FLUCTUATION OF ECONOMIC ACTIVITY, SECTORAL DISTRIBUTION OF GROSS VALUE ADDED AND THE SIZE OF BACKWARD MULTIPLIERS IN ROMANIA DURING THE PERIOD 1989-2009

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*A*bstract. *In this paper it is adopted the assumption that the analysis of the features of the sectoral structure of a country's economy shall have in view not only the sectoral distribution of value-added, but also the sectoral ratios of the effective production to the value added, and the sectoral multipliers of the input-output table. In this context, having in view some algebrical properties of the backward multipliers of the input-output table, demonstrated in F. M. Pavelescu (1997), an improved methodology is proposed for the analysis and interpretation of the economic significance of the above-mentioned indicator both in absolute and relative values.*

The analytical framework mentioned above is applied in the case of Romania and permits to show that in Romania, during the period 1989-2009, the transformation process and the integration into the European Union generated not only important fluctuations of the gross domestic product (GDP) and the growth of the role of the service sector, but also important changes in the sectoral ratio of the effective production to the value added and in the size of the input-output multipliers.

Key words: main sense of structural change, effective production/gross value-added ratio, harmonical weighted mean, types of relative backward multiplier

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Introduction

During the period 1989-2009 Romania's economy experienced sensible structural changes as a consequence of the transition to market economy and of the integration into the European Union. Among the indicators, which quantify the intensity of structural changes of an economy, we may have in view the evolution of sectoral distribution of the gross value added, effective production/gross value-added ratio and the size of the backward multiplier of the input-output table. In fact the respective indicators give information about the type of economic structure of a country and about the features of the linkages between economic sectors (branches), respectively. Because during the above-mentioned period, in Romania, the economic activity was characterized by ample fluctuations, the above indicators have to be seen in correlation with the economic cycles. This way we may test whether there are correlations between the type of economic fluctuation (recovery or recession) and the sense of the changes in the economic structure.

1. Economic cycles and sectoral distribution of gross value added in Romania between 1989 and 2009

During two decades, respectively the period 1989-2008, in the context of the transition to the market economy and, afterwards, of accession and integration into the European Union, the level of gross domestic product in real terms fluctuated considerably. Due to the specific conditions of transition to market economy and to the models which were chosen for the transformation of the economic mechanism during the decade 1990-1999 there were registered two periods of recession (1990-1992 and 1997-1999, respectively) and one period of recovery (1993-1999). Between 2000 and 2008 the level of gross domestic product in real terms experienced a continuous growth in the last stages of transition to the market economy and preparedness for the accession to and integration into European Union. The level of gross domestic product registered a decrease by 6.6% in 2009, in comparison with the previous year, highlighting that the Romanian economy faced a third recession from the beginning of the transformation process in 1990.

Therefore, between 1989 and 2009 one may identify five phases of fluctuation of the economic activity, respectively:

a) **A period of recession between 1990 and 1992**, when the gross domestic product in real terms decreased by an average annual rate of –9.7%. The contraction of the economic activity and the great perturbations in

international economic relations are the main factors in explaining the occurrence of twin deficits (of the consolidated state budget and of the foreign trade balance respectively). Therefore, the consolidated state budget increased from –0.4% of the gross domestic product in 1990 to –4.4% in 1992, while the deficit of the foreign trade balance oscillated between -3.9% and –9.5% of the gross domestic product (Annex 1).

b) **A period of partial economic recovery during 1993 and 1996**, when the annual rate of gross domestic product ranged between 1.5% and 7.1%, the average level being 3.94%. The consolidated budget deficit, after a reduction to 2.6% of the gross domestic product in 1993 registered a continuous increase to 4.9% in 1996. The economic growth was mainly based on exports in 1993 and 1994, having in view the deficit of the foreign trade balance, diminished from –8.4% in 1992 to –2.1% in 1994. Between 1995 and 1996 the economic growth was essentially determined by domestic absorption. Consequently, the deficit of the foreign trade balance increased to -5.6% of the gross domestic product in 1995 and to -8.4% in 1996.

c) **A period of recession during 1997 and 1999**, when the gross domestic product diminished with an average annual rate of –2.46%. The decrease of the volume of economic activity took place in the context of diminishing of the deficit of the foreign trade balance from –7.1% of gross domestic product in 1997 to –4.9% in 1999. The deficit of the consolidated state budget tended to increase from –3.6% of the gross domestic product in 1997 to –5.4% in 1999.

d) **A period of continuous growth in the gross domestic product between 2000 and 2008.** The average rate of economic growth was 5.8%, in the context of annual rates oscillating between 2.4% and 8.4%. The rapid economic growth was obtained under the conditions of a quasi-continuous increase in the deficit of the foreign trade balance. Therefore, the value of the respective indicator passed from –5.5% of the gross domestic product in 2000 to –9.1% in 2004. During 2005 and 2008 the imports exceeded exports in a proportion ranging between 10.3% and 13.9% of the value of the gross domestic product. The high rate of economic growth and the impetuous increase in the imports generated an important growth of the incomes of the consolidated state budget and have permitted a sensible reduction of the budgetary deficit from –4.3% of the gross domestic product in 2000 to –1.3% in 2005. During the period 2006 - 2008 the deficit of the consolidated state budget registered an increase from –1.8% of the gross domestic product to -3.8%. These facts reveal that the economic growth in Romania became more and more dependent on the import dynamics after 2005.

Also, it is to note that the level of the gross domestic product in real terms registered in 1989 was exceeded by 3.4% in 2004 and by 32.6% in 2008.

e) **A period of recession during the year 2009,** which continued also in 2010, in the context of a unfavorable external economic climate. The level of gross domestic product decreased by 6.6%, while the deficit of the consolidated state budget was greater than 7% of the gross domestic product.

The fluctuations of the gross domestic product level in real terms were accompanied by sensible structural changes in economic activity. And one of the main aspects of the structural changes was the redefinition of the roles played by economic sectors in the generation of gross value added. One may notice that, in 1989, more than 50% of the gross value added, i.e. 55.68% was generated by the secondary, sector about 16% by the primary sector and about 28.3% by the tertiary sector[1] (Table 1).

Table 1. The shares of the economic sectors in the total value added during the period 1989-2009 (selected years)

%

Year	Primary sector	Secondary sector	Tertiary sector	RSTS
1989	15.98	55.68	28.34	50.90
1992	20.66	40.34	39.00	96.68
1996	20.57	42.46	36.97	87.07
1999	15.15	33.86	50.99	150.59
2008	7.44	38.03	54.53	143.39
2009	7.16	38.46	54.38	141.39

Note: RSTS = ratio of the share of tertiary sector to the share of the secondary sector in the total gross value added.

Source: Computed on the basis of the National Accounts, the National Institute of Statistics, Bucharest, 1994, 1995, 1999, 2002 and 2012.

The transition to the market economy determined a trend of decrease of relative importance of the secondary sector in producing value added at the same time with a growth in the share of the tertiary sector. Therefore, even in 1999, more

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[1] The definition of the economic sectors used in this paper is given in Annex 2.

than one half (50.99%) of the total value added of the Romanian economy was produced by the tertiary sector.

These mutations are consequences of the massive industrial restructuring and the advances towards a "service economy", in which the tertiary sector has the main role in modeling economic activity, generating the value added and the utilization of the production factors.

It is to note that the transition to the "service economy" or the "postindustrial society" as Daniel Bell (1973) defined it, is a trend in the long-run evolution of all developed countries, but there can be detected some national features. In the case of Romania it is important to highlight that in fact during only one decade, between 1989-1999, the secondary and tertiary sectors practically changed their relative importance in generating the value-added.

Also, one may observe that the increase in the share of the tertiary sector in total value added took place mainly during the recession period. In other words, Romania's experience showed that when the economy enters recession, the main negative consequences for business development are found in industry and constructions.

But one should not ignore that the market mechanism mainly favoured the tertiary sector in the process of the price modeling and the respective feature was stronger during the recession periods. In this context we can speak about a "forced transition to service economy" which was determined by rapid implementation of the market mechanism and the narrowing of the industrial tissue.

The recession registered in 2009 was an exception from the above-mentioned rule. The tertiary (services) sector registered a more rapid relative decrease in the value added in comparison with the secondary sector. The respective evolution is partly a correction of intersectoral proportions, because the economic growth experienced during 2000 and 2008 determined an unsustainable development of some activities of the services sector and especially of real estate activities.

The computation of the values of the coefficient of intensity of structural changes[1] for the sectoral distribution of the value added brings another proof in favour of the idea that usually during recession the intensity of changes in the roles played by economic sectors is much greater than during the periods of economic recovery.

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[1] In Annex 3 some algebraical properties of the coefficient of intensity of structural changes are demonstrated.

The computed value of the above-mentioned indicator is 19.26% for **the period 1989-1992**, while the transfer of shares is 15.34% and the main sense of the structural change is the decrease in the share of the secondary sector. The secondary sense of the structural change was an increase in the share of the tertiary sector (Table 2).

During the period 1992-1996, in conditions of an economic recovery, the value of CISC was 2.94%, the main sense of the structural change was an increase in the share of the secondary sector, in the context of a transfer of shares (TSh) of only 2.12%. The secondary sense of the structural change was a decrease in the share of the tertiary sector. It is to note that the decrease in the share of the tertiary sector is sensibly bigger than the decrease in the share of the primary sector. Consequently, the value of the coefficient of distribution of the changes in the shares (CDSh) is relatively higher, i.e.1.3852.

Table 2. The value of the coefficient of structural changes and the main and secondary senses of the structural change in case of the sectoral distribution of the value added in Romania during the 1989-2009 period

%

Period	CISC	TSh	CDSh	Main sense of the structural changes	Second sense in the structural change
1989-1992	19.26	15.34	125.54	Decrease in the share of the secondary sector	Increase in the share of the tertiary sector
1992-1996	2.94	2.12	138.52	Increase in the share of the secondary sector	Decrease in the share of the tertiary sector
1996-1999	17.32	14.02	123.52	Increase in the share of the tertiary sector	Decrease in the share of secondary sector
1999-2008	9.45	7.71	122.61	Decrease in the share of the primary sector	Increase in the share of the secondary sector
2008-2009	0.53	0.43	124.23	Increase in the share of the secondary sector	Decrease in the share of the primary sector

Source: Computations based on data from Table 1.

During the 1997-1999 recession, which was sometimes viewed in economic literature as the "second transformational recession", the transfer of sectoral shares of gross value added was 14.02% and the main sense of the structural change was the increase in the share of the tertiary sector. The secondary sense of the structural change was the decrease in the share of the secondary sector.

One may observe that, even the value of the coefficient of structural change related to the 1996-1999 period was smaller in comparison with the 1989-1992 period, the values of transfer of sectoral shares and of the coefficient of distribution of structural changes are comparable in the two recessions which were analyzed. The respective figures reveal the fact the two recessions which Romania faced in the last decade of the 20th century were both of great amplitude not only in connection with the loss in gross domestic product, industrial and agricultural production and services activity, but also in connection with the economic structure, the combination of production factors used in economic activities and the linkages between economic sectors and branches.

The 2000-2008 period, when the gross domestic product registered a continuous growth, is characterized by a moderate structural sectoral change, the value of the coefficient of structural change being equal to 9.45%. As an exception from the rule, in comparison with the 1992-1996 period, the main sense of the structural change was a decrease of the share of the primary sector. The secondary sense of the structural change was an increase in the share of the secondary sector. The respective evolution was a consequence of the fact that, during the respective period of economic recovery, the gross value tended to grow slower within the tertiary sector in comparison with the secondary sector.

In 2009, in a recessionary context, the value of CISC was 0.53% while the transfer of shares was 0.43%. The main and secondary senses of the structural change are reversed in comparison with the 1999-2008 period. We may speak about an increase in the share of the secondary sector as the main sense and about a decrease in the share of the primary sector as the secondary sense of the sectoral structural change. The respective situation highlights that recession played within some margins a role in correcting the sectoral proportions, on the one hand, and that the share of the services sector in the total value added tend to be more stable even in conditions of sensible fluctuations of the economic activity.

2. Evolution of the ratio effective production/gross value added at sectoral and national levels

The changes in the sectoral distribution of the gross value added took place between 1989 and 2009 in the context of a sensible transformation of production organization methods and changes in the consumption of production factors. Consequently, the ratio of the effective production to value added have registered sensible mutations both at sectoral and national levels.

If the methodology of National Accounts is taken into consideration, the effective production is the sum of the gross value added and the intermediate consumption. The "effective production/gross value-added" ratio indirectly gives information about the features of the technologies which are used in a particular economic sector or economic entity. The implementation of technological changes may determine both growth or diminutions in the above-mentioned ratio.

On the one hand, it is possible that the increase in complexity of technology leads to an increase in the intermediary consumption at a rate higher than the rate of effective production. Therefore, the effective production/gross value added ratio tends to grow. On the other hand, it may happen that the technological change to save mainly the intermediary inputs take place, determining a decrease in the effective production/gross value added ratio.

But at the same time one may not ignore that the price formation mechanisms, the system of taxation or the relationship established between the stakeholders also influence the effective production/gross value added ratio.

Having in view the modeling factors mentioned above, it is important not only to compute the sectoral effective production/ gross value added ratio (RPVsectj), but also to emphasize their differentiation in order to highlight some of the features of the activity within economic sectors. As indicators of the features of the sectoral effective production/value added ratio within an economy of a country we may use:

a) the minimum value of the sectoral effective production/gross value added ratio (minRPVsect)

b) the simple arithmetical mean of the sectoral effective production/gross valued added ratio (RPVsam)

c) the ratio of the maximum value to the minimum value of the RPVsectj (max/minRPVsect)

d) the coefficient of variation of the RPVsectj (Cv(RPVsectj).

It is to note at the level of the whole economy, that the effective production/gross value added ratio is in fact the arithmetical mean of the ratios RPVsectj weighted by the value-added sectoral shares (RPVwam).

One may notice that the value of RPVwam is influenced by the distribution of sectoral shares of the value added and by the differentiation in the values of RPVsectj. The influence of the differentiation in the individual values of RPVsectj on the value of RPVwam under conditions of a particular distribution of value

added sectoral shares can be revealed by the computation of the harmonical mean of the ratios RPVsectj weighted by the value-added sectoral shares (RPVwhm) and afterwards the comparison of the values of RPVwhm and RPVwam. Consequently, we have: $\dfrac{RPVwhm}{RPVwam} \leq 1$.

The maximum value of the $\dfrac{RPVwhm}{RPVwam}$ ratio is obtained if all the values of RPVsectj are equal. The $\dfrac{RPVwhm}{RPVwam}$ ratio tends to become smaller and smaller as the max/min RPVsect ratio is greater and greater.

In Romania, during the 1989-2009 period, the minimum values of the sectoral "effective production/gross value added" ratios were registered within the tertiary sector, while the maximum ones were specific to the secondary sector.

In this case of the tertiary sector, the value of the RPVsect3 ratio tended to decrease from 1.8702 in 1989 to 1.7744 in 2008. The respective indicator appeared to be influenced by the economic situation. RPVsect3 decreased during recessions and grew during recovery periods. The exception to rule was registered in 2009, when the respective indicator increased from 1.7744 to 1.8007 (Table 3).

Table 3. Differentiation in the sectoral effective production/gross value added ratios in Romania between 1989 and 2009 (selected years)

Year	RPVsect1	RPVsect2	RPVsect3	Max-minRPVsect	RPVsam	Cv(RPVsect)
1989	1.9693	3.6522	1.8702	1.9528	2.4973	0.3274
1992	1.9952	4.1048	1.7593	2.3332	2.6198	0.4025
1996	1.8199	3.1138	1.8006	1.7293	2.2448	0.2738
1999	1.8312	3.1154	1.7166	1.8149	2.2210	0.2855
2008	2.1472	2.6881	1.7744	1.5149	2.2032	0.1703
2009	2.0889	2.6979	1.8007	1.4983	2.1958	0.1703

Source: Computed on the basis of the National Accounts, the National Institute of Statistics, Bucharest, 1994, 1995, 1999, 2002 and 2012.

Within the secondary sector, the RPVsect2 ratio decreased from 3.6522 in 1989 to 2.6979 in 2009. But contrary to the tertiary sector, in the case of the secondary sector the value of the respective indicator increased during recessions and diminished during economic recoveries.

The primary sector is characterized by great oscillations of the RPVsect1 ratio. From a value of 1.9693 in 1989, it reached a minimum of 1.8199 in 1996 and a maximum of 2.1472 in 2008. The dynamics behaviour of ratio RPVsect1 had some similarities with RPVsect2 during 1989 and 1999. During the period 1999-2008 the respective indicator increased its value from 1.8312 to 2.1472, and decreased to 2.0889 in 2009, contrary to the evolutions reported in the other two sectors.

Therefore, one may notice a decreasing trend of the effective production/value added ratio, having in view that the simple arithmetical mean of the sectoral ratios was 2.4973 in 1989 to 2.1958 in 2009. At the same time, we can be identify a narrowing of the differentiation of the indicator at a sectoral level, having in view that the values of the "max-minRPVsect" and "Cv(RPVsect)" indicators tended to diminish.

In the context of the increase in the share of the tertiary sector in the value added at the level of the whole economy, the "effective production/value added" ratio experienced a continuous decrease from 2.8783 in 1989 to 2.1664 in 2009, the minimum value (2.1496) being registered in 2008 (Table 4).

The computation of the weighted harmonical mean of the RPVsectj (RPVwhm) ratios confirm the trend towards diminishing the role played by intermediary inputs in obtaining effective production, especially during the 1989-1999 decade, when the value of the above-mentioned indicator decreased from 2.5965 to 2.0472. During the 1999-2009 decade we may detect a trend towards a slow increase in RPVwhm from 2.0472 to 2.0884.

Table 4. Values of weighted arithmetical and harmonical means of the sectoral "effective production/value added" ratios

Year	RPVwam	RPVwhm	$\dfrac{RPVwhm}{RPVwam}$
1989	2.8783	2.5965	0.9021
1992	2.7543	2.3613	0.8573
1996	2.3622	2.1992	0.9310
1999	2.2076	2.0472	0.9274
2008	2.1496	2.0685	0.9623
2009	2.1664	2.0884	0.9640

Source: Computation based on data from Table 1 and Table 3.

The evolution of the $(\dfrac{RPVwhm}{RPVwam})$ ratio shows again that, even in a given sectoral distribution of the value-added the differentiation of the RPVsectj ratios tended to enlarge during recessions and to narrow during economic recoveries, with the exception of the 2009 recession.

3. Impact of structural changes in the economy on the size of the backward multiplier of the input-output table

The RPVsectj ratios reveal not only the features of the technologies used within sectors or the influence of economic and social-institutional factors on the nominal value of effective production, but also the effect of a unitary modification of the value-added on the economic activity dynamics at the sectoral level. Consequently, the RPVsectj ratios can be viewed as "multipliers of economic activity at the sectoral level determined by a unitary impulse of value added".

Similarly, RPVwam can be defined as a "multiplier of the activity at the level of the whole economy determined by a unitary impulse of the value added".

But the influences of the unitary impulse given by the value-added generated within a particular sector are not limited only to the respective sector, because the economic sectors or activities are interconnected. In fact, "backward linkages", can be identified which indicate an interconnection of a particular economic sector with other sectors from which it purchases inputs (Gh. Zaman et al., 2010).

3.1. A methodological note on absolute and relative values of the backward multipliers and their significance

The study of the backward linkages can be done with the help of an input-output table. In the respective framework, "backward multipliers" can be defined as the sum of the elements on a column corresponding to each economic sector in the inverse of Leontief matrix and represent an important step in identifying the role of the sectors in the economic activity (Rasmunsen, 1956)[1].

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[1] The backward multiplier was largely accepted as an important concept in the utilization of the input-output table method, but it was also criticized. One of the reasons for the criticism of the definition of the above-mentioned indicator is that the hypothesis of a particular change in the final demand for a particular sector, a unitary impulse of value-added, respectively is adopted (Skolna, 1986).

In F. M. Pavelescu (1997) it was shown that the backward multiplier for an economic sector or branch (Mbsectj) might be expressed as:

$$Mb\sec tj = \frac{\displaystyle\sum_{j=1}^{k} cf_{ij}}{\displaystyle\sum_{j=1}^{k} (\frac{vab_j}{Oef_j}) * cf_{ij}}$$

(1) where:

cf$_{ij}$= co-factors of the determinant of the inverse of the Leontief matrix

vab$_j$= the gross value-added obtained in the sector j

Qef$_j$= the effective production of the sector j

This is equivalent to:

$$Mb\sec tj = \frac{\displaystyle\sum_{j=1}^{k} cf_{ij}}{\displaystyle\sum_{j=1}^{k} (\frac{1}{RPV\sec t_j}) * cf_{ij}}$$

(2)

In other words, **the backward multipliers of the input-output table are the harmonical mean of the RPVsectj ratios, weighted by the co-factors of the determinant of the inverse of the Leontief matrix.** Consequently, the absolute values of the respective multipliers are comprised between the minimum and maximum values of the RPVsectj ratios.

Therefore, the absolute values of the backward multipliers have to be viewed in correlation with their modeling factors. This means firstly **to take into account the minimum and the maximum of the RPVsectj ratios.**

Secondly, in order to detect some of the feature of the backward linkages it is necessary to **compute the share of the analyzed sector in the backward multiplier absolute value (Shansectj)**. This way, an image of the interconnections between the analyzed economic sectors and the rest of the economy can be created.

Thirdly, it is important to **determine the relative values of the backward multipliers**. Having in mind the computation formula of the respective indicator several types of relative values can be defined, namely:

a) **relative values of the backward multipliers related to the values of the RPVsectj (MbjRPVsect) ratios,** according to the formula:

$$MbjRPV\sec t = \frac{Mb\sec tj}{RPV\sec tj} \qquad (3)$$

Therefore, the multiplication effect of a unitary impulse of the value-added from a particular sector at the level of the whole economy can be compared with the multiplication effect generated within the respective sector. If MbjRPV>1, we can speak about an economic sector j whose demand for intermediate inputs is orientated to the economic sectors with higher RPVsect ratios in comparison with the analyzed sector.

b) **relative values of the backward multipliers related to RPVwam (MbjRPVwam)**, according to the formula:

$$MbjRPVwam = \frac{Mb\sec tj}{RPVwam} \qquad (4)$$

The above-mentioned relative value permits to compare the effect of multiplication generated by a unitary impulse of the value added of a particular sector within the whole economy with the average effect of multiplication generated by a unitary impulse of the value added at the level of the whole economy. If MbjRPVwam>1 the sector j may be considered as one with a higher potential of multiplication of activity in given economic conditions.

c) **relative values of the backward multipliers related to RPVwhm (MbjRPVwhm)**, according to the formula:

$$MbjRPVwhm = \frac{Mb\sec tj}{RPVwhm} \qquad (5)$$

The respective indicator enables us to highlight the feature of the distribution of the co-factors of the determinant of the inverse of the Leontief matrix in comparison with the sectoral distribution of the value added. If MbjRPVwhm>1, it results that the distribution of the determinant of the inverse of the Leontief matrix is more orientated to sectors with higher RPVsect in comparison with the sectoral distribution of the value added.

3.2. Evolution of the absolute values of backward multipliers in Romania between 1989 and 2008

The computation of the absolute values of backward multiplier shows that in 1989 a unitary impulse of the value added from the secondary sector generated a multiplication effect of 3.2264 within the whole economy, while the other two economic sectors are characterized by a backward multiplication effect of about 2.40 (Table 5).

Table 5. The absolute values of the sectoral backward multiplier in Romania during the period 1989-2009 (selected years)

Year	Mbsect1	Mbsect2	Mbsect3
1989	2.3892	3.2264	2.4081
1992	2.6119	3.8451	2.4478
1996	2.0521	2.8053	2.1465
1999	2.0254	2.7597	2.0352
2008	2.2306	2.5271	2.0048
2009	2.1974	2.5324	2.0365

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 1994, 1995, 1999, 2002 and 2012.*

During the period 1989-1992 in the context of recession of the economic activity the respective indicators tended to increase in all the three sectors, because the sense of the activity restructuring was the rationalizing of the labour costs, while the first stages of the price liberalization led to a sensible increase in the prices of intermediate inputs. During the period 1992-2009 the absolute values of the backward multiplier tended to diminish, following in fact the evolutions of the RPVsectj ratios. The exception to the rule was the growth registered by the above-mentioned indicator between 1999 and 2008 within the primary sector, but the change was in line with the sense of the modification of the RPVsect1 ratio.

The absolute values of the backward multiplier are influenced in different proportions by the activity developed by the analyzed economic sectors. The most powerful influence of the analyzed economic sector was detected for the secondary sector, if we have in view that the share Shansect2 was high and relatively stable during the whole period 1989-2008, being comprised between 83% and 85% (Table 6). These figures show that the activity of the respective sector is mainly orientated inside it.

Table 6. The share of the analyzed sector (Shansectj) in the backward multiplier absolute value in Romania during the period 1989-2009 (selected years)

%

Year	Shansect1	Shansect2	Shansect3
1989	57.86	85.08	48.64
1992	52.88	84.19	51.32
1996	67.55	84.76	55.15
1999	68.70	83.04	62.02
2008	69.74	85.00	65.05
2009	68.53	84.53	60.81

Source: Computed on the basis of Annexes 2, 3, 4, 5 and 6.

For the other two sectors the shares Shansect1 and Shansect3 are sensibly smaller than the values of Shansect2, emphasizing the fact that their activity is orientated in an important proportion to another activity and especially to the secondary sector (Annex 4). But this feature tended to fail, if one has in view the growth of Shansect1 from 57.86% in 1989 to 69.74% in 2008 and of Shansect3 from 48.64% in 1989 to 65.05% in 2008. It is to note that during the year 2009 the values of Shansctj registered decreases in all the three economic sectors taken into account.

Ones of the features of the linkages between the three economic sectors are highlighted by the values of the relative backward multipliers related to the RPVsectj (MbjRPVsect) ratios. Because the maximum value of RPVsect j was registered in the secondary sector during the analyzed period, the values of Mb2RPVsect are smaller than 1, oscillating between 0.8834 and 0.9401 (Table 7). Symmetrically, because the tertiary sector was characterized by the minimum value of RPVsectj, the values of Mb3RPVsect are bigger than 1, between 1.1298 and 1.3913, respectively.

Table 7. Relative values of the backward multipliers related to ratios RPVsectj in Romania during the period 1989-2008 (selected years)

Year	Mb1RPVsect	Mb2RPVsect	Mb3RPVsect
1989	1.2132	0.8834	1.2876
1992	1.3090	0.9367	1.3913
1996	1.1276	0.9009	1.1921
1999	1.1060	0.8858	1.1856
2008	1.0388	0.9401	1.1298
2009	1.0519	0.9387	1.1310

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 1994, 1995, 1999, 2002 and 2012.*

In the case of the primary sector, the values of the mentioned-above indicator is bigger than 1, for every considered year, revealing the fact that the analyzed sector was much more orientated toward the secondary sector for the purchase of its intermediary inputs than toward the tertiary sector.

Computation of the relative values of backward multipliers related to the RPVwam shows the fact that the unitary impulse of the value added in the secondary sector determined a multiplication of the economic activity, which was 1.12-1.25 times bigger than that registered at the level of the whole Romanian economy (Table 8). The changes in the relative values mentioned-above were influenced by the phases of the economic cycles. They usually increased during recessions and diminished during economic recoveries.

Table 8. Relative values of the backward multipliers related to RPVwam in Romania during the period 1989-2008 (selected years)

Year	Mb1RPVwam	Mb2RPVwam	Mb3RPVwam
1989	0.8301	1.1209	0.8366
1992	0.9483	1.3961	0.8887
1996	0.8687	1.1876	0.9087
1999	0.9175	1.2501	0.9219
2008	1.0377	1.1756	0.9326
2009	1.0143	1.1690	0.9401

Source: Computed on the basis of the National Accounts, the National Institute of Statistics, Bucharest, 1994, 1995, 1999, 2002 and 2012.

In the case of the primary and tertiary sectors, respectively, the backward multipliers were usually smaller than the backward multiplication effect obtained at the level of the whole economy. It is to note that for both economic sectors, during the decade 1989-1999, the behaviour of respective relative multipliers behaviour was analogous to that of the secondary sector. They grew during recessions and diminished during recovery.

During the period 1999-2008 a trend toward an increase in the respective indicators values can be detected. The trend mentioned above is more manifest in the case of the primary sector. Consequently, in 2008, the backward multiplication effect generated by a unitary impulse of value added from analyzed sector on economic activity was 1.0377 times bigger than the level registered by respective indicator at the national level.

During the year 2009, the relative backward multipliers of input-output table experienced a small decrease in the primary and secondary sector, but remaining bigger than 1, and an increase from 0.9326 to 0.9401 in the tertiary sector.

The values of the relative backward multipliers related to RPVwhm in the secondary sector (Mb2whm), oscillated between 1.2217 and 1.6284 and confirm once again that the most important part of the demand for intermediate inputs was concentrated within the respective sector (Table 9).

Table 9. Relative values of the backward multipliers related to RPVwhm in Romania during the period 1989-2008 (selected years)

Year	Mb1RPVwhm	Mb2RPVwhm	Mb3RPVwhm
1989	0.9202	1.2426	0.9274
1992	1.1061	1.6284	1.0366
1996	0.9331	1.2756	0.9760
1999	0.9893	1.3480	0.9941
2008	1.0784	1.2217	0.9692
2009	1.0623	1.2243	0.9845

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 1994, 1995, 1999, 2002 and 2012.*

The concentration of the demand for intermediate inputs in the interior of the analyzed economic sector was present also in the other sectors and has usually determinated under unitary values for Mb1RPVwhm and Mb3RPVwhm. The exception of the rule have occurred in 1992 for both sectors and in 2008- 2009 for primary sector when the structure of demand for intermediary inputs was more orientated towards the secondary sector, than was the sectoral distribution of value added. Therefore, the values of Mb1RPVwhm and Mb3RPVwhm became bigger than 1.

4. Conclusions

The experience of Romania's economy during the period 1989-2009 bring proofs in favour of the idea that changes of the sectoral distribution of value added are influenced both by the general trend of transition to a postindustrial (services) economy and by the phases of the economic cycles. If the hypothesis of the cyclical evolution of a market economy is admitted, the problem which has to be solved is when the process of the structural change is more accelerated. In the

case of Romania, the acceleration of the growth of the relative importance of services in generating value added was detected usually during the recessions. The periods of economic growth appeared to those ones with a trend towards slower changes in the sectoral distribution of the value added.

The analysis of the structural change cannot be reduced to the mutations in the sectoral distribution of the value added. It is recommendable that the analytical methodology to take into accounts also the evolution of the "effective production/value added" ratio and the feature of the backward linkages.

In the case of Romania's economy, it is to note that during the analyzed period the increase in the relative importance of the tertiary (services) sector in obtaining value added determinated the decrease in the backward multiplication effect at the national level, because the respective sector had constantly the lowest "effective production /value added" ratio. Also, the multiplication effect generated by a unitary impulse of the value added tended to become lower during recoveries and higher during recessions.

From a sectoral perspective, the secondary sector (industry and constructions) have maintained the highest values of the backward multiplier. Consequently, in the process of the elaboration of macroeconomic and sectoral development policies, it is important to have in mind that within the services, the value added is relatively easier to be obtained, but the development of activities in industry and constructions can lead to the occurrence of strong support for economic growth through the effect of multiplication of the demand for intermediate inputs.

Annexes

ANNEX 1

Deficits of the consolidated state budget (DefCSB) and of the foreign trade balance (DefFTB) in Romania during the period 1990-2009

Year	DefCSB	DefFTB
1990	1.0	-9.5
1991	3.1	-3.9
1992	-4.7	-8.4
1993	-0.4	-5.0
1994	-2.0	-2.1
1995	-2.5	-5.0
1996	-3.7	-7.9
1997	-3.5	-6.8
1998	-3.6	-7.8
1999	-1.8	-4.5
2000	-4.0	-5.3
2001	-3.2	-7.6
2002	-2.6	-5.6
2003	-2.2	-7.5
2004	-1.1	-9.0
2005	-1.2	-10.2
2006	-1.6	-12.0
2007	-2.3	-13.9
2008	-4.8	-13.0
2009	-7.3	-5.2

Source: F. M. Pavelescu (2009) and the National Institute for Statistics (2010).

ANNEX 2

The definition of the economic sectors used in the present paper

The notion of "economic sectors" was for the first time given by Colin Clark (1940). Therefore, economic activities were grouped in three sectors, namely:

- ✓ **Primary sector** which includes agriculture, forestry, hunting, fishing, mining and quarrying;

- ✓ **Secondary sector** which includes manufacturing industry and energy, gas and water supply;

- ✓ **Tertiary sector** which includes constructions and services.

Afterwards, some changes were made in the distribution of the economic branches within sectors, having in view the structural change of the economy and technological progress. At the present time, national and international statistics usually work with the definition of economic sectors given by Y. Sabolo, J. Gaude and R. Wery (1974), as follows:

- ✓ **Primary sector** which includes agriculture, forestry, hunting and fishing

- ✓ **Secondary sector** which includes mining and quarrying industry, manufacturing industry, electricity, gas, steam and air conditioning production and supply and water supply

- ✓ **Tertiary sector** comprising all activities, which can be defined as "services".

It is to be mentioned that the definition of economic sectors given in 1974 is used in the present paper.

ANNEX 3

Some algebraical properties of the coefficient of intensity of structural changes

In F.M. Pavelescu (1997), the coefficient of intensity of structural changes (CISC) was defined through the formula:

$$CISC = \sqrt{\sum_{j=1}^{3} (sh_{jf} - sh_{ji})^2} \; ,$$

where: sh_{jf}, sh_{ji} = share of the sector j in the total value added in the final and initial year of the analyzed period, respectively.

We can demonstrate that the computed values of the coefficient of structural changes (CISC) may be viewed as a product between the transfer of shares between the economic sectors (TSh) and a factor which is dependent on the distribution of the changes in the shares (CDSh).

The transfer of shares is defined as the sum of changes in shares registered in the sectors, which have experienced a growth in relative importance.

The maximum value of CDSh is equal to $\sqrt{2}$ and is obtained if the transfer of shares takes place only between two economic sectors or branches.

The minimum value of CDSh occurs if the changes in shares are equally distributed among the m economic sectors (branches) which have experienced an increase in relative importance and among the n economic sectors (branches) which have experienced a decrease in relative importance.

In this case, we have $CDSh = \sqrt{\dfrac{m+n}{m*n}}$.

If we consider only three economic sectors, the minimum value of CDS is $\sqrt{\dfrac{3}{2}}$.

If we have in view the case with three economic sectors, it is relatively easy to determine the main and secondary sense of the structural change (F. M. Pavelescu (coord.), 2007).

Two situations are possible:

a) a sector whose relative importance have increased while the other two sectors have registered a decrease in relative importance and

b) a sector whose relative importance have decreased, while the other two sectors have registered an increase in relative importance.

Consequently, the main sense of the structural change is given by the type of change, which has taken place in the sector, experiencing a modification of its relative importance equal to the transfer of shares.

The secondary sense of the structural change is given by the type of change, which was identified in the sector that has experienced a change in its share with the second absolute value in the respective structural change.

Theoretically, when the main sense of the structural change is related to a sector it is possible to have 4 situations. Consequently, if all the three sectors are considered, the number of possible situations is 12.

ANNEX 4

The inverse of the Leontief matrix (I-A)$^{-1}$ in a trisectoral vision and backward multipliers in Romania in 1989, 1992, 1996, 1999, 2008 and 2009

Annex 4.1. The inverse of the Leontief matrix (I-A)$^{-1}$ in a trisectoral vision and backward multipliers in Romania in 1989

	Primary sector	Secondary sector	Tertiary sector
Primary sector	1.3824	0.3337	0.1498
Secondary sector	0.9210	2.7450	1.0869
Tertiary sector	0.0857	0.1476	1.1714
Mbsectj	2.3892	3.2264	2.4081

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 1994.*

Annex 4.2. The inverse of the Leontief matrix (I-A)$^{-1}$ in a trisectoral vision and backward multipliers in Romania in 1992

	Primary sector	Secondary sector	Tertiary sector
Primary sector	1.3811	0.3666	0.1238
Secondary sector	1.0924	3.2371	1.0679
Tertiary sector	0.1384	0.2415	1.2561
Mbsectj	2.6119	3.8451	2.4478

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 1995.*

Annex 4.3. The inverse of the Leontief matrix (I-A)$^{-1}$ in a trisectoral vision and backward multipliers in Romania in 1996

	Primary sector	Secondary sector	Tertiary sector
Primary sector	1.3863	0.1772	0.1463
Secondary sector	0.5614	2.3777	0.8164
Tertiary sector	0.1044	0.2503	1.1838
Mbsectj	2.0521	2.8053	2.1465

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 1999.*

Annex 4.4. The inverse of the Leontief matrix (I-A)$^{-1}$ in a trisectoral vision and backward multipliers in Romania in 1999

	Primary sector	**Secondary sector**	**Tertiary sector**
Primary sector	1.3913	0.2266	0.0737
Secondary sector	0.4938	2.2918	0.6994
Tertiary sector	0.1402	0.2414	1.2621
Mbsectj	2.0254	2.7597	2.0352

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 2002.*

Annex 4.5. The inverse of the Leontief matrix (I-A)$^{-1}$ in a trisectoral vision and backward multipliers in Romania in 2008

	Primary sector	Secondary sector	Tertiary sector
Primary sector	1.5555	0.1241	0.0490
Secondary sector	0.5468	2.1479	0.6517
Tertiary sector	0.1283	0.2550	1.3041
Mbsectj	2.2306	2.5271	2.0048

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 2012.*

Annex 4.6. The inverse of the Lenitive matrix (I-A)$^{-1}$ in a trisectoral vision and backward multipliers in Romania in 2009

	Primary sector	**Secondary sector**	**Tertiary sector**
Primary sector	1.5058	0.1437	0.1517
Secondary sector	0.5681	2.1407	0.6463
Tertiary sector	0.1236	0.2481	1.2385
Mbsectj	2.1974	2.5324	2.0365

Source: Computed on the basis of the *National Accounts, the National Institute of Statistics, Bucharest, 2012.*

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