10. DYNAMICS OF FIXED CAPITAL PRODUCTIVITY AND THE MACROECONOMIC EQUILIBRIUM

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Abstract

This paper shows that dynamics of fixed capital productivity at macroeconomic level is related to changes in the indicators and relationships which are fundamental to the economic stability (index of gross fixed capital formation, consumption-fixed capital accumulation relationship, and external equilibrium). In this context, a model of factorial analysis of the dynamics of fixed capital productivity is proposed. Therefore, the impact of pressure of domestic aggregate demand and external equilibrium on the evolution of fixed capital productivity during a period of time should be emphasized. The respective model is applied to the case of Romania. At the end of the paper, having in view Romania's experience during two decades (1990-2010), arguments are presented to reinforce the thesis of R. Solow stating that a condition for a long run balanced economic growth is that fixed capital productivity should be constant.

Keywords: relative acceleration of gross fixed capital formation, demand pressure, balanced economic growth, external equilibrium

JEL Classification: C13, C20, C51, C52

1. Introduction

One of the major conditions for a durable economic growth is the increase in the partial and total production factor productivity. Neo-classical theory considers the dynamics of total factor productivity as a proxy for the rate of technical progress. But in the case of each production factor, the dynamics of partial productivity is conditioned not only by the features of the economic situation, but also by the role played by the respective factor in the economic activity and by the way it is formed (created) and allocated. The fixed capital represents one of the essential production factors and the evolution of its partial productivity has an important impact on the rate of economic growth in the long run. Consequently, there are serious reasons to detect the modeling factors for the evolution of productivity of the above-mentioned production factor and its consequences for the macroeconomic equilibrium.

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2. Traditional Approaches to the Dynamics of Fixed Capital Productivity at Macroeconomic Level

Traditional approaches of the dynamics of fixed capital productivity are linked to the concept of production factor substitution. It is well-known that the neo-classical economy has adopted the assumption that the productivity of the substituted production factor grows more rapidly than the productivity of the substituting production factor. In a standard neo-classical model, two main production factors are taken into consideration: labor force and fixed capital.

In this conceptual framework, technical change is usually seen as mainly labor saving and fixed capital consuming. In other words, the labor force is the substituted production factor, while the fixed capital represents the substituting production factor. Under these circumstances, it is admitted that productivity of labor increases faster than the fixed capital productivity. It is adopted even the hypotheses that the fixed capital productivity may decrease, as an expression of the law of decreasing returns.

The assumption of decreasing fixed capital productivity has to be carefully taken into consideration. Indeed, the historical experience shows that there were periods in economic history when the fixed capital productivity decreased because of a sensible growth in labor productivity. Those situations were especially consequences of very intense processes of labor force substitution during the period of building the base of industrial structure[2].

But a continuous decrease in productivity of fixed capital, even in the context of an increase in productivity of labor may represent a loss in effective allocation and use of one of the most important production factor. Therefore, from the theoretical point of view it is recommended that the fixed capital productivity dynamics be studied in correlation with the total factor productivity. Considering the total factor productivity dynamics as a proxy for the rate of technical progress, it may be admitted that premises are created for a long run economic development if the dynamics of the respective indicator is positive[3].

The problem of dynamics of fixed capital productivity cannot be neglected both in economies which are very capitalistic ones (i.e. the level of capital ratio is very high) and in the economies where there is a shortage of fixed capital and productive capacities. Historical experience shows that a stable increase in productivity of labor and, consequently, a durable economic growth cannot be obtained if a threshold of capital deepening at the macroeconomic level is not exceeded.

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[2] For example, during the period 1960-1973, some countries members of OECD, such as Japan, Italy, Austria, Greece, Spain, registered growth of labour productivity at an average rate higher than 5%, but in conditions of a negative average rate of growth of fixed capital productivity (F.M. Pavelescu, 1997).

[3] Having in mind the computation formula of the index of total factor productivity (ITFP), respectively: $ITFP=I(Y/L)^{s}*I(Y/K)^{(1-s)}$, where: I(Y/L)=index of labour productivity, Y=gross domestic product, L= employed population s=share of extended labour incomes in gross value-added, I(Y/K)= index of fixed capital productivity, K= stock of fixed capital in real terms, we may obtain the condition of an increase in the index of total factor productivity, i.e. $I(Y/K)>I(K/L)^{s-1}$, where I(K/L)=index of capital-deepening (capital-output ratio).

Also, the relative change in the fixed capital productivity depends on the nature of economic growth. In the context of building a new economic structure, as it was the base of industrialization, it is easier to obtain an increase in both productivity of labor and productivity of fixed capital[4]. In the case of the restructuring of the productive apparatus, it appears relatively easy to obtain an increase in the productivity of labor, but much more difficult to determine an increase in the productivity of fixed capital.

At the same time, neglecting the evolution of the dynamics of fixed capital productivity and having in view only the growth of labor productivity or generate in the long run blockages in the economic development[5].

The evolution of fixed capital productivity is influenced by the rate of capital accumulation. Experiences of consolidated market economies show that in conditions of a higher rate of capital accumulation a decreasing trend in fixed capital productivity may occur. Inversely, an increasing trend in the fixed capital productivity may be detected if the rate of capital accumulation is relatively low[6]. The evolutions mentioned before need to be carefully analyzed, because the dynamics of partial productivity highlights especially the demand-side aspects of the economic activity and, inherently, creates a short or medium run vision related to economic development. In the long run, the rate of economic growth depends mainly on the quantitative and qualitative

[4] In the case of Romania, it is worth mentioning that, during the period 1950-1976, when the main part of the base of industrial structure was built, the productivity of labor grew concomitantly with the productivity of fixed capital. The average growth rate of labor productivity was 8.12% during 1950-1962 and 9.23% during 1962-1976, while the growth rate of fixed capital productivity was 4.58% during 1950-1962 and 0.88% during 1962-1976 (F.M. Pavelescu, 2008).

[5] The classic example of neglecting the role of productivity of fixed capital in sustaining the economic growth was the experience of Eastern and Central European countries, especially in the 1980's. Because of central planning, the rate of economic growth was constantly slower in comparison with the dynamics of stock of fixed capital. Consequently, in a study for the World Bank, T. Poznansky (1985) claimed that in the long run the consolidated market economies were able to ensure both the growth of labor and total factor productivity, while the centrally planned economies could only ensure a small rate of growth of labor productivity, in the context of a negative rate of growth of the total factor productivity. It may be noticed that the above-mentioned assumption can be also applied to the case of Romania. Data presented in F.M. Pavelescu (2008) show that during 1976-1989 the average rate of growth was 2.1% for the productivity of labor and –0.01% for the total factor productivity, because the average rate of growth of fixed capital productivity was –4.79%.

[6] For example, in F.M. Pavelescu (1997), it is shown that the estimation of Cobb-Douglas production function parameters for 1972-1989 highlights a sensible decrease in productivity of fixed capital for Japan, and an increase in the respective productivity in the case of the U.S.A. It is well-known that in the analyzed period the rate of capital accumulation was sensibly higher in Japan as compared to the U.S.A. Also, it is important to note that, in Japan, the decrease in fixed capital productivity occurred in conditions of a quasi-exponential increase in the productivity of labor (the coefficient of correlation between the logarithm of productivity of labor and factor being 0.9987) at a rate of 2.8% for the disembodied technical progress. The data for the U.S.A reveal also a very good time stability of increase in the productivity of labor (the coefficient of correlation between the logarithm of productivity of labor and factor being 0.9484) at a rate of 0.9% for the disembodied technical progress.

supply of production factors, on the features of technical changes and on fulfillment of conditions needed to achieve and maintain the macroeconomic equilibrium.

Therefore, it is recommendable to identify the determining elements of demand side and analyze their impact on the dynamics of fixed capital productivity, in short and medium run, on the one hand, and to emphasize the impact of achieving the conditions of long run macroeconomic equilibrium on the relative changes of the above-mentioned indicator, on the other hand.

3. A Proposal for a Factorial Analysis Model for the Fixed Capital Productivity Dynamics

The fixed capital productivity dynamics may be seen not only in relation to the relative changes in the productivity of labor and capital deepening. Considering that the above-mentioned indicator is defined as the ratio of gross domestic product (GDP) to the stock of fixed capital, and the relation between the stock of fixed capital (cK) and a component of gross domestic product, namely the gross fixed capital formation (GFCF), we may write the following expression:

$$PcK = \frac{GDP}{cK} = \frac{GFCF}{cK} * \frac{GDP}{GFCF} \quad (1),$$

equivalent with:

$$PcK = \frac{GFCF}{cK} * \frac{1}{ARK} \quad (2)$$

where: PcK= productivity of fixed capital

ARK = apparent rate of fixed capital accumulation.

At first sight, it seems that the fixed capital productivity is inversely proportional to the rate of fixed capital accumulation, or, in other words, proportional to the propensity to consume, but this assumption needs careful consideration. In an open economy, the above-mentioned rate highlights important correlations of economic activity not only with the propensity to consume, but also with the structure of demand and the external equilibrium.

The apparent rate of fixed capital accumulation (ARK) can be also expressed as a product of three indicators:

$$ARK = shGFCF_{DAD} * shDAD_{TD} * \frac{1}{VAd_{TD}}, \quad (3)$$

where: $shGFCF_{DAD}$ = share of gross fixed capital formation in the domestic aggregate demand (DAD)

sh DAD = share of domestic aggregate demand in total demand (TD)

VAd = value-added deepening of total demand (ratio of gross domestic product to total demand). It is worth noticing that VAd is the complement of degree of import penetration in total demand.

Having in view the formulae (2) and (3), we may express the fixed capital productivity as a product of four ratios:

$$PcK = (\frac{GFCF}{cK}) * (\frac{DAD}{GFCF}) * (\frac{TD}{DAD}) * (\frac{GDP}{TD}) \quad (4)$$

The four ratios mentioned before may be re-arranged in various combinations, which can be useful for different kinds of macroeconomic analysis.

Therefore, if we have in view the concept of "pressure of total demand" (pressTD) defined in E. Dobrescu (2008) as: $pressTD = \frac{TD}{cK}$ (5)

the fixed capital productivity at macroeconomic level can be written as:

$$PcK = \Pr essTD * VAd_{TD} \quad (6)$$

The formula (6) points out that the fixed capital productivity is directly correlated with the degree of economic capacity utilization, on one hand, and with the relative importance of gross domestic product related to total demand, on the other hand.

Analogously to the concept of "pressure of total demand" (pressTD), we may speak about the "pressure of the domestic aggregate demand" (pressDAD), quantified by the ratio: $pressDAD = \frac{DAD}{cK}$ (7)

According to the above-mentioned vision, fixed capital productivity may be defined as:

$$PcK = (\frac{DAD}{cK}) / (\frac{DAD}{GDP}) \quad (8)$$

Formula (8) shows that the partial productivity (of fixed capital) at macroeconomic level depends not only on the size of the pressure of domestic aggregate demand, but also on the way the gross domestic product is correlated with foreign trade development.

The above-mentioned formula has the advantage of showing that the changes in the relative level of fixed capital productivity can be viewed as depending on two large groups of factors: a) the index (relative change) of domestic aggregate demand pressure (IpressDAD) and b) the inverse of index (relative change) of absorbance of the gross domestic product (IabGDP).

We notice that the relative changes in the above-mentioned indicators can be measured with indices defined as:

$$IpressDAD = \frac{IDAD}{IcK} \quad (9), \text{ and}$$

$$IabGDP = \frac{IDAD}{IGDP} \quad (10)$$

On this basis, we may build a factorial analysis model of relative change in the fixed capital productivity at macroeconomic level. The first objective of the respective model is to highlight the contributions of relative change in the pressure of domestic

aggregate demand and the absorbability of gross domestic product, and to the relative change in the productivity of fixed capital, respectively. Consequently, it is possible to determine the main modeling factor of the relative change in the respective productivity. We may consider as main modeling factor of the above-mentioned relative change if the contribution of such factor is higher than 50%. The other modeling factor is considered as a secondary one.

In order to detect the above-mentioned contribution, firstly, it is necessary to emphasize the impact of the relative changes in the pressure of domestic demand (ΔpressDAD) and in the absorbability of gross domestic product on the relative change in fixed capital productivity (ΔabsGDP).

$$\Delta pressDAD = \frac{IDAD - IcK}{IcK} \tag{11}$$

$$\Delta absGDP = \frac{IGDP - IDAD}{IcK} \tag{12}$$

Consequently, the contribution of the relative change in domestic aggregate demand pressure (CpressDAD) and of the relative change in absorbability of gross domestic product to the relative change in fixed capital productivity (CabsGDP) can be computed using the formulae:

$$CpressDAD = \frac{IGDP * IabGDP - IcK}{IGDP - IcK} \tag{13}$$

$$CabsGDP = \frac{IGDP - IGDP * IabGDP}{IGDP - IcK} \tag{14}$$

Having in view the formula (13) we notice that the pressure of domestic demand is the main modeling factor of the relative change in the fixed capital productivity if:

a) $IGDP * IabGDP > (1/2) * (IGDP + IcK)$ while $IGDP > IcK$ and

b) $IGDP * IabGDP < (1/2) * (IGDP + IcK)$ while $IGDP < IcK$

Also, it is important to note that CabsGDP is positive if:

a) there is an increase in the fixed capital productivity which takes place in the context of a decrease in the absorbability of gross domestic product; and

b) there is an increase in the fixed capital productivity which takes place in the context of a decrease in the absorbability of gross domestic product.

Analogously, we are able to emphasize the contribution of modeling factors to the relative change in the pressure of domestic aggregate demand. In this case, the modeling factors are: a) the relative acceleration of gross capital formation in comparison with the stock of fixed capital dynamics (reaccK), highlighted by the ratio of the index of gross capital formation to the index of stock of fixed capital (IGFCF/IcK); and b) the index (relative change) of the rate of fixed capital accumulation related to domestic aggregate demand (IRaccK).

The relationship between IGFCF and IcK is not a simple one.

Therefore, according to E. Dobrescu (2006), we may write the index of fixed capital for the year t-1 (IcK (-1)) as:

$$CKc(-1) = CKc(-2) - CKc(-1) * d + GFCFc(-1) \quad (15)$$

where: d= rate of depreciation of the fixed capital

If we note: $rk = \frac{GFCFc}{CKc(-1)}$, we may write: $cK(-2) = cK(-2) * (1 - d + rk)$ (16)

The stock of fixed capital in the year t may be expressed as:

$$cK(-2) = cK(-2) * (1 - d + rk) * (1 - d) + cK(-2) * rk * IGFCF \quad (17)$$

Consequently: $IcKc = (1 - d) + \frac{rk * IGFCFc}{1 - d + rk}$ (18)

If we consider that rate of depreciation remains constant in the considered years, it can be demonstrated that:

IGFCF$_t$= IcK$_t$, if $IGFCF_t = (1 - d_{t-1} + rk_{t-1}) = IK_{t-1}$

IGFCF$_t$> IcK$_t$, if $IGFCF_t > (1 - d_{t-1} + rk_{t-1})$ and

IGFCF$_t$< IcK$_t$, if $IGFCF_t < (1 - d_{t-1} + rk_{t-1})$

In other words, if the index of gross capital formation in the year t is higher than the index of fixed capital in the previous year (t-1) then an increase in the productivity of fixed capital is possible.

The relationship between the IGFCF and IDAD may be viewed as a consequence of change in the rate of fixed capital accumulation related to domestic aggregate demand, ratio fixed gross capital formation/domestic aggregate demand (RaccumK), respectively. Therefore, we may write:

$$IGFCF = IDAD * IRaccumK \quad (19),$$

Under these circumstances, the contributions of the relative acceleration of the gross capital formation in comparison with the stock of fixed capital dynamics (CreaccGFCF) and the relative change in the rate of fixed capital accumulation related to domestic aggregate demand (CIRaccumK), respectively, may be determined by the formulae:

$$CreaccK = \frac{IDAD * IRaccumK - IcK}{IDAD - IcK} \quad (20)$$

$$CIRaccumK = \frac{IDAD - IDAD * IRaccumK}{IDAD - IcK} \quad (21)$$

If we take into consideration the formula (20) we notice that the relative acceleration of the gross capital formation in comparison with the stock of fixed capital (CreaccK) is the main modeling factor of the relative change in the pressure of the domestic demand if:

$IDAD * IRaccumK > (1/2) * (IDAD + IcK)$ while $IDAD > IcK$ and

$IDAD * IRaccumK < (1/2) * (IDAD + IcK)$ while $IDAD < IcK$

It is worth mentioning that contribution of the relative change of the rate of fixed capital accumulation (CIRaccumK) is negative if:

a) pressure of domestic demand increases at the same time with an increase in the rate of fixed capital accumulation; and

b) pressure of the domestic demand decreases at the same time with a decrease in the rate of fixed capital accumulation.

In the case of relative change in the (GDP/DAD) ratio, in fact the inverse of the GDP absorbability, the modeling factors are the relative acceleration of the total demand related to the domestic aggregate demand (reaccTD) and the index of value-added deepening of total demand (IVad).

It is to mention that the comparison between IDAD and ITD shows that a reason for an increase in productivity is that exports expand more rapidly than the domestic aggregate demand. The correlation between ITD and IY is in fact an indicator of the evolution of foreign trade efficiency. In this way, the fact that the increase in the fixed capital productivity implies not only a greater openness to external economic flows, but also a balance between the exports and imports may be highlighted.

Taking into consideration the methodology used for the analysis of the relative change in the pressure of domestic demand, we may write the formulae for the contributions of relative changes in total demand (CracITD) and value-added deepening to the relative change in the inverse of the absorbability of the gross domestic product (CVadGDP), i.e.

$$CracITD = \frac{ITD - IDAD}{IGDP - IDAD} \tag{22}$$

$$CVadGDP = \frac{IGDP - ITD}{IGDP - IDAD} \tag{23},$$

It is worth mentioning that the relative acceleration of the total demand in comparison with the domestic aggregate demand is the main modeling factor of the relative change in pressure of the domestic demand if:

$ITD > (1/2)*(IGDP + IDAD)$ while $IDAD < IGDP$ and

$ITD < (1/2)*(IGDP + IDAD)$ while $IDAD > IGDP$

It is worth noticing that CVadGDP is negative if

a) ITD>IGDP>IDAD and
b) IDAD>IGDP>ITD

In the next chapter, the methodology proposed for the computation of contributions of the modeling factors to the fixed capital productivity dynamics is applied in the case of Romania during the period 1989-2010. The analysis takes into consideration the phases of the economic cycle: recovery or recession. Also, in order to highlight the trend of fixed capital productivity dynamics over each economic cycle and to permit

comparisons of the indicators during recoveries and recessions, we use average rates instead of indices[7].

4. Features of Fixed Capital Productivity Dynamics in Romania during the Period 1989-2010

During the period 1989-2010, fixed capital productivity dynamics in Romania was sensibly influenced by the characteristic features of the transformation process of the economic mechanism and by the preparedness for and integration into the European Union. The intensity of the transformation process and the large changes in the external environment determined important fluctuations in the economic activity, highlighted by the gross domestic product. Therefore, in the 1990's the Romanian economy faced two transformational recessions (1990-1992 and 1997-1999) and a period of economic recovery (1993-1996). During 2000-2008, the gross domestic product registered a continuous growth. In this context, it is important to note that the period 2000-2008 may be divided into two sub-periods (2000-2004 and 2004-2008, respectively), because at the end of 2004 the European Commission and the International Monetary Fund recognized Romania as a functional market economy. On the other hand, the economic policy implemented during 2005-2008 was sensibly different from the orientation taken into consideration during 2000-2004. During 2009-2010, in the context of world economic crisis the Romanian economy faced a new recession.

Therefore, the gross domestic product and the partial productivity of production factors in real terms fluctuated considerably. In the case of fixed capital productivity, the fluctuations are generated not only by the instability of the economic environment or of the investment processes, but also by other causes. A series of objective difficulties occurred because of the absence of conditions for a correct measurement of the stock of fixed capital. In the context of very rapid changes in the internal economic environment, especially large industrial restructuring, the official statistical data has over-evaluated the stock of fixed capital8.

This situation has created many difficulties in the analysis of the current economic situation and in the estimation of future evolutions. Consequently, a feasible method

[7] Therefore, we deal with the rpcK, rcK, rGFCF, rDAD, rTD, rGDP instead of IpcK, IcK, IGFCF, IDAD, ITD, IGDP.

[8] The fact that there are major and objective difficulties in the correct estimation of the stock of fixed capital not only in Romania, but also in other Central and Eastern European countries, was emphasized during the mid 90s at conferences and other meetings organized by the UNO Commission for Statistics. The researchers and statistical experts recognized that a feasible estimation of the stock of fixed capital is a complicated problem in any market economy.

From the theoretical point of view, in a consolidated market economy it is recommendable to give up the method of fixed capital balance, which is derived from the philosophy of system of material production and to make transition to the method of perpetual inventory. But the implementation with good results of the above-mentioned method is dependent on fulfilling some conditions related to the informational systems at enterprise level and a relatively high development of the official (public) statistics.

for the quantification of the stock of fixed capital is required. One of the methods which produce very good results in estimating the dynamics of the stock of fixed capital was proposed by acad. E Dobrescu and is used in this paper to reveal the features of the dynamics of fixed capital productivity and its modeling factors.

The analysis of the dynamics of fixed capital productivity in Romania shows an increasing trend of the respective indicator during the period 1989-2010 when the economy recovered and a decrease when the economic activities faced a recession. An exception to this rule occurred during the second transformational recession (1997-1999), when the fixed capital productivity increased by an average rate of 7.20% (Table 1).

The explanation of the respective evolution was that in the context of an extended industrial restructuring the decrease in stock of fixed capital was sensibly more rapid than the decrease in the level of gross domestic product in real terms. It is worth mentioning that the industrial restructuring was not characteristic of 1990's, but also of the period 2000-2008, when the economy experienced a high growth rate. Consequently, the estimated stock of fixed capital in real terms continued to diminish during the period 2004-2008 at an average rate of –3.59%, while the gross domestic product grew at an average rate of 5.37%.

These facts are at first sight in contradiction with the classic assumptions of economic theory, which consider that the economic growth is dependent on the increase in the stock of fixed capital in real terms. But in Romania, like in other Central and Eastern European countries, the macroeconomic policy favored not only the industrial restructuring but also the development of the service sector. Consequently, the requirements for the ratio stock of fixed capital/output are sensibly smaller in comparison with the previous period.

Table 1

Rate of growth of fixed capital productivity and of determining economic indicators in Romania during 1989-2010

%

	rpcK	rck	rGFCF	rDAD	rTD	rGDP
1989-1992	-9.52	-0.25	-22.48	-6.42	-6.47	-9.74
1992-1996	2.09	1.81	10.25	3.81	3.58	3.94
1996-1999	7.20	-9.01	-2.06	-3.48	-2.82	-2.46
1999-2004	9.29	-3.59	8.96	6.25	7.21	5.37
2004-2008	3.04	3.27	20.12	7.39	5.85	6.41

Note: *Computations are based on the data from the Statistical Yearbook of Romania for IGFCF, IDAD, ITD and IGDP. The data for the stock of fixed capital dynamics for 1990-2004 are taken from E. Dobrescu (2006), while for the period 2005-2010 they are determined by the author using the methodology proposed by E. Dobrescu (2006) and the author's estimation related to the rate of depreciation of fixed capital.*

The transition to a service economy continued during the period 2000-2008, when the gross domestic product grew at an average rate of 6.41%. The stock of fixed capital registered an average growth rate of 3.27%. Therefore, the productivity of capital increased at an average rate of 3.04%. It is worth mentioning that in the respective

period the economic growth was based on consumption stimulation and on the expansion of the real estate activities. Consequently, the industrial restructuring continued on a large scale, at the same time with an expansion of the activities grouped in the service sector.

In this context, there were important changes in the structure of the stock of fixed capital it. The share of industrial capacities in the whole stock of fixed capital diminished, while the share of the fixed capital resulted from real estate activities increased. The respective evolution was not characteristic only of Romania[9] and was the consequence of an economic growth based mainly on domestic consumption and favored by a relatively low external debt. This type of economic growth proved to be unsustainable. In fact, the crisis which began in 2008 determined painful readjustment in the level of economic activity, mostly in the countries where the real estate business previously experienced an explosive expansion.

During the 2009-2010 recession, when the gross domestic product decreased at an average rate of 4.13%, the stock of fixed capital increased at an average rate of 2.49%, due to inertial forces. Consequently, the fixed capital productivity decreased at an average rate of -6.46%.

During the whole period 1990-2010, the fluctuation of pressure of the domestic demand acted as a main modeling factor of the dynamics of fixed capital productivity. The contribution of the pressure of domestic demand to the relative change in the fixed capital productivity oscillated between 65.03% and 93.91% during the 1990's and between 109.85% and 151.26% in 2000-2010 (Table 2).

Table 2

Contribution of the modeling factors to the rate of growth of fixed capital productivity in Romania during 1989-2010

%

	CpressDAD	CabsGDP	CreaccK	CIRaccumK	CracITD	CvadGDP
1989-1992	65.03	34.97	360.15	-260.15	1.30	98.70
1992-1996	93.91	6.09	422.49	-322.49	-176.28	276.28
1996-1999	84.53	15.47	125.64	-25.64	65.32	34.68
1999-2004	109.85	-9.85	127.61	-27.61	-109.10	209.10
2004-2008	131.01	-31.01	409.03	-309.03	157.73	-57.73
2008-2010	151.26	-51.26	185.66	-85.66	81.83	18.17

Note: *Computation based on data from Table 1*.

The relative acceleration of gross fixed capital formation was the main modeling factor of the dynamics of the domestic demand pressure, its contribution being higher than 100% during each analyzed period. The explanation of this situation is that the rate of fixed capital accumulation increased when the gross fixed capital accelerated and decreased when the gross capital accumulation decreased.

[9] The trend of a sensible increase in the gross fixed capital formation during the period 2000-2008 can be detected also in other member countries of the European Union, such as Spain and Latvia.

The role of the modeling factors in the relative change in the absorbability of gross domestic product changed, depending on the phases of the economic cycle, on the one hand, and on the relative acceleration of the total demand in comparison with the domestic aggregate demand, on the other hand. As a rule, the absorbability of the gross domestic product increased during recoveries and decreased during recessions. The exceptions occurred during the 1990-1992 recession and the 1993-1996 recovery.

Usually, total demand decreased more slowly during recessions and increased more slowly during recoveries, the exceptions being recorded in 1990-1992 and 2000-2004. Consequently, the relative acceleration of the total demand in comparison with the domestic aggregate demand was the main modeling factor of the change in the absorbability of the gross domestic product during the 1997-1999 and 2009-2010 recessions and 2000-2004 recovery. The change in value-added deepening of the gross domestic product appeared to be the main factor of the relative change in the absorbability of gross domestic product when there was an exception to the rule of the behavior of the total demand during the phases of economic cycle.

5. Conclusions. Dynamics of Fixed Capital Productivity and the Achievement of Conditions for a Balanced Growth

Romania's experience during the 1990-2010 period shows that in the context of an economic environment defined by ample structural changes, the fixed capital productivity could fluctuate sensibly. The causes of such evolution are multiple, being linked both to the relationship between the consumption and accumulation, and to the external equilibrium and the correctness of the stock of fixed capital estimation.

In the context of a transformational process, the level of fixed capital productivity in real terms has sensibly fluctuated. Also, there were situations in contradiction with the theoretical assumption related to the dynamics of fixed capital stock and of fixed capital productivity. (For example, the stock of fixed capital decreased even during recovery periods, or the fixed capital productivity increased during recessions.) These particular situations have to be carefully studied and it is necessary to take into consideration the features of the indicators of "(partial) productivity type".

Any indicator of partial productivity type behaves according to static comparability and favors a vision in the short run. Therefore, the behavior of the respective partial productivity has to be seen in connection with the specific conditions of the analyzed period. We have in mind especially the phases of the economic cycle (recovery or recession), the "regime of capital accumulation" (R. Boyer, 1992), and the features of substitution of labor by fixed capital or the changes in the macroeconomic structure.

At the same time it is very important to detect the quality of (fixed) capital accumulation (D. Dăianu, 1992). It is worth mentioning that the quality of fixed capital accumulation can be highlighted only in context of a reliable methodology for the evaluation of the stock of that production factor. This way, conditions are created for a realistic evaluation of fixed capital productivity for a correct estimation of the rate of

total factor productivity, which is the indicator frequently used to forecast the rate of technical progress and the rate of economic growth in the long run.

As regards the economic growth in the long run, it is worth mentioning that in this case the dynamics of the stock of fixed capital acts as a part of the production factor supply. Consequently, the productivity may be considered a measure of efficiency of the production factor allocation. At the same time, the sustainability of economic growth is conditioned by the achievement of a balance between the main macroeconomic indicators and correlations. Among the most important correlations at the macroeconomic level, the equilibrium between the exports and imports and the stability of the share of fixed capital in the domestic aggregate demand may be taken into consideration.

The fulfillment of the above-mentioned conditions for a balanced economic growth implies that the index of fixed capital productivity has to be equal to the relative acceleration of the gross fixed capital formation in comparison with the stock of fixed capital. But in the long run, in the context of equality between exports and imports and of a stable ratio of the gross fixed capital formation to the domestic aggregate demand, and also a stable rate of depreciation, the index of the stock of fixed capital will tend towards the index of the fixed gross capital formation.

Consequently, a stable rate of growth for the stock of fixed capital and practically a constant level of the productivity of the production factor will occur. The conclusion that in conditions of a balanced economic growth the fixed capital productivity is constant is not a new one. The demonstration was made by Solow in the mid 1950's, by taking into consideration that a balanced growth implies an equilibrium between the average level of productivity of labor and the level of fixed capital deepening (fixed capital in real terms per worker).

The re-enforcement of the Robert Solow conclusion has the advantage that it was demonstrated starting from the correlations between the dynamics of the stock of fixed capital and the main macroeconomic indicators of the demand side. Also, this assumption allows us to speak about a natural rate of growth of the stock of fixed capital in real terms.

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