ASSESSING THE SCALE OF AND FINANCIAL REASONS BEHIND DIFFERENCES IN THE LOCAL GOVERNMENT UNITS’ INVESTMENT EXPENDITURES IN THE CONTEXT OF REDUCING DISPARITIES IN SOCIO-ECONOMIC DEVELOPMENT

Aldona Standar
Poznań University of Life Sciences
Faculty of Economics and Social Sciences
Department of Economics and Economic Policies for the Agribusiness
ul. Wojska Polskiego 28
Poznań, Poland
e-mail: standar@up.poznan.pl

Abstract

The main purpose of this paper is to assess the scale of and financial reasons behind differences in the local government units’ investment expenditures in the context of reducing disparities in socio-economic development. The study was conducted in three parts. The first part consisted in presenting the development and structure of investment expenditure. To do so, selected methods of descriptive statistics were used. In the second part, a synthetic indicator of municipalities’ development was developed. Also, an analysis of variance was performed to check whether the municipalities’ development level affects the investment level. In the third part, a multiple regression model was created to explain the financial determinants of investment levels. The analyses found that the levels of investment expenditure incurred by the municipalities were subject to variations. The differences in the cumulated values of investments proved to be statistically significant considering the development levels of local government units under consideration. A directly proportional relationship was discovered. The level of investment expenditure was positively impacted by the municipality’s own potential expressed as the level of own incomes and the operating
surplus. Conversely, financial liquidity and indebtedness were found to be significant factors with a negative effect.

**Keywords:** regression analysis, convergence, local government, investment expenditure, sources of investment

**JEL classification:** H70, H71, H72

### 1 Introduction

Development means positive quantitative and qualitative changes which consist in leveraging available regional resources to improve the region's welfare and support the aims of equality (Bocian, 2007; Capello & Nijkamp, 2009). To make it happen, the responsible entity must incur investment expenditure. In Poland, that entity is the local government, primarily including the municipalities. The municipality is the basic, lowest level of local government. The municipal government has legal personality, owns assets and has the capacity to collect incomes allocated to ongoing activities and investments (Article 164 of the Constitution of the Republic of Poland; Articles 2, 43, 51, 54 of the Municipal Government Act). The authority of the Polish municipality extends to: technical and social infrastructure, environmental protection and spatial order (Article 7 of the Municipal Government Act). However, such investments require considerable financial expenditure because of the capital-intensive nature of most projects (e.g. construction of roads or schools). Also, it is often difficult to estimate the outcomes or even the payback period of specific measures (Kozłowski, 2012, p. 15). As a consequence, municipalities do not rely solely on their own investment sources; additionally, they use external financing which primarily includes nonrefundable grants from the EU and repayable instruments (loans and bonds).

Over the recent years, Poland has undergone considerable changes, also thanks to EU support. However, the development level of nearly all of its regions is still so low that they continue to be eligible for aid under the first objective of the Cohesion Policy (https://europa.eu/european-union/topics/regional-policy_pl). Note that Poland also demonstrates significant intra-regional disparities, especially at the municipality level (Standar & Puślecki, 2011). Differences between local government units are a natural and obvious phenomenon; the problem is the scale and trends of differences rather than the differences themselves. For many years, the issue of disparities, their reasons and consequences has been of particular interest for scientists around the world (Capello & Nijkamp, 2009; Dawkins, 2012). This could be illustrated by the examples of such authors as Sala-i-Martin (2003),
Derviş (2012) or Dervish (2012). As noted by Afonasova (2017), the term “convergence” is used most often in describing integration processes.

Of all types of municipalities, rural ones demonstrate the highest differentiation of development levels. On the one hand, there is a large infrastructural gap resulting from past developments and many years of neglect (Standar & Bartkowiak-Bakun, 2014). On the other hand, the reasons for the disparities are the evolving functions of rural areas. Currently, many municipalities transform from rural areas into bedroom communities for the population of nearby cities, into logistic and production facilities for industrial centers, or into tourist centers. They become quasi-cities (Spellerberg et al. 2007). This is how they access additional budget incomes which may be allocated to development, unlike small rural units which, in addition to their low incomes, are only supported by the state which encourages them with increased transfers from the central budget.

The main purpose of this paper is to assess the scale of and financial reasons behind differences in the local government units’ investment expenditures in the context of reducing disparities in socio-economic development.

2 Data and methods

The study period extended from 2007 to 2015. One of the Poland’s regions, Wielkopolska, was used as the example. With an area of 29,826.50 sq. km and a population of 3.47 million, Wielkopolskie is the country’s second and third largest voivodeship, respectively. It comprises of 226 municipalities, including 4 urban districts, 19 urban municipalities, 91 urban-rural municipalities and 116 rural municipalities (Local Data Bank of the Central Statistical Office). This analysis covered a group of 116 rural local government units. The study was conducted in three parts. The first part consisted in presenting the development of investment expenditure. Expenditure per capita was used as the indicator of expenditure levels. To show the scale of differences between investment levels, selected methods of descriptive statistics were used (position, variation and concentration measures). Also, the development of selected investment expenditure types was presented. The second part consisted in analyzing whether the municipalities’ development level affects the investment level. In order for the development gap to be effectively narrowed, investments implemented by municipalities at higher development levels should be considerably larger. Therefore, a synthetic development measure was calculated for variables based on 2007 data. Then, the analysis of variance was performed to check the significance of differences in cumulative investment expenditure incurred over the 2007-2016 period.
The synthetic feature was developed based on the phased method proposed by Wysocki & Lira (2005). First, the simple characteristics which co-determine the complex process under consideration were selected based on substantive and statistical grounds (analysis of diagonal entries of inverse correlation matrix R). Two criteria were used in the statistical verification: the explanatory and discriminatory power of variables. The characteristics, selected based on the extensive set of relevant literature, e.g. Strahl (2006), were confirmed to be useful by Standar & Puślecki (2011). They match the key determinants of development, such as human capital, entrepreneurship, infrastructure and financial condition of municipalities. The following characteristics were used:

- unemployed per 1,000 working-age population,
- operators of the national economy entered to the REGON register per 100 working-age population,
- synthetic measure of infrastructural development (share of population served by sewage treatment plants in the total population [%], water supply network length in km per 100 sq. km, sewage network length in km per 100 sq. km, length of hard-surfaced municipal roads in km per 100 sq. km),
- number of secondary school pupils per 1,000 population aged 16-19,
- municipality’s own incomes (PLN per capita),
- municipality’s investment expenditure (PLN per capita).

Afterwards, the values of simple characteristics were normalized, and the values of the synthetic characteristic were calculated. The Hellwig’s development pattern (1968) was used to create the synthetic indicator. It consists in calculating the Euclidean distances between specific entities and the model unit with reference values of simple characteristics under consideration. Having calculated the synthetic measure, its arithmetic mean and standard deviation were used to arrange the municipalities and group them as follows:

- group 1 (high level),
- group 2 (medium-high level): \( \bar{q} + s_q > q_i \geq \bar{q} \)
- group 3 (medium-low level): \( \bar{q} > q_i \geq \bar{q} - s_q \)
- group 4 (low level): \( q_i < \bar{q} - s_q \)

with \( \bar{q} \): arithmetic mean of the indicator; \( s_q \): standard deviation (Strahl 2006). The greater the value of the indicator, the higher is the development level of the municipality. As a consequence, the closer a municipality’s result is to 0, the lower the development level; conversely, values closer to 1 were characteristic of municipalities demonstrating relatively higher socio-economic development levels. Afterwards, the relationship between the development level and investment amounts was verified with the analysis of variance.
In the third part, a multiple regression model was created to explain the financial determinants of investment levels. The expenditure level per capita was set as the explained variable (Y). Explanatory (independent) variables were selected based on substantive and statistical grounds. After a literature review and a statistical verification, the following was selected:

- share of own incomes in total incomes (%);
- share of operating surplus in total incomes (%);
- the “self-financing ratio”: share of operating surplus and property incomes in property expenditure (%);
- current transfers per capita (PLN);
- share of total liabilities in total incomes (%);
- share of debt-servicing costs in total incomes (%);
- share of liabilities due in total liabilities (%);
- total EU funds accessed per capita (PLN).

The selected indicators are recommended by the Ministry of Finance to be used in assessing the financial condition of local government units, and are relevant to the following areas: financial autonomy; investment opportunities; financial liquidity; indebtedness; and activity in accessing external funds. These factors were covered by the research on the financial condition by Bieniasz et al. (2013) and Dylewski (2004; 2010). The Least Squares Method was used to find the estimators. The statistical significance of the whole model was verified with the F test. The t test was used to check the significance of the model’s parameters. Because of different measurement units, the values of regression coefficients were not interpreted. However, beta coefficients (normalized parameters of the regression equation) were introduced (Stanisz, 2007, p. 43-45 and 101). The adjusted coefficient of determination was used to assess how well the outcomes are replicated by the model. Also, following the interpretation of the results of this study, values representing the variation of a variable explained by other variables (Stanisz, 2007, p. 77) were also taken into consideration.

The data was arranged in tables and mapped to a box-plot. Source materials were retrieved from the Local Data Bank of the Central Statistical Office and from the database of the Ministry of Finance (Wskaźniki do oceny sytuacji finansowej jednostki samorządu terytorialnego [Indexes for the assessment of local government units’ financial standing]).
3 Results and Discussion

3.1 Scale and structure of investment expenditure in municipalities covered by this study

In the period under consideration (2007-2016), the rural municipalities covered by this analysis invested a total of PLN 5.5 billion. The largest investments took place in 2010-2011, with annual amounts of ca. PLN 700 million, i.e. PLN 673 per capita (and a median of PLN 694). From 2007 to 2011, a 146% increase in investment expenditure was recorded. Afterwards, investment processes decelerated, reaching PLN 344 in 2016, which means a reduction by as much as one half. The reason for the intensification of investment projects was probably the inflow of EU funds as part of the 2007-2013 perspective and the fact that most of that amount was actually disbursed in 2010-2011 (Standar, 2013) (Table 1).

Also note that the increase in investment expenditure was accompanied by a reduction in disparities. In 2007, the coefficient of variation was as high as 125% (which means extreme variation). Afterwards, it went down to 57% (medium variation) and increased slightly in the last period. The decrease in disparities is also reflected by the narrowing range. This is because the municipalities which had previously reported low investment levels have recently increased their investment expenditure. Conversely, those who had invested large amounts now have considerably decreased their investment levels (Table 1). This means that the reduced dispersion of investment expenditure is not related to a general increase in investment amounts but rather to the deceleration of the investment process by the leading investors.

Table 1 Selected descriptive statistics of the level of per capita investment expenditure in rural municipalities of the Wiekopolskie voivodeship

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Coefficient of variation</th>
<th>Lower quartile</th>
<th>Upper quartile</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>365.64</td>
<td>281.86</td>
<td>9.74</td>
<td>4258.48</td>
<td>125.63</td>
<td>159.18</td>
<td>395.81</td>
<td>4248.74</td>
</tr>
<tr>
<td>2008</td>
<td>443.25</td>
<td>364.33</td>
<td>45.65</td>
<td>2652.90</td>
<td>89.12</td>
<td>237.75</td>
<td>497.10</td>
<td>2607.25</td>
</tr>
<tr>
<td>2009</td>
<td>541.09</td>
<td>488.06</td>
<td>41.05</td>
<td>2394.86</td>
<td>63.18</td>
<td>319.88</td>
<td>648.93</td>
<td>2353.81</td>
</tr>
<tr>
<td>2010</td>
<td>757.65</td>
<td>673.25</td>
<td>36.85</td>
<td>2564.00</td>
<td>56.55</td>
<td>469.94</td>
<td>970.80</td>
<td>2527.15</td>
</tr>
<tr>
<td>2011</td>
<td>794.34</td>
<td>694.36</td>
<td>27.86</td>
<td>3391.90</td>
<td>71.93</td>
<td>404.12</td>
<td>949.39</td>
<td>3364.04</td>
</tr>
<tr>
<td>2012</td>
<td>535.15</td>
<td>477.36</td>
<td>32.28</td>
<td>2654.92</td>
<td>69.57</td>
<td>280.27</td>
<td>699.53</td>
<td>2622.64</td>
</tr>
<tr>
<td>Year</td>
<td>Mean</td>
<td>Median</td>
<td>Min</td>
<td>Max</td>
<td>Coefficient of variation</td>
<td>Lower quartile</td>
<td>Upper quartile</td>
<td>Range</td>
</tr>
<tr>
<td>------</td>
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<td>---------</td>
<td>--------------------------</td>
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<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td>2013</td>
<td>487.67</td>
<td>393.21</td>
<td>63.81</td>
<td>1594.52</td>
<td>61.66</td>
<td>298.85</td>
<td>627.02</td>
<td>1530.71</td>
</tr>
<tr>
<td>2014</td>
<td>527.71</td>
<td>500.06</td>
<td>85.11</td>
<td>3186.79</td>
<td>66.92</td>
<td>323.28</td>
<td>651.51</td>
<td>3101.67</td>
</tr>
<tr>
<td>2015</td>
<td>447.94</td>
<td>374.99</td>
<td>88.09</td>
<td>1523.19</td>
<td>62.88</td>
<td>261.13</td>
<td>531.04</td>
<td>1435.09</td>
</tr>
<tr>
<td>2016</td>
<td>429.45</td>
<td>343.61</td>
<td>103.95</td>
<td>1696.00</td>
<td>65.36</td>
<td>226.31</td>
<td>504.20</td>
<td>1592.05</td>
</tr>
</tbody>
</table>

Source: Own study based on the Local Data Bank of the Central Statistical Office.

In rural municipalities of the Wielkopolskie voivodeship, the largest amounts were allocated to infrastructural investments. Figure 2 shows the levels of selected investment expenditure in the rural municipalities covered by this study, grouped in line with the Polish Classification of Economic Activity. The funds were primarily allocated to transport and telecommunications, with a share ranging from 17% to 46% over the years. The development of the transport infrastructure, especially including the roads, is a crucial problem for Poland which suffers from an underdeveloped, poor-quality road network. The implementation of fundamental changes in that area has already begun, and is mainly related to Union funds accessed (Broniszewska, 2013). The expenditure on education and upbringing was considerably lower, ranging from 6% to 18%, and was usually allocated to the construction and upgrade of schools. The third investment target was the environmental protection and utilities, representing 7% of investment expenditure, on average. This is related to large discrepancies in development levels between the water supply network and the sewerage network (Standar & Bartkowiak-Bakun, 2014). Note that the increase in investment expenditure in 2010-2011 was related to a particularly significant growth in transport and communications expenditure.
3.2 The municipalities’ investment expenditure and development level

The development levels will converge if the local government units at lower development levels intensify their investment efforts. If they fail to accelerate the changes while the most developed municipalities increase their investments, they will face stagnation or even growth in disparities. Note that supporting changes in lagging regions is the first objective of the European Union's cohesion policy and a priority for the Polish domestic policy.
The box-plot (Figure 3) shows the average cumulative investment expenditure per capita by development levels of municipalities covered by this study. Over the 2007-2016 period, in the municipalities at high development levels (group 1), the average investment amount was PLN 8,600, compared to around PLN 5,100 in group 2. The amounts of investments recorded in other municipalities (demonstrating medium-low and low development levels) were below PLN 5,000. The significance of differences between the results of group 1 and those of other groups was confirmed by the Kruskal-Wallis ANOVA (KW) nonparametric test, resulting in F=12.96 at p=0.00. On that basis, it may be concluded that no convergence processes were observed in the rural municipalities covered by this analysis. On the contrary, they were found to diverge progressively. What also needs to be emphasized is that the group of municipalities at high development levels turned out to be the most diversified of all groups considered.

3.3 Financial determinants of differences in investment expenditure levels

In the next stage of the research, the regression function was determined with the use of STATISTICA 13.1. The method employed for that purpose was stepwise regression which consists in adding only those variables (predictors) that significantly predict the dependent variable. Therefore, as shown by the regression equation, the investment levels were affected by five factors (Table 2) in the study period. The growth of investments was driven by the increase in operating
surplus and own incomes. Also contributing were the EU funds accessed, and the
decrease in self-sufficiency (liquidity) and indebtedness levels. The operating sur-
plus per capita (beta = 0.43) and own incomes per capita (beta = 0.41) were found
to have the relatively strongest impact on the explained variable.

The operating surplus means the difference between current incomes and
current expenditure. It reflects the municipality’s financial standing (Ministry of
Finance, 2011) and indebtedness (Article 243 of the Public Finance Act). There
fore, the presence of this variable in the regression equation seems obvious. The
current operating surplus may be allocated to investments or debt repayment. In
turn, own incomes reflect the municipality’s financial self-sufficiency and inde
pendence from the state budget. Undoubtedly, increasing the municipality’s own
potential also contributes to improving the investment capacity. In Poland, sourc
es of own income include: local taxes and fees (agricultural tax, forestry tax, prop
erty tax etc.), shares in personal and corporate income taxes, and other capital
and property incomes (e.g. sales tax, lease tax). The contribution of EU funds was
found to be slightly smaller. This is because the implementation of investments
co-financed by the EU requires the use of the municipality’s own capital which
is only partially refundable. It has a restrictive effect on the investment capacity,
especially when it comes to less wealthy municipalities.

Table 1 Summary of the regression of the “investment expenditure per capita”
dependent variable (PLN)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>BETA</th>
<th>BETA standard error</th>
<th>t</th>
<th>Standard error</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept term</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>Operating surplus per capita (PLN)</td>
<td>0.43</td>
<td>0.09</td>
<td>0.61</td>
<td>0.12</td>
<td>4.95</td>
<td>0.00</td>
</tr>
<tr>
<td>“Self-financing ratio”: share of operating surplus and property incomes in property expenditure (%)</td>
<td>-0.22</td>
<td>0.06</td>
<td>-135.63</td>
<td>35.95</td>
<td>-3.77</td>
<td>0.00</td>
</tr>
<tr>
<td>Own income per capita</td>
<td>0.41</td>
<td>0.09</td>
<td>0.14</td>
<td>0.03</td>
<td>4.42</td>
<td>0.00</td>
</tr>
<tr>
<td>Share of EU funds in total incomes (%)</td>
<td>0.16</td>
<td>0.06</td>
<td>19.59</td>
<td>7.58</td>
<td>2.58</td>
<td>0.01</td>
</tr>
<tr>
<td>Share of total liabilities in total incomes (%)</td>
<td>-0.14</td>
<td>0.07</td>
<td>-250.72</td>
<td>119.93</td>
<td>-2.09</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Source: Own calculations based on the Ministry of Finance Database and the Lo
cal Data Bank of the Central Statistical Office.
Meanwhile, self-financing and indebtedness levels have a negative effect on investment amounts. *Overinvestment*, difficulties in estimating the time and amount of return on investments, and increased ongoing maintenance expenses related to the investment are factors that may have a destabilizing effect on financial liquidity. In turn, a high indebtedness rate decreases the financial capacity by restricting the municipality’s own incomes (because of required debt repayment and debt servicing costs). Also, it hinders access to repayable instruments because of low creditworthiness. Note that the process covered by the analysis was explained well by the model, as the adjusted coefficient of determination was 62%. This means the investment growth potential is largely explained by the factors addressed by this analysis.

4 Conclusion

The main purpose of this paper is to assess the scale of and financial reasons behind differences in the local government units’ investment expenditures in the context of reducing disparities in socio-economic development. The following may be concluded based on this study:

1. There were fluctuations in the levels of investments implemented by rural municipalities of the Wielkopolskie voivodeship over the study period. Following the initial growth (until 2011), funds allocated to investment projects decreased to a level comparable to that recorded in the first year of this analysis. Also, investment amounts were highly diversified. The disparities were reduced through the intensified efforts of municipalities who had previously allocated small amounts of funds to investments.

2. The differences in the cumulated values of investments proved to be statistically significant considering the development levels of local government units under consideration. The higher the development level of municipalities, the larger was the amount of investments implemented in 2007-2016. On that basis, it may be concluded that no convergence processes were observed in the rural municipalities covered by this analysis. On the contrary, they were found to diverge progressively. Note that supporting changes in lagging regions is the first objective of the European Union's cohesion policy and a priority for the Polish domestic policy.

3. Undoubtedly, the level of investment expenditure was positively impacted by the municipality’s own potential expressed as the level of own incomes and the operating surplus. These are the two characteristics with the greatest impact on the level of investments realized, as evidenced by the beta factor. Funds accessed under the EU’s cohesion policy play a less significant role. Conversely,
financial liquidity and indebtedness were found to be significant factors with a negative effect. Considering the strength of impact of factors included in the regression equation, the beneficiary’s own potential is the key driver of investment capacities. Therefore, it should be at the core of measures taken by municipal authorities who intend to intensify their investment projects in the future.

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