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## **Update of the factors that adjust the economic growth rate - comparison of the models of M. Kalecki and K. Laski**

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### **1. Aim of the research**

My research was the dynamics of economic growth of modern economies in continuous and dynamic changes. They are the source of a broad stream of institutional determinants that affect economic mechanisms with varying intensity. As the economic foundation of my considerations, I adopted M. Kalecki's model of economic dynamics, which was developed primarily by Prof. K. Laski. His deliberations were collected and edited by Prof. J. Osiatynski in a well-known book entitled "Lecture in macroeconomics. A Capitalist Economy Without Unemployment". I studied M. Kalecki's approach mainly from his collected works and from the book "Capitalism: Economic Dynamics and Full Employment", whose editors were K. Laski and J. Osiatynski. Also, meetings and conversations with Prof. J. Toporowski and Prof. N. Orlik-Levy were important for my research.

In my research, I have attempted to analyze and compare M. Kalecki's model of economic dynamics, its original form and the one changed by K. Laski in relation to institutional determinism in the view of institutional economics. In this context, two key aims of my research emerged. The first one is an attempt to update the factors determining the rate of economic growth of the original Klicik model against the background of the revised model by K. Laski. The second aim is to embed the growth model in the institutional determinism of modern economies. Professor J. Toporowski's statement was not without significance for me. He stated that the reference to institutional factors seems to extend M. Kalecki's theory of economic growth dynamics. Prof. J. Osiatynski pointed out in one of our conversations that institutional economics alone cannot distinguish between changes in the relation of private investment to changes in GDP because of the evolution of technical capital intensity, and modernization resulting from changes in utilization of the production apparatus because of fluctuations in aggregate demand. In this context, I made a hypothesis. I believe that the rate of economic growth also depends -

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apart from the factors described by M. Kalecki and K. Laski - on the degree of organizational and production excellence of enterprises. These are largely determined by a broad stream of formal and informal, essentialist and sub-essentialist institutions.

## 2. Identification of base model problems

A detailed analysis of the basic models of M. Kalecki and K. Laski led to the identification of three problem areas. To some extent, these have become methodological assumptions. These are the capacity utilization rate, the capital intensity issue, and the technological improvement factor.

M. Kalecki emphasizes that in a capitalist system, utilization of the productive apparatus depends on the ratio of demand to the size of the productive potential. Therefore, this indicator will not be an independent indicator here, but will also reflect the changes in the marketability of the product of the manufacturing facilities. Moreover, the capacity utilization rate in a capitalist economy will never equal 1. This is because businesses never achieve full utilization of their resources. This in turn generates so-called production reserves. In this context, for the study I have taken the capacity utilization rate ( $w$ ) as the ratio of real output to maximum capacity.

The second problem area is the issue of capital intensity. To be more precise, the issue is the difference between capital intensity and capital intensity ratio. In M. Kalecki's model we are dealing with the latter. It is distinguished by the elements of productive accumulation. In this context, the capital intensity ratio ( $k$ ) is the sum of two coefficients. The first is the capital intensity ratio in relation to capital expenditures. It determines the ratio of capital expenditures to GDP growth ( $m = I/\Delta Y$ ). The second capital intensity factor, on the other hand, refers to the growth of income measures ( $O$ ). It is defined by M. Kalecki as the ratio of the growth of these measures to the growth of GDP ( $\mu = O/\Delta Y$ ). A different methodology was adopted by K. Laski. In his revised model, capital intensity appears, which is defined as the ratio of capital to productive capacity. In K. Laski's considerations, capital intensity understood in this way appears as a factor that corrects the impact of maximum production capacity ( $Y^*$ ) on the value of  $Y$  in the context of gross private investment. However, in my research I adopt the capital intensity ratio in the sense of M. Kalecki. This is primarily because this coefficient, so understood, can be used to interpret the model in the context of national income distribution from the perspective of propensity to save ( $sp$ ).

The third problem area concerns the organizational improvement factor ( $u$ ). In Kaleckian economics it is related to the degree of utilization of the productive apparatus. The  $u$ -factor was related only to improvements in the organization of work and progressive savings in raw materials, which were expected to have a direct effect on increasing productivity, in relation to existing fixed capital. It should be added that this is a coefficient of technological improvement, which, however, does not depend on investment. From this it follows that it is significantly determined by the organizational factors of the manufacturing process within the company's boundaries. In my research I adopt the following interpretation of these relationships. The utilization rate of the manufacturing apparatus ( $w$ ) is determined by the total demand factor, while the organizational improvement rate ( $u$ ) is influenced by organizational factors. Additionally, it should be noted - which was identified at the stage of comparative analysis of two models based here

- that in K. Laski's model the second factor was completely omitted. In my research, I found this to be the wrong approach. Thus, in my analyzes I adopted M. Kalecki's interpretation.

### 3. Comparison of the model of M. Kalecki and K. Laski

#### *Verification of M. Kalecki's model*

The starting point in M. Kalecki's deliberations is the determination of the size of national income in a closed economy. It is the sum of private investment, working capital growth and sales ( $Y = I + O + S$ ). In contrast, the sum of the first two values represents the value of productive accumulation ( $A = I + O$ ). In the next step, the capital intensity coefficient was introduced for private investment ( $\Delta Y = (1/m)I$ ) and for the size of current assets ( $(\Delta Y = (1/\mu)O$ ). The capital intensity factor for all capital ( $k$ ) was defined by M. Kalecki as their sum. In addition, the relation  $i = (I + O)/Y$  is introduced, which is defined as the rate of productive accumulation and the index  $a$  defined as the depreciation coefficient. Having carried out appropriate transformations, M. Kalecki derived the final form of the model of the dynamics of economic growth.

$$r = \frac{1}{k}i - \frac{m}{k}(a - u) \quad (1)$$

In my research, I proposed a verification of this model in terms of two problem areas. First, following K. Laski, I introduced the coefficient for the degree of capacity utilization ( $w$ ). I related it to the value of productive accumulation ( $I + O$ ). The rationale for this procedure is as follows. In capitalist economies, the real volume of production is less than the maximum production capacity due to the determinism of total demand in the economy. Thus, the accumulation of production defined by M. Kalecki is here considered as the maximum capacity of production. This can be written as the equation  $Y = w(I + O) + S$ , where there is a relationship  $0 < w \leq 1$ . It follows that capacity utilization rate is the ratio of total demand to maximum capacity. On the other hand, from this the relationship  $I + O \geq Y$ .

The second area where I proposed some verification concerns the coefficient of technological improvements independent of capital expenditure ( $u$ ). In a sense, this verification also concerns the capacity utilization rate. Nowadays it is recognized that companies operate under the influence of many factors that determine, inter alia, their productivity. Total demand is also one of them. However, the way in which business processes are organized within a company, the way it operates, is nowadays becoming an extremely important factor influencing the way the company functions. Moreover, regardless of the level of total demand in the economy, different firms, in different ways implement their strategic plans, which may indicate imperfect organizational efficiency. This in turn differentiates the said level of capacity utilization. It is worth embedding these facts in institutional economics that how a firm is organized and how that organization operates is the result of holistic institutional determinism. In this context, I have verified the meaning of the  $u$ -factor. I introduced the symbol  $u^i$  into M. Kalecki's model. It is a coefficient that measures the degree of organizational and production improvements that do not require capital expenditures but are influenced by institutional determinism.

I introduced the two modifications presented in the process of deriving the economic growth model. I verified the production effect and adjusted the national income with the coefficient  $u^i$ . That's how I got the relationship:

$$\Delta Y = \frac{1}{m}wI - aY + u^iY \quad (2)$$

$$0 < u^i \leq 1$$

By performing further transformations, I obtained the following form of the economic growth model.

$$r = \frac{\Delta Y}{Y} = \frac{1}{m} \frac{wI}{Y} - a + u^i \quad (3)$$

It should be added that the volume of the increase in current assets  $O$  together with the value  $I$  forms the total productive capacity in the economy, so it is also influenced by the factor  $w$ . So I introduced dependencies:

$$wO = \mu\Delta Y \quad (4)$$

$$\Delta Y = \frac{wO}{\mu}$$

Transforming equation 3 I obtained the relation:

$$\frac{wI}{Y} = m(r + a - u^i) \quad (5)$$

Dividing each side from equation 4 by  $Y$ , I got:

$$\frac{wO}{Y} = \mu \frac{\Delta Y}{Y} = \mu r \quad (6)$$

Adding formulas 5 and 6 together, I got:

$$\frac{w(I + O)}{Y} = r(m + \mu) + m(a - u^i) \quad (7)$$

From this formula, I could already derive the formula for the rate of economic growth.

$$r = \frac{1}{m + \mu} \frac{w(I + O)}{Y} - \frac{m}{m + \mu} (a - u^i) \quad (8)$$

Assuming M. Kalecki's assumptions that  $k = m + \mu$  and the rate of productive accumulation is  $i' = w(I + O)/Y$ , we obtain the final formula for determining the rate of economic growth.

$$r = \frac{1}{k} i' - \frac{m}{k} (a - u^i) \quad (9)$$

The verification of M. Kalecki's baseline model presented here revealed the effect of the level of capacity utilization, determined by total demand in the economy, on the rate of economic growth  $i' = w(I + O)/Y$ . In addition, institutional determinism, which mainly shapes the level and quality of organizational-production within the boundaries of firms ( $u^i$ ), is written into the model.

*Verification of K. Laski's model*

K. Laski in his considerations starts from a different assumption. It refers to the degree of capacity utilization. It assumes the existence of maximum production capacity in capitalist economies ( $Y^*$ ), which is adjusted by the index ( $w$ ). In such a way that  $Y = wY^*$ . The change in real GDP thus takes the form  $\Delta Y = w\Delta Y^* + Y^*\Delta w$ . In turn, the level of gross private investment that will shape the new level of capacity was defined as  $IP = k\Delta Y^* + akY^*$ . This is where the depreciation factor ( $a$ ) and capital intensity ( $k$ ) come in. However, it is defined by K. Laski as a constant technological ratio of capital to production capacity. Assuming that  $Y^*/Y = 1/w$  and  $IP/Y = SP/Y = sp^2$  after performing the appropriate transformations, the final growth model is revealed.

$$r = \frac{sp}{k/w} - a + \frac{\Delta w}{w} \quad (10)$$

I changed K. Laski's model of economic growth only in one of the problem areas. It refers to the coefficient of technological improvement independent of the capital expenditure ( $u$ ). This revision is as justified as before. I replaced the coefficient  $u$  with the coefficient  $u^i$ . Again, this is a coefficient on the degree of organizational and production improvements that do not require capital expenditures, but are influenced by institutional determinism. Maintaining the logic of K. Laski's argument, I started from an assumption:

$$Y = wu^iY^* \quad (11)$$

$$0 < u^i \leq 1 \text{ and } 0 < w \leq 1$$

It follows from this provision that the real volume of gross domestic product will be derived from the level of maximum production capacity present in the economy, adjusted by the rate of its utilization. However, they are further adjusted by a coefficient determining the degree of organizational and production improvements ( $u^i$ ). On this basis, I derived a formula revealing the level of change in the size of GDP over time:

$$\Delta Y = wu^i\Delta Y^* + u^iY^*\Delta w + wY^*\Delta u^i \quad (12)$$

Further transformations already coincide with those performed by K. Laski. Making new assumptions, equation (12) took the form:

$$\Delta Y = wu^i\frac{IP}{k} - wu^iaY^* + u^iY^*\Delta w + wY^*\Delta u^i \quad (13)$$

Dividing this expression by  $Y$ , I obtained:

$$\frac{\Delta Y}{Y} = wu^i\frac{1}{k}\frac{IP}{Y} - wu^ia\frac{Y^*}{Y} + u^i\Delta w\frac{Y^*}{Y} + w\Delta u^i\frac{Y^*}{Y} \quad (14)$$

Adopting the assumptions used to derive equation (10), I got a new form of the economic growth dynamics formula.

$$r = \frac{sp}{k/wu^i} - au^i + \frac{\Delta w}{w}u^i + \Delta u^i \quad (15)$$

This equation differs from M. Kalecki's equation in that capital intensity is further adjusted by a factor  $w$ . It should be stressed that we are dealing here with capital intensity and not with capital intensity ratios. In addition, my proposed verification results in a

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<sup>2</sup> A certain assumption is revealed in this record. This applies to the relationship between IP and SP.

significant impact on the final value of  $r$  also by the coefficient of organizational and production improvements ( $u^i$ ).

#### 4. Kalecki-Laski model of economic growth

Previous analyses have allowed me to compare the two growth models reviewed. Final methodological assumptions will still be needed. I have assumed that the sum of M. Kalecki's productive accumulation is equal to K. Laski's gross private investment ( $IP = I + O$ ). Again here I have used the rate of productive accumulation ( $i' = w(I + O)/Y$ ). This allowed me to write equation (9) in the form:

$$r = w \frac{1}{k} \frac{IP}{Y} - \frac{m}{k} (a - u^i) \quad (16)$$

In order to finally transform equation (15) I again used M. Kalecki's assumption  $IP/Y = SP/Y = sp$ . In this way I obtained:

$$r = u^i w \frac{1}{k} \frac{IP}{Y} - au^i + \frac{\Delta w}{w} u^i + \Delta u^i \quad (17)$$

These models should not be analyzed in isolation. Each of them has its own specificity and they have common elements. Therefore, I propose it take the name of the Kalecki-Laski model of economic growth. Their proposed revision unified the interpretation of  $w$  and  $u^i$  indices. The first form of the model allows us to distinguish the capital intensity ratio with respect to capital expenditures and working capital growth. In turn, the second form of the model emphasizes the importance of the coefficient of organizational and production improvements ( $u^i$ ) and the degree of capacity utilization ( $w$ ).

#### 5. Conclusions

Based on my research and the justifications provided, I have drawn some key conclusions. It has been found that organizational improvement rate is one of the most important determinants of economic development. Thus, omitting it is unjustified. The attempt to embed the model in institutional determinism will allow for some modification of this coefficient. I proposed to introduce in its place an organizational excellence coefficient ( $u^i$ ), influenced by institutional determinism. It is defined as a coefficient that determines the degree of organizational and production improvements that do not require capital expenditures but are influenced by institutional determinism. This coefficient gained additional significance in the second form of the Kalecki-Laski model. The second important factor is the capacity utilization rate. It was also very clearly emphasized in the second form of the model. This can be seen especially in the expression  $(\Delta w/w) u^i$ .

The proposed Kalecki-Laski model of economic growth sorted out the individual indicators adjusting to the last level of GDP dynamics. The introduced coefficient of organizational excellence  $u^i$  remains in agreement with M. Kalecki's model, while not denying the existence of K. Laski's degree of capacity utilization. The three coefficients presented here are characterized by different sources of determinism. The capital intensity ratio with respect to total capital  $k$  is influenced by technological factors. The degree of

utilization of maximum capacity  $w$  is determined by the total demand in the economy. The organizational excellence coefficient  $u^i$ , on the other hand, refers to the institutional determinism affecting how firms are organized.

The research presented here allows one more conclusion to be drawn. This relates to the structure of investment in the economy. It finds its justification in the second form of the Kalecki-Laski model (17). The first type is productive investment. Their direct effect is contained in the equation that determines the rate of utilization of maximum capacity  $w = Y/Y^*$ . It follows from this notation that productive investment can result in either a change in actual output  $\Delta Y$ , or an increase in maximum capacity  $\Delta Y^*$ . The second type of investment realized in the economy directly affects the change in the level of capital intensity  $\Delta k$ . This type of investment relates to the technological factors that determine the level of capital needed to produce goods in an economy. I have proposed here the name of efficiency investments, which will have the final aim of reducing the capital intensity ratio of production. The third type of investment in the economy concerns changes in the organizational excellence index ( $\Delta u^i$ ), which is influenced by dynamic institutional determinism. These will be optimization investments. Their task is to create favorable conditions for the functioning of the economy. This type of investment, in the main, is carried out by the state as part of a broad economic policy. Thus, one can relate optimization investments to government investments.

The research presented here allowed us to confirm the hypothesis. According to it, the rate of economic growth depends jointly on the degree of utilization of maximum production capacity, the level of capital intensity ratio with respect to total capital, and the degree of organizational and production excellence. These three quantities have a corrective function for the most important element of economic growth, which is gross private investment. The derived Kalecki-Laski model of economic growth and its interpretation seem to justify such a claim.