \mathrm{b1_i} \times \mathrm{wrq_i} \quad (1)$$

$$\mathrm{wrq_i} = \mathrm{a2_i} + \mathrm{b2_i} \times \mathrm{wrp_i} \quad (2)$$

where wrqi represents the output variation corrected by the relative weight of sector i in the aggregated indicator, and wrpi represents the price variation corrected by the relative weight of the price in the sector i in the aggregated indicator.

The coeficients specific to (1) and (2) were calculated using ortogonal regression. From this perspective, the interecept b1 indicates the ortogonal price elasticity to the structural changes in production, and the intercept b2 indicates the ortogonal production elasticity to the structural changes in prices.

The results (see Dobrescu 2009) reveal a higher value of the mean of b1 compared with the mean of b2. This suggests that the structural impulse has a higher impact on inflation compared with the inflational impulse on the sectorial production structure.

The transmission mechanism of the impulse comming from the structural changes on inflation is strongly connected with the real and nominal economic rigidities. From this perspective, Dobrescu (2009) analyzed the downward rigidities of prices and production in the context of relative price changes. The following relations were estimated:

$$\mathrm{wrp_{i,t}} = \mathrm{a1_i} + \mathrm{b1_i} \times \mathrm{wrq_{i,t}} \quad (3)$$

$$\mathrm{rp_{i,t}} = \mathrm{c_t} \times (\mathrm{a1_i} + \mathrm{b1_i} \times \mathrm{wrq_{i,t}})/\mathrm{w_i}(\mathrm{t}-1) = \mathrm{c_t} \times (\mathrm{a1i}/\mathrm{w_i}(\mathrm{t}-1) + \mathrm{b1_i} \times \mathrm{rq_{it}}) \quad (4)$$

where c_t is a correction coefficient which ensures that $\Sigma rp_{it} \times wrq_{it}=1$, w_i is the weight of the sector in total, rp_{it} represents the sectorial relative price index and is calculated as a ratio p_{it}/P_t,. rq_{it} represents the sectorial relative production index and is calculated as a ratio qit/Qt . The rest of the notations are unchanged.

The price index is calculated as:

$$\mathrm{p_{it}} = \mathrm{c_t} \times (\mathrm{a1_i}/\mathrm{w_i}(\mathrm{t}-1) + \mathrm{b1_i} \times \mathrm{rq_{it}}) \times \mathrm{P_t} \quad (5)$$

The value of Pt is equal to one which coresponds to zero inflation (the aggregated price index calculated as a chain index equals one). In this case, the sectoral price index is:

$$\pi_{\mathrm{it}} = \mathrm{c_t} \times (\mathrm{a1_i}/\mathrm{w_i}(\mathrm{t}-1) + \mathrm{b1_i} \times \mathrm{rq_{it}}) \quad (6)$$

The sectorial price index is calculated in the context of downward price rigidities and is: $pr_{it}=\pi_{it}$ for $\pi_{it}>1$ and pmit for $\pi_{it}<1$. Consequantly the aggregated price index is:

$$\mathrm{PR_t} = \sum \mathrm{pr_{it}} \times \mathrm{wrq_{it}} \quad (7)$$

To calculate pr_{it} we use the minimum price index (pm_{it}) which reflects the minimum price at which the production can be sold. The index is calculated as a weigthed

average of the sectorial price indexes smaller than 1. If all the sectorial prices indexes are smaller then one than pm_{it} =1.

The comparance between the aggregated price index PR_t with the gross domestic deflator allows for the identification of role that downward price rigidities played in the analyzed period. The analysis (see Dobrescu 2009) indicates the impact of the downward price rigidities as an inflational impulse.

The analysis of the downward output rigidities allows for the identification of the relation between the nominal and real rigidities. Dobrescu (2009) suggests calculating the relations:

$$\mathrm{wrq}\pi_{\mathrm{it}} = (\mathrm{a2}_{\mathrm{i}} + \mathrm{b2}_{\mathrm{i}} \times \mathrm{wr}\pi_{\mathrm{it}}) \tag{8}$$

$$\mathrm{wrqr}_{\mathrm{i,t}} = (\mathrm{a2}_{\mathrm{i}} + \mathrm{b2}_{\mathrm{i}} \times \mathrm{wrpr}_{\mathrm{it}}) \tag{9}$$

The downward output rigidity is calculated as:

$$\mathrm{QR}_{\mathrm{t}} = \sum \mathrm{wrqh}_{\mathrm{i,t}} / \sum \mathrm{wrq}\pi_{\mathrm{i,t}} \tag{10}$$

Where $wrqh_{it}$ =max($wrq\pi_{it}$, $wrqr_{it}$).

The comparison of PR_t to QR_t (Dobrescu 2009) indicates a strong relation between the downward price rigidities and downward output rigidities.

În conclusion the model proposed by Dobrescu (2009) indicates two phenomena.

First of all, the structural impulse generates changes in inflation and the inflation impulse generates structural changes. The first of the impulses is prevalent. Consequantly, the model indicates that there is a structural component of inflation generated by structural changes in the economy.

Second of all, the impact of these impulses is strongly connected with nominal and real economic rigidities. The results indicated the strong connection between the downward rigidities of prices and the downward rigidities of output.

3. The model presentation

The paper builds a general dynamic intersectoral model. The chapter will focus on presenting: a) the general characteristics of the model, b) the algorithm and the specific behavior functions of producers and consumers concentrating on the specific production function and the wage formation mechanisms.

The main general characteristics of the model are:

a) The model describes an economy with three sectors, the relations between them beeing represented by technological coefficients. Each sector is populated by a reprezentative producer.

b) The model is an out-of equlibrium model in the sense that the prices do not adjust automatically to equilibrium prices where the demand is equal to the offer. The functional behaviours of the firm (quantity produced and price setting mechanisms, wage formation mehcanisms) and the functional behavior of the consumers (demand mechanism) determine the trajectories of the economic system and if the system is converging to an equilibrium state.

Households

The economy is described by a number of consumers with identical preferences. The income is generated by their labor taken into account the number of working hours and the hourly cost of labor.

$$I_t = w_{L_{i,t-1}} * H_{i,t-1} \tag{11}$$

Where I_t represents the income at moment t, $w_{L_{i,t-1}}$ the hourly cost of labor in sector i at the moment t-1, $H_{i,t-1}$ represents the number of hours worked in sector i at the moment t-1.

The consumer preferences are described by Cobb-Douglas types of indifference curves. The choice of the function reflects the phenomenon of decreasing marginal utility.

$$U(q_i) = \prod_{i=1}^{6} q_i^{a_i} \tag{12}$$

Where q_i represents the quantity of goods produces in sector i, a_i are the coefficients that reflect the consumers' preferences.

The model doesn't take into account the substitution effect. This doesn't affect the analysis due to the fact that the model focuses on the relation between economic sectors and uses representative goods. In this context, the substitutability effect between different goods is not relevant.

The demand for the goods in the economy reflects the options of the consumers taken into account the disposable income and the preferences and reflects the optimal solution for the consumer. Consequently, the selected bundle of goods represents the solution to the utility maximization problem in the context of the budgetary constraints.

$$\begin{aligned} &\max U(q_i) \\ &a.c. \\ &I_t = \sum_{i=1}^{6} p_{i,t} * q_{i,t} \end{aligned} \tag{13}$$

Where $p_{i,t}$ represents the price of good i at moment t; the rest of the notations remain unchanged

This version of the model has the following restrictions regarding the income: 1) the incomes are represented by the salaries, consequently the model doesn't take into account other types of accumulations or wealth; 2) the income generated in one period is consumed in that period, thus the saving rate is 0.

Using the Lagrangian multiplier the above described problem can be written as:

$$\max U(q_i) - \lambda(\sum_{i=1}^{6} p_{i,t} * q_{i,t} - I_t) \tag{14}$$

The algebraic manipulation of the first order condition leads to the following relation for the demand for good i:

$$q_i = \frac{I_{i,t}}{p_{i,t}(1+(\sum_{j=1}^{6}\alpha_j - \alpha_i)/\alpha_i))} \quad (15)$$

Relation 5 reflects the determining factors for the final demand. The demand for good i depends on the income, the price of good i and the specific coefficients of the indifference curve. Indirectly the demand depends via income on production.

Firms

The economy is characterized by a representative producer for each of the sectors. The production possibilities of the firms are reflected by a Leontief production function. Balke and Wynne (1996) uses Cobb-Douglas production function, but this choice assumes variable technological coefficients in the short run. The hypothesis is inconsistent with the economic data. Taken this into consideration we chose a Leontief production function, for which the technological coefficients are fixed.

$$Y_{j,t} = \max\left\{\frac{x_{1,t-1}}{a_{1,j}}, \ldots \frac{x_{i,t-1}}{a_{i,j}}, \frac{H_{j,t}}{b_j}\right\} \quad (16)$$

Where $Y_{j,t}$ represents the production of good j at the moment t, $H_{j,t}$ represents the number of hours worked in sector j at the moment t, $x_{i,t-1}$ represents the production in sector i at the moment t-1. The coefficient of the production function $a_{i,j}$ and b_j satisfies the constraint s $a_{i,j}>0$, $b_j>0$ and $b_j + \sum_{i=1}^{N} a_{i,j} = 1$ for i =1…N.

In the first period (the moment of entering the market), the firms optimize their choice of the quantity produced by maximizing profit.

$$\max Y_{j,t} * P_{j,t} - Y_{j,t} * \sum a_{i,j} * P_{i,t-1} - Y_{j,t} * b_j * w_{L_{j,t}} \quad (17)$$

Where $w_{L_{j,t}}$ represents the cost of labor in sector j at the moment t, $P_{i,t-1}$ represents the price of good i at the moment t-1. The rest of the notations remain unchanged.

The solution to the firm's maximization problem takes into account the characteristics of the production process, namely the production capacity and the intermediate consumption.

From the first order condition one may see that the function described by relation (17) is monotonically increasing or decreasing. The monotonicity depends on the costs of intermediate consumption and labor force, (17) indicates that the firm will choose to produce the maximum allowed by the production capacity and by the intermediate consumption or not to produce at all.

The first period maximization problem of the producer is a case in which the producer just entered the market. In this period, the producer is a price taker, lacking the market information and the market power to change price. The producer identifies the quantity to be produce to maximize his profit.

Beginning with the second period the producer faces specific market rigidities. These regidities are: a) contract with suppliers and customers, b) cost of reemployment and of training of the personnel, c) production capacity, d) tehnological limitations.

The quantity adjustment recursive relation is of the form:

$$Y_{j,t} = [Y_{j,t-1} + \theta_1 * (C_{j,t-1} - Y_{j,t-1})] * \theta_2 \quad (18)$$

Where θ_1 reflects the adjustment of the quantity produces to demand taking into consideration the rigidites mentioned at point a and b and θ_2 reflects the adjustment of the quantity produces to demand taking into consideration the rigidites mentioned at point c and d.

Relation (18) describes a producer which adjusts the quantity produce as to minimize the differences between production and demand taking into account the market rigidities.

Each producer calculates a price elasticity (ε_t) based on the price and demand data of his sector for the last two periods. The price change mechanism is:

$$P_{j,t} = \frac{P_{j,t-1}}{1 - (Y_{j,t} - C_{j,t-1}) * Y_{j,t} * \varepsilon_t} \quad (19)$$

Where the produce makes the assumption that the demand in the current period will be equal to the adjusted quantity produces.

Relation (19) describes the price changing mechanism in which the price change depend on the demand of the consumer from the last period, the price of the producer form the last period, the adjustment of the quantity produced and the price elasticity of demand.

The wage formation mechanism takes into account that a percentage of the pofits of the firm are given to the employees and they share a part of the burdens of the lost. Consequantly, the wage formation mechanism is:

$$W_{j,t} = \begin{cases} W_{j,t-1} * CPI_{t-1} * \varphi_1 * pr_{j,t-1} \text{ if } pr_{j,t-1} > 0, \mathrm{C_{j,t\text{-}1}} > Y_{j,t} \\ W_{j,t-1} * CPI_{t-1} \text{ if } pr_{jt-1} > 0, \mathrm{C_{j,t\text{-}1}} < Y_{j,t} \\ W_{j,t-1} * CPI_{t-1} * \varphi_2 * pr_{j,t-1} * \alpha_1 \text{ if } pr_{j,t-1} < 0 \end{cases} \quad (20)$$

Where pr stands for profit, $\varphi_{1,2}$ stands for the percentage of the profit given to the employers in the case of positive and negative profit, and α_1 stands for wage rigidit, respectively y.

The wage cannot be lower than the minimum wage in the economy.

There is a second wage formation mechanism which is introduced in the case of the asymmetric behavior of the producer, namely:

$$W_{j,t} = W_{j,t-1} * CPI_{t-1} \quad (21)$$

In this case the profit is not partially distributed to the employees and the salary is only indexed with inflation.

4. The impact of structural factors in the presence of symmetric and asymmetric behaviors– results of the simulation

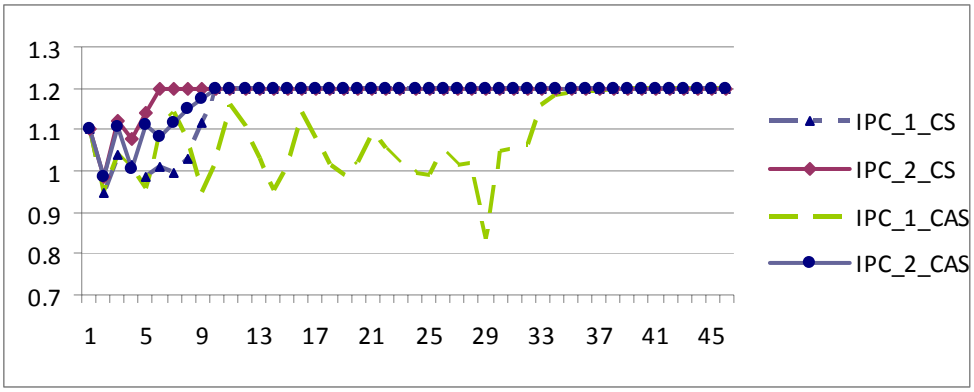
The dynamics of inflation is the results of a complex web of interdependencies which are reflected by the behavior functions of the producers and the consumers and the structural characteristics of the model.

The dynamics of inflation is analyzed in the context of changes in the structural factor, namely the consumer's preferences. The changes take place in two different situations: a) scenario 1 – the producers have symmetric behaviors, namely the same wage formation mechanism, reflected by relation 20, b) scenario 2 – the producers have asymmetric behaviors, namely for producers in the first sector, the wage formation mechanism is reflected by relation 21, and for the producers in the second and third sectors the wage formation mechanism is reflected by relation 20.

The dynamics of inflation for the two scenarios are presented below.

Figure 1

The dynamics of consumer price index for the two scenarios



Legend: *IPC stands for consumer price index, the first subscript i indicates the vector of consumers preferences used and the second subscript CS indicates symmetric behaviors and CAS asymmetric behaviours*

Each scenario is run for two vectors of the consumers preferences, namely (0.47, 0.23, 0.2) and (0.48, 0.22, 0.2). Each of the values indicates the percent of the income allocated for one of the goods. For example 0.47 indicates that 0.47% of the income is allocated for the good produces by the firms in the first sector.

Figure 1 and the time series of consumer price indexes indicate that:

a) a change in the consumers' preferences is accompanied by a change in the consumer price index in the short run;

b) in the long run the consumer price index stabilizes to a different value compared with the value before the preference change;

c) for the case of asymmetric behavior, the adjustment to the new long-run value of the index is slower.

The long run is taken loosely to mean the periods after a period k, when k is exogenously defined. In the case of the analysis, the long run is represented by the value at which the consumer price index stabilizes. It should be mentined that no random shocks are included in the model.

Dobrescu (2009) tested the relative sectoral changes in output and relative price variability binomial. The procedure was presented in subchapter 2.2 of this paper. The results (see Dobrescu 2009) indicated a higher value for the mean of b1 compared with the mean of b2. This suggested that the structural production impulse has a higher impact on inflation compared with the inflational impulse on the sectorial production structure.

We applied the same procedure as in Dobrescu (2009). The novelty of the approach is that the relation between the structural component and inflation is analyzed for two scenarios one characterized by symmetric behaviors and one by asymmetry. The initial analysis was based, as it was mentioned in subchapter 2.2. on statistical data which reflected the structure and inner working of the economic. Consequantly it reflected a mix of symmetric and asymmetric behaviors of economic agents which were aggregated, thus leading to the statistical data used. Out objective was to isolate a symmetric and asymmetric behavior, represented by the wage formation mechanism and test if the change from one case to another leads to a change in the structural changes – price changes binomial.

We analyzed the relations:

$$\mathrm{wrp}_{i,j} = \mathrm{a1}_{i,j} + \mathrm{b1}_{i,j} \times \mathrm{wrq}_{i,j} \tag{22}$$

$$\mathrm{wrq}_{i,j} = \mathrm{a2}_{i,j} + \mathrm{b2}_{i,j} \times \mathrm{wrp}_{i,j} \tag{23}$$

where wrqi represents the output varition corrected by the relative weight of sector i in the aggregated indicator, and wrpi represents the price variation corrected by the relative weight of the price in the sector i in the aggregated indicator, the first index i indicates the sector and the second index j indicates the scenario.

As in the procedure described in Dobrescu (2009) the coeficients specific to (22) and (23) were calculated using ortogonal regression.

Equations (22) and (23) where calculated for two cases. In the case of symmetric behavior, all of the firms have the same wage mechanism. In the case of asymmetric behavior there are two mechanisms of wage formation. A percentage of the firm adopt the first mechanisms while the rest of the firms adopt the second one. The consumer preference vector used was (0.47, 0.23, 0.2). Consequantly 12 equations were estimated. The results of the estimations are presented bellow.

Table 1

Orthogonal regression – Econometric coefficients

	wrpi,1=a1(i,1)+b1(i,1)*wrqi,1		**wrqi,1=a2(l,1)+b2(i,1)*wrpi,1**	
Scenario 1 symmetric behavior	a1	b1	a2	b2
Sector 1	-0.1123	1.2723	0.0883	0.786
Sector 2	-1.0441	4.6279	0.2256	0.2161
Sector 3	-0.1746	1.5754	0.1109	0.6348
Average value	-0.44367	2.491866667	0.1416	0.545633333
	wrpi,2=a1(l,2)+b1(l,2)*wrqi,2		**Wrqi,2=a2(l,2)+b2(l,2)*wrpi,2**	
Scenario 2 asymmetric behavior	a1	b1	a2	b2
Sector 1	-0.2424	1.4432	0.168	0.6929
Sector 2	-0.0359	1.1536	0.0311	0.8669
Sector 3	-0.1635	1.7548	0.0932	0.5699
Average value	-0.14727	1.450533333	0.097433	0.7099

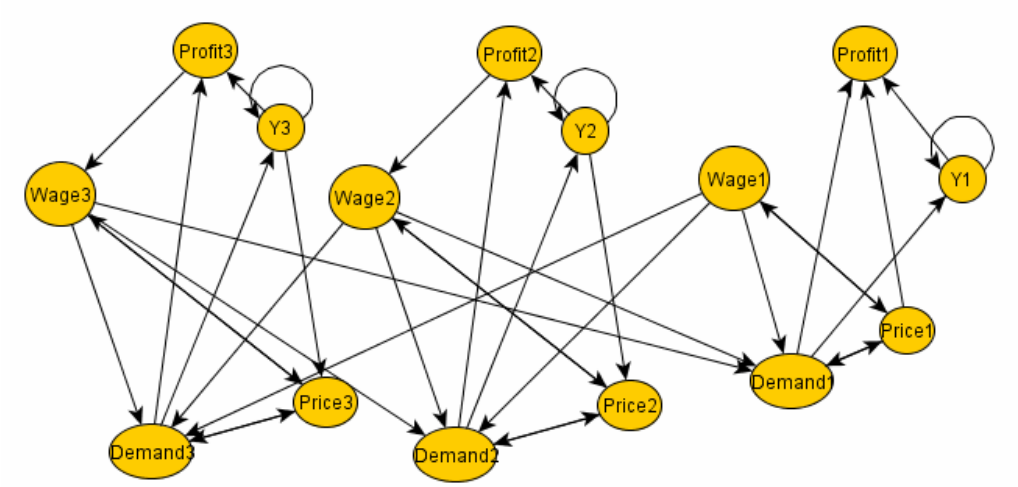
The results from table 1 are in line with those reported by Dobrescu (2009), namely the mean of b1 is higher than that of b2. This suggests that the price elasticity to structural shifts is higher comparatively with the converse relationship.

The difference in the value of b1 and b2 for the two scenarious, reflect the asymmetric and symmetric behaviors of producers as regards to the wage formation mechanism and is explainable by the effect of the behavior change. In this respect, the introduction of asymmetric behaviors generates a cascade of modifications: 1) it changes the relation between wages and profits for the generic firm in the first sector; 2) this, in turn, changes the relative weight of wages in the first sector; and 3) the behavior of demand in the first sector and its' relative weight in the aggregated demand, which, in turn, changes 4) the relation between the dynamics of production and wages. In the second and third sectors production and wages are more interconnected. This can be seen in the causal diagram below.

To better see the causal mechanism of price and output formation for each of the sectors we rearranged the graph in figure 2. It can be seen (see Figure 3 and 4) that the elimination of the connection between profit and wages in sector 1 changes the causal factors of price and output formation. The presentation will focus on the first and second sectors given that the causal mechanism is the same in the second and third sectors because the same behaviors functions are implemented in these sectors.

Figure 2

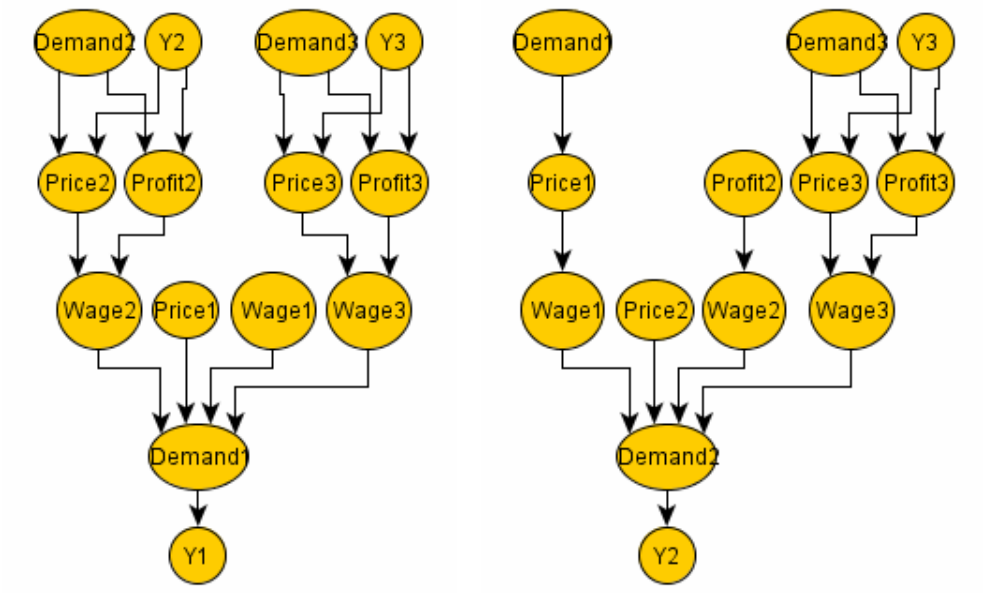
The network of interdependencies between the model variables



Legend: *An arc between two nodes is introduce only if the two nodes are connected by a functional relations (see relations 11-21 in the model presentation)*

Figure 3

Causal mechanism of output formation for sectors 1 and 2



Legend: *The direction of the arrow indicates the direction of the causal relation*

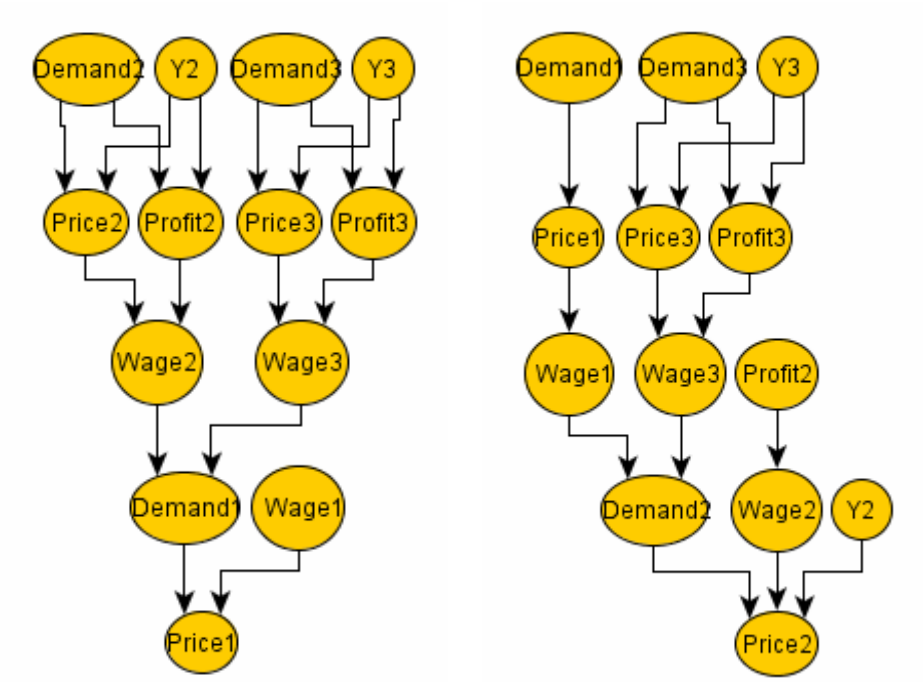
In the case of the output formation the elimination of the above mentioned connection led to:

a) the elimination of the indirect impact of Y1 on Y2 and Y3;

b) the elimination of the indirect impact of the profits in sector 1 on Y2 and Y3.

Figure 4

Causal mechanism of price formation for sectors 1 and 2



Legend: The direction of the arrow indicates the direction of the causal relation

In the case of the price formation the elimination of the above mentioned connection led to:

c) the elimination of the direct impact of Y1 on p1

d) the elimination of the indirect impact of Y1 on p2,p3;

e) the elimination of the indirect impact of the profits in sector 1 on p1, p2, p3.

The above changes in the causal mechanism of output and price formation indicate how a change in one of the behaviors at the sectoral level, namely the elimination of the connection between wages and profits in sector 1, leads to changes in the relations between output and prices . The changes are generated by the modification of the causal mechanisms responsible for the formation of output and prices in the sectors.

In this case evidence suggests that in a higly interconnected system as in the case of an economy, a change in one behavior carries with it an entire array of modifications due to the spread of the behavior change through the network of interdependencies. *The change leads to local behaviors and non-linear behaviors of the aggreagated system which depends on local topological characteristics of the network of interdependencies and on the characteristics of the network flows.*

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