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THE MULTIPLIER ACCELERATOR THEORY IN THE STUDY OF MUNICIPAL-LEVEL INVESTMENT

In our research we specially adapted the multiplier accelerator approach for analysis of investment processes on the municipal level. We analyzed the databases of municipalities of the Bashkortostan Republic and found a one-year lag and ratchet effects in the development of investment processes, which manifested themselves through steady rates of growth in the volumes of shipped goods and services in these areas while the amount of investment was declining. Excessively high values of the investment accelerator in certain municipalities were explained, on the one hand, by the insignificant changes in the economic performance of these municipalities and, on the other hand, by the inflow of capital, which was not related to the incentive function of return from the previous investment. The main causes of the disincentive function include the low investment attractiveness of the territories; the poorly developed environment for investment stimulation; the inefficiency of the investment itself; and its short-term character.

Our approach combines the multiplier accelerator theory with the concept of efficient management of investment in socio-economic systems of various levels and thus it has enabled us to develop a matrix for diagnostics of investment processes by calculating investment efficiency (with the help of the investment multiplier) and the focus of the investment process (with the help of the investment accelerator). Upon these results we have mapped municipalities according to their levels of investment development and proposed a differentiated approach to managerial decision-making.

These findings can be used to study investment attractiveness on the municipal level and to develop guidelines for assessment of investment attractiveness and for managerial decision-making to enhance investment efficiency.

Keywords: investment processes, multiplier accelerator, investment attractiveness, municipalities, economic growth

Assumptions and constraints

Due to the scarcity of data on investment processes in municipalities we made the following assumptions:

1) the amount of investment realized in a municipality was taken as the amount of investment into the main capital with the deflator index adjustments;

2) to estimate the economic performance of municipalities we used as an indicator the volume of shipped goods of domestic production and the volume of works and services provided by using the territory's own resources (hence referred to as the output). We also took into consideration the sectoral structure of production in municipalities with the corresponding deflator index adjustments.

The theoretical framework for our analysis of investment processes in Bashkir municipalities was provided by the following:

firstly, the multiplier-accelerator theory, which synthesized approaches proposed by John Maynard Keynes and Albert Aftalion and further developed by such international and Russian researchers as J.-L. Bailly [1], H.-U. Brautzsch, J. Günther, B. Loose, U. Ludwig, N. Nulsch [2], S. Cristian, M. Marius-Corneliu, S. Aura-Gabriela, M. Dorin [3], B. Domański, K. Gwosdz [4], M. Dupaigne, P. Fève [5], L. A. Kormishkina, E. D. Kormishkin, D. A. Koloskov [6], R. Lee [7], W. J. Ma [8], G. V. Moura [9], S. Ogibayashi, K. Takashima [10], T. Ovsianikova, O. Rabtsevich, I. Yugova [11], G. Quaa [12], E. C. Urdiales, J. L. Gallardo [13], D. J. Zhao, and X. F. Gao [14]. This theory was originally designed for the national and regional level but it can be adjusted for the municipal level, too;

secondly, the concept of investment management in socio-economic systems, based on the theories of added values and capital reproduction [15].

Application of the multiplier theory for analysis of investment processes on the municipal level

Application of the multiplier-accelerator theory enables us to identify trends of development of socio-economic systems on any levels. The start of a business cycle in the spiral of investment processes is accompanied by the multiplier effect. Investment creates added value and ensures the growth of the economy's wealth, which, in its turn, encourages the inflow of induced investment while maintaining the propensity to save and the productivity of capital in the structural of the economy. The absence of autonomous investment (independent of the previously earned revenue) stimulates the decrease in the marginal propensity to save and leads to further investment reduction. Thus, the whole investment process slows down, which is accompanied by an economic downturn. The transition to the next loop of the spiral that pushes the economy out of the crisis is possible only if there is autonomous investment available.

Considering the model of John Maynard Keynes in the context of the law of growing needs, we can conclude that investment plays the pivotal role in progressive economic growth. Development of needs causes an increase in the customer demand, which is directly dependent on people's aggregate income and the distribution of customer preferences. Studies of customer behaviour show that people tend to cut their spending due to certain subjective factors. In this case, investment can be considered as a compensating mechanism which determines, on the one hand, the generation of aggregate demand and, on the other hand, the reproduction of capital through its accumulation and redistribution.

Realized investment triggers the following chain of transformations: investment – expansion of production capacity – production growth – increase in revenue – increase in consumption – new investment. This re-starts the investment spiral, which reflects the cyclical nature of economic development.

The role of investment as a catalyst of economic development is determined and complemented by a number of factors: the taxation system, the structure of economy, international business connections, interregional and intermunicipal relations, migration flows, and so on. Nevertheless, even if we focus only on the connection between the dynamics of investment and the economic growth, it will provide us with sufficient data for analysis. For instance, in recession periods, the amount of investment is reduced, which means that by applying the investment multiplier we can identify the signs of the future slowdown of investment processes at an early stage and launch the mechanisms of state regulation to prevent unbalanced changes in the economic structure.

The application of the investment multiplier to analyze the data on Bashkortostan brings to light the unstable dynamics in its regional economy. The period between 2010 and 2013 was characterized by an increase in the multiplier effect of investment, followed by a significant setback in 2014.

Our analysis of multiplier effects proves the fact of economic growth in the region: investment boosted the economic growth and stimulated generation of added value.

We analyzed databases of Bashkortostan to study multiplier effects of investment and found that in modern conditions there was a lag between the dynamics of economic growth (in our case the GRP) and the dynamics of investment. We estimated the investment multiplier's sensitivity to the changes in the time lag and found that the lag that maximized investment in the GRP growth was one year.

The sharp decline in the multiplier in 2014 resulted from the economic recession and the drop in production in certain sectors of the regional economy. Bashkortostan was preparing to host the SCO and BRICS summits in 2015, which attracted a substantial amount of state investment. This investment enabled the region to cope with the impact of the financial recession, drastic currency changes, and surging inflation. At the same time such dramatic decline should be seen as an indicator of economic recession, which the Republic felt most strongly at the end of 2015 and the beginning of 2016. If the existing conditions and parameters of investment processes persist, we should be expecting a further decline in multiplier effects of investment. On the one hand, this trend is linked to macroeconomic factors and, on the other hand, to the structure of investment, that is, the significant reduction in long- and medium-term investment and the shift in investment priorities to the service industry. This situation causes a decrease in investment in the real sector, which will constrain the growth of added value because the service industry only contributes to the redistribution of the generated added value while the stable economic growth primarily depends on the real sector.

As the investment multiplier is linked to consumption patterns and the propensity to save, we analyzed the expenditures and savings of the regional population. As a result, we have found that the dynamics of the expenditures structure corresponded to the above-described trend of the investment multiplier. The share of grocery spending and the spending on eating out rose in inverse proportion to the dynamics of the investment multiplier: from 27.6% in 2013 to 30.6% in 2014. The consumer spending until 2014 grew by 5.1% while the income declined by the same percentage in 2015 in comparison with 2014, which reveals a steady downward trend in the investment multiplier.

Provided that municipalities in Bashkortostan differ significantly in their socio-economic development, we will now analyze investment multipliers in the context of municipalities.

According to the Keynesian approach, there is a direct correlation between the performance of a socio-economic system and investment. This correlation can be quantitatively estimated on the basis of the investment multiplier. Any changes in the amount of investment trigger changes in the economic growth. Since the information base on the municipal level is limited, we have adapted the Keynesian multiplier to analyze investment processes in the region.

Therefore, the investment multiplier looks the following way:

$$K = \frac{\Delta Y}{\Delta IC}$$

where ΔY is the change in the output with consideration of the sectoral structure of production in municipalities and the corresponding deflator index adjustments (we are focusing on the sectors that contribute to the overall output of municipal economy);

ΔIC is the change in the investment amount with the deflator index adjustments. The index was determined in accordance with the Guidelines for Calculation of Deflator Indices of Physical Volume of Investment in the Main Capital, approved by the Federal State Statistics Service (PФ 25.12.2013 № 38-У).

Our study has found that there are significant disparities between the development of territories within the Republic. We analyzed the data on 54 administrative districts, 21 towns, and 2 urban-type settlements. In the given period, 37 municipalities were characterized by positive values of the investment multiplier, which accounted for 48% of the total number of municipalities (Fig.1).

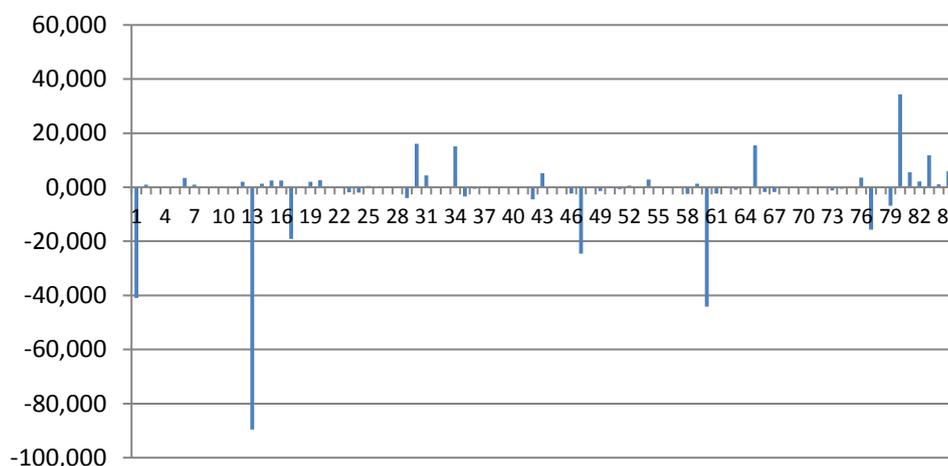


Fig. 1. Values of the investment multiplier, according to the data on municipalities in Bashkortostan

In 19 municipalities out of 77, the growth of investment was accompanied by a multiple reduction in the output. The highest indicators were recorded in settlement Priyutovo: the investment growth by one rouble was accompanied by a reduction in the output by over 89 roubles. In Salavat region, the investment multiplier was -44.160 and in Abzelilovsky region, -40.938. These negative values of the investment multiplier demonstrate that the investment was used extremely inefficiently. Taking into account the timelines of investment projects and their distribution among municipalities, it can be concluded that the long-term character of certain investments (less than 5% from the total amount of investment in the region) does not explain the negative dynamics. Low values of the investment multiplier in municipalities that have a relatively

high level of socio-economic development show that these territories are running out of resources for growth in their traditional spheres, which means that they should be looking for new spheres for investment and ways of stimulating investment processes.

It should be noted that in certain municipalities the investment multiplier reveals a high elasticity of output with respect to the volume of investment. Such municipalities as Agidel (34.369), Davlekanovo (16.041), and Oktyabrsky (11.756) significantly exceeded the average regional values of the investment multiplier. The positive trend, however, is that the Republic has managed to sustain a steady growth in output despite the decline in investment in some municipalities. We believe that this trend is caused by ratchet effects in the development of investment processes. These effects are, on the hand, determined by the choice of highly profitable spheres for investment and, on the other hand, by the synergistically connected effects that result from the systemic character of investment implementation.

Nevertheless, the sharp fluctuations of the investment multiplier in specific periods do not indicate the efficiency of investment since one of the reasons for significant changes might be a zero base for comparison. We did not take into consideration the results for those municipalities that had a base for comparison that was close to zero in terms of output as well as the amount of investment.

To reveal other effects in municipal-level investment processes in Bashkortostan, we analyzed the ratio of output growth rates (taking into account the sectoral structure of production in municipalities) to the investment in the main capital. Our analysis has shown that self-supporting, that is, non-subsidized municipalities actively invest in the development of their territories while low-income municipalities such as Ermekeevo rely on governmental subsidies. Only in 35 municipalities (including municipal districts and areas) the output growth rates exceed the rates of investment growth: in Kaltasy, Kuyurgazinsky, and Salavat municipalities, more than twice. In Kaltasy and Kuyurazinsky municipalities, such dynamics is associated with a slight increase in investment while in the city of Salavat such figures are indicative of high investment efficiency. It should be noted that a significant role in these trends is played by the sectoral structure of municipal economy.

The centre of the Republic enjoys a high level of socio-economic development due to the concentration of the territorial resource potential, accumulation of financial flows, and the inflow of the qualified workforce from other parts of Bashkortostan.

The southern part is also quite prosperous because the majority of petroleum refineries, chemical and petrochemical factories have been relocated there: the salary level is generally higher than in the rest of the region while the production development positively affects the service sphere and the educational system, thus providing higher standards of living. At the same time this part faces a number of environmental safety issues caused by the high concentration of industrial production.

In the west of Bashkortostan, the balanced distribution of industrial enterprises determines the balanced distribution of the population, infrastructure, and so on. This part of the region borders with Tatarstan, which creates an ambivalent effect: on the one hand, there is an outflow of the qualified workforce and, on the other hand, the interregional cooperation contributes to progressive development of socio-economic relations.

The economic performance of the north-western part primarily relies on specific enterprises as growth points. As for the infrastructure and the level of institutional development, this part of Bashkortostan lags far behind the centre.

The Ural region is one of the least developed in terms of industry. It mainly relies on raw material production (logging and gemstone mining) and on primary processing (extraction of concentrates of non-ferrous metal ores and wood processing). The processing industry develops only in certain locations and its contribution to the socio-economic development of the region is considerably lower than that of extractive industries. Further processing is done outside Ural and the export of materials has a negative impact on the growth of added value and the GRP.

The north-eastern part of the Republic is poorly developed both economically and socially due to its limited sectoral structure. The growth of the agricultural sector is impeded by the climatic conditions while the lack of large industrial enterprises causes migration of the economically active population to other regions or outside Bashkortostan.

The northern region also has a limited sectoral structure with the oil and timber industry playing the main role. The socio-economic development of this region is much lower than the average rates in the Republic.

Application of the accelerator theory for analysis of investment processes on the municipal level

The cyclical development of economic processes creates a close connection between investment and the performance of a socio-economic system on any level. This connection manifests itself not only through the impact of investment on economic outcomes but also vice versa: the impact of economic outcomes on investment.

To study this relationship on the municipal level we have applied the accelerator theory based on calculating the accelerator coefficient as the ratio of an increase in investment to the resultant increment in income.

Analysis of accelerator effects shows that economic growth causes an increase in future investment. We are also able to estimate the indirect investment attractiveness of certain socio-economic systems. Taking into consideration the above-described factors, the municipal-level investment accelerator will be defined here as the ratio of this year's amount of investment to the last year's growth in the output. Steady economic growth of municipalities results in significant investment growth, since an increment in income encourages a rise in the marginal propensity to invest while the growing return on investment stimulates the inflow of investment from external sources.

Our analysis of accelerator effects in Bashkortostan reveals the growth in the incentive effect of the GRP at the end of 2014. Such dynamics can be explained by the region's preparation for the SCO and BRICS summits in 2015. The growth in the region's investment attractiveness also significantly contributed to the accelerator effect.

The comparative analysis of multiplier and accelerator effects, however, reveals the signs of economic recession such as the slowdown in the rates of industrial production, the decline in the investment growth, the rising rates of unemployment; and the falling income and living standards.

The analysis of the investment accelerator has demonstrated that there are significant discrepancies between municipalities. The expected values of the indicator illustrated by the diagram show polarization in the development of investment processes in municipalities.

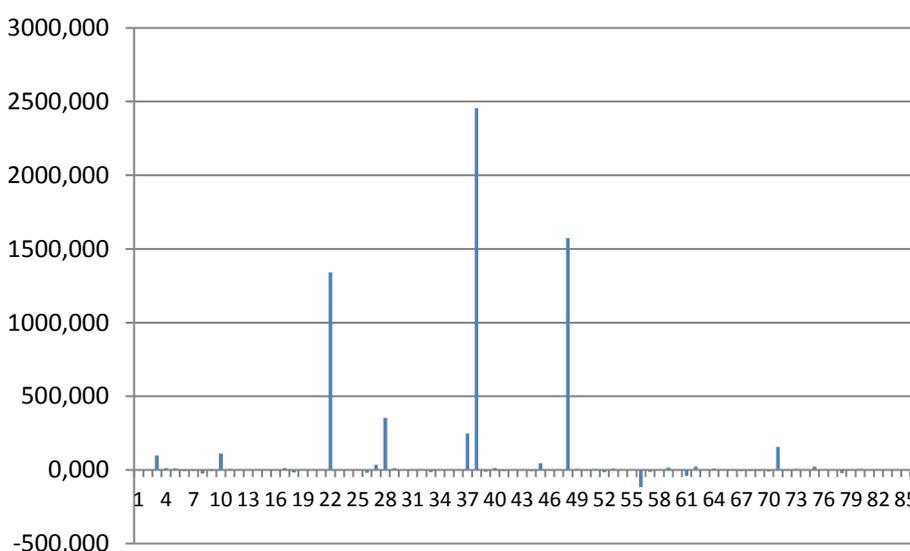


Fig. 2. Values of the investment accelerator, according to the data on municipalities in Bashkortostan

Our comparative analysis of the investment accelerator and output dynamics has shown that the excessively high values of the investment accelerator in specific municipalities (for example, Zianchurinsky or Blagovarsky) are caused, on the one hand, by slight changes in the economic output of municipalities and,

on the other hand, by the inflow of capital that was not connected to the incentive return on the previous investment.

In certain municipalities (for example, Mechetlinsky and Sterlibashevo), the investment accelerator acquired negative values, which means that the economic performance of these territories destabilized the capital inflow. The main reasons were, on the one hand, the low investment attractiveness of these areas and the poorly developed environment for stimulation of investment and, on the other hand, the inefficiency of investment and its short-term character. Implementation of long-term projects capable of enhancing the investment potential lacks consistency, which reduces their overall effect on the region's performance.

As for the sources of investment, private investment prevails (78.8%). State and regional investment is in decline while the share of municipal investment is so small that, even if there was a steady upward trend, it would not be sufficient to develop a new system of financial support for municipal territories, which requires a thorough revision of the mechanisms of investment support.

The accelerator effects in the development of investment processes in urban districts of Bashkortostan demonstrate unstable dynamics and low growth rates, which means that investment processes are developing inefficiently, which impedes formation of attractive investment environment.

Diagnostics of investment processes based on the multiplier and accelerator theory

We combined the multiplier accelerator theory with the concept of efficient management of investment in socio-economic systems of various levels, in particular, the spiral model of investment processes. This combination has provided us with a comprehensive tool for analysis, which comprises the matrix for diagnostics of an investment process (based on the investment multiplier) and the focus of investment (based on the investment accelerator).

A cycle of an investment process goes through the following stages: crisis (downturn), recession (stagnation), revival and boom (growth). A crisis implies a decline both in the amount of investment and its efficiency. In the recession (stagnation) period, investment market is depressed and sluggish and so is the sphere of autonomous and induced investment. The revival period manifests itself through the rise in the effective demand on the investment market and in the rising growth rates of autonomous investment. The increase in autonomous investment through the multiplier effect starts the investment spiral, which results in the increase in the amount of induced investment. Thus, the matrix for diagnostics of investment processes can be as follows:

Table 1.

**Matrix for diagnostics of investment processes based on the
multiplier accelerator framework**

Accelerator of investment Investment multiplier	Positive value, grows	Negative value, falls
Positive value, grows	revival of investment processes, growth	expansion of the investment spiral, revival
Negative value, falls	investment spiral narrows, crisis	slowdown in investment processes, recession.

Overall, the investment development in Bashkortostan is now on the rise, although the investment multiplier is showing a steady downward trend, which can be seen as a sign of imminent crisis in the investment sphere resulting from the joint effect of diverse but interconnected investment processes in various municipalities. If we look at the indicative figures, we can conclude that in Bashkortostan the stage of growth is almost over, which means that investment activity is likely to subside. The length of recession will depend on the efficiency of the regulating measures.

This conclusion is supported by our findings (see Fig.3): for example, 37.3% of the municipalities in the region are facing investment crises due to the slowdown in the rates of investment growth, decline in investment return, and the incentive function being replaced by the restrictive ('wait-and-see') function. Almost every tenth municipality (9.4%) faces a slowdown in investment, which creates depression in the

socio-economic sphere. At the same time in 40% of municipalities in the given period we found revival of investment processes, accompanied by the expanding investment spiral and the surge in investment.

The map that reflects distribution of municipalities according to their stages of investment development shows that there are several groups of territories with similar characteristics. For example, Ufa agglomeration can be seen as a zone which is experiencing a downturn in its investment development, caused not only by the shift of priorities towards urban-type settlements but also by the falling investment efficiency.

Similar trends are found in Sterlitamak (southern Bashkortostan) agglomeration. It should also be noted that in separate spots investment processes are now undergoing revival (for example, Sterlitamak and Meleuz) or growth (Salavat and Ishimbay).

When the town of Kumertau gained the status of an advanced development zone, it positively affected not only the territory itself but also the neighbouring municipalities.

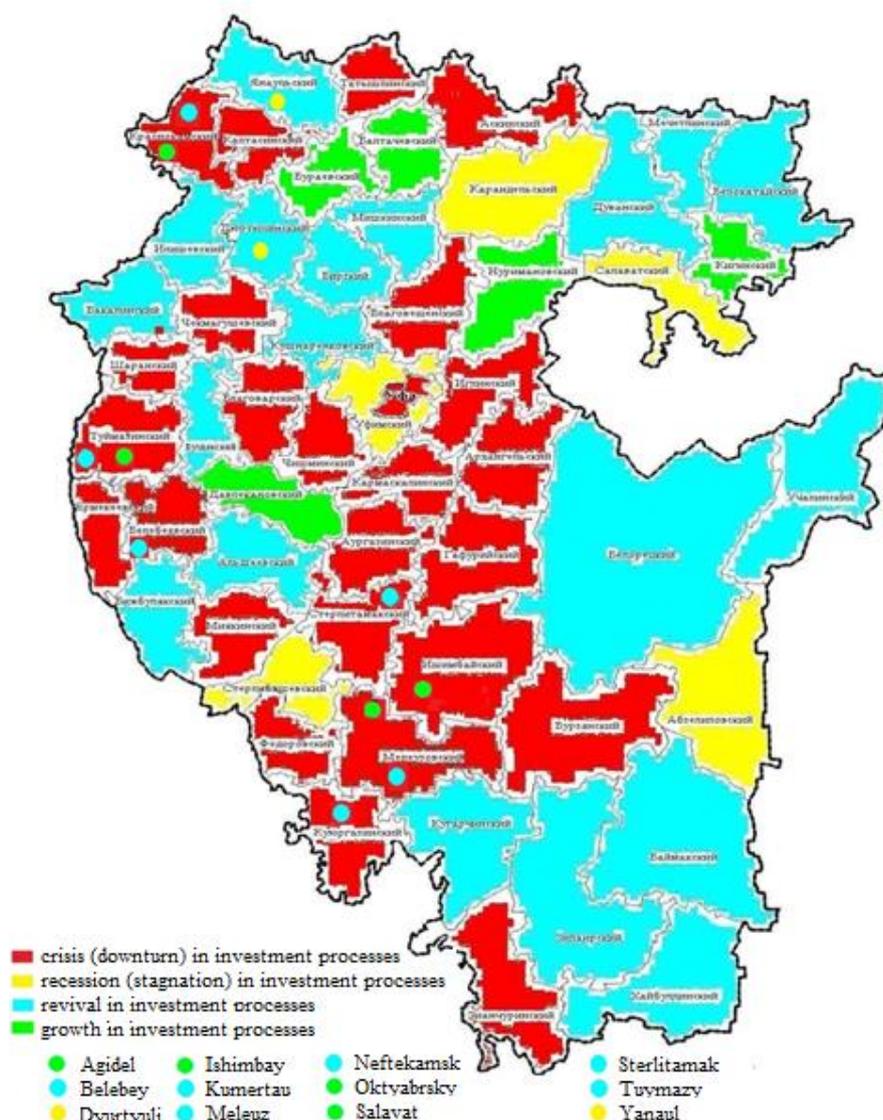


Fig. 3. Map of municipalities in Bashkortostan and their stages of investment development.

Conclusion

Within the proposed approach we estimated multiplier accelerator effects, conducted matrix analysis and mapped municipalities according to their stages of investment development. The research tool described in this article can be applied for further research in this sphere as well as for regional strategic planning and managerial decision-making to enhance investment attractiveness of the territory.

The multiplier effect results from efficient autonomous investment but it takes some time before this effect manifests itself. The multiplier effect triggers accelerator effects, which explain both the expansion and contraction of the investment spiral. Accelerator effects are not based on the principle of accumulation and subsidence in the course of time. Therefore, it is important to identify the stage of development in the investment process so that the local administration should take adequate decisions addressing the challenges of the current situation. For example, when the development is particularly intensive, it is recommended to minimize regulation while at the end of the growth stage the government should regulate the investment process and apply preventive measures to mitigate the crisis and accelerate the recovery. At the stage of recession (slowdown), the regulating function of the government should be supplemented with measures to create favourable environment for investment and to stimulate the investment that 'triggers' the new curve of the investment spiral. Such differentiated approach to managerial decision-making will enable the government to use the resources more efficiently and to ensure the flexibility of the system for investment control on the municipal level.

The practical value of this study is that the proposed approach can be used to diagnose investment processes on the municipal level by applying the matrix tools and identifying trends in the municipal economy and by developing effective investment policy on the municipal and regional levels to compensate for the limited budget funding.

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