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**What Drives Local Public Investments? Evidence from
Poland**

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What Drives Local Public Investments? Evidence from Poland

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Abstract

Research background: Local public investments satisfy basic local communities' needs and are crucial from the perspective of regional convergence. Against this background, investments by Polish local government pose as an interesting research subject. It is because, due to its size and dynamics, local public investments exert a considerably significant influence on the Polish economy. Self-government entities with primary responsibility for conducting local public investments in Poland are municipalities.

Purpose of the article: The paper aims to identify fiscal, demographic and infrastructural determinants of municipal investment spending in Poland.

Methodology/methods: I use panel data for 2412 Polish municipalities over the period 2007–2014. For institutional reasons, the sample excludes cities with county rights. The baseline specification employs two-way fixed-effects (FE) estimation that controls both for municipality and year fixed effects. To test for robustness, the sample is restricted to municipalities with up to 20,000; 10,000 and 5,000 inhabitants. For each considered sample there are four regression specifications implemented.

Findings: Investment spending increases both in own revenues and grants. On the contrary, I document the negative impact of indebtedness level and the coverage of water supply and sewage systems. The coefficients on population size and the share of old inhabitants cease to be negative and statistically significant for municipalities with fewer than 10,000 inhabitants. The results indicate that, apart from fiscal capacity, the investment policies of Polish municipalities are affected by economies of scale, local communities' preferences and infrastructural endowment. The study also shows that incurring debt should be of particular concern for supervisory and control bodies.

Introduction

In decentralized countries subnational government units are responsible for constructing and maintaining technical and social infrastructure that satisfies local community's needs. There is some evidence that decentralization contributes to better tailoring of investment projects to local circumstances (Esteller & Solé, 2005).

Investment by Polish local government is an interesting research subject for at least two reasons. Firstly, since 2005 Poland has experienced a marked increase in public investment spending. Secondly, whereas the share of local public investment in total public investment in Poland is slightly below an average for subnational governments in OECD countries, a ratio of subnational investment spending to GDP in Poland is among the highest ones¹. It follows that local investment in Poland exerts a considerably significant influence on the national economy.

The paper aims to identify fiscal, demographic and infrastructural determinants of municipal investment spending in Poland. Previous studies on the determinants of local investment spending in Poland focused on fiscal capacity and made use of aggregate time-series data (Sekuła, 2013; Sekuła & Basińska, 2014; Sekuła & Basińska, 2016). In contrast, this paper employs panel regression estimation. The paper extends the empirical literature on determinants of local government spending in young democracies.

The paper is structured as follows. The next section discusses research methodology. Then related literature is presented. It is followed by the formulation of research hypotheses and the operationalization of independent variables. Next, empirical analyses' results and some robustness checks are reported. Finally, some concluding remarks are offered.

Research Methodology

The paper investigates the determinants of local investment spending in Poland. The vast majority of local public investment projects in Poland are carried out by the lowest tier, i.e. municipalities. Over the period 2007–2014 municipal investment spending accounted for on average $\frac{3}{4}$ of total local government units' investment spending (Central Statistical Office Local Data Bank). Therefore, the analysis in my paper is limited to this local government level.

The empirical analysis employs fixed effects panel regression estimator, controlling both for municipality and year fixed effect. As a result, I ac-

¹ As for 2014, Poland obtained 9th place out of 34 OECD countries.

count for municipality-specific time-invariant and common time-varying heterogeneity. Standard errors are robust to autocorrelation and heteroskedasticity and clustered at municipal level.

The data on municipal investment spending encompass only money that flow via municipal budgets. Hence, the main possible bias in my regression results may stem from the fact that I underestimate investment spending for municipalities that finance investment projects beyond municipal budget. The extra-budgetary form of financing investment expenditures is more popular among more populated municipalities, especially in cities with county rights (Swianiewicz & Łukomska, 2015). Consequently, in my baseline specifications I exclude these municipalities. My sample consists of 2412 municipalities (out of 2479 in total)². I verify the robustness of my baseline specifications by restricting the sample to municipalities with up to 20,000, 10,000 and 5,000 inhabitants (see table 4, 5 and 6). The numbers of municipalities remaining in the sample are respectively: 2160, 1646 and 648.

Investment expenditures consist of spending on both physical and financial fixed assets. In the sample period approximately 97 percent of these expenditures in municipalities other than cities with county rights were attributed to physical assets. In most cases investment expenditures accounted for between 10 and 20 percent of total expenditures. Since the distribution of investment spending per capita is significantly right skewed and contains only one observation of value zero, I implement logarithmic transformation. Thanks to it regression results are less sensitive to outlying observations (Wooldridge, 2013, p. 216). In addition, this transformation allows for interpretation of coefficients in terms of elasticities.

The data on dependent and independent variables were retrieved from Central Statistical Office and Ministry of Finance databases.

Related literature

The decline in public investment in developed countries since 1970s raised interest in the determinants of these expenditures. Besides cross-country studies on the drivers of public investment (e.g. Gali & Perotti, 2003; Heinemann, 2006; Vuchelen & Caekelbergh, 2010; Jäger & Schmidt, 2016) there is also an increasing strand of literature consisting of intra-country local government analyses.

Since local investment projects often generate interjurisdictional positive externalities, fiscal federalism theory suggests subsidizing them by

² The sample excludes Wałbrzych municipality that regained city with county rights status in 2013 and Jaslska municipality that was established only in 2010.

central government (e.g. Bailey, 1999, p. 7-8; Oates, 1999, p. 1126-1127). Other factors that justify upper-government support for local investment include high sunk costs and economies of scale (de Mello, 2012, p. 117-118). Using the sample of Canadian provinces, Bojorquez *et al.* (2009) show that intergovernmental grants foster municipal investments.

Building on Grossman and Helpman (1996), Kondoh (2008) models the impact of a special interest group and median voter's preferences on local governments investment policy. He provides empirical evidence that the construction industry influenced Japanese local public investment. At the same time the predictions from median voter theorem occur not to be relevant.

Yu *et. al* (2011) employ spatial estimation to identify the determinants of local public infrastructure spending on a cross-section of Chinese cities in 2005. Their empirical model accounts for both horizontal (city – city) and vertical fiscal interactions (province – city and city – county). They find that investment spending in a city responds negatively to investment spending in neighbouring cities and responds positively to investment spending by lower-tier governments.

For regions in Russia over the period 1994-1997, Matheson (2005) points out that horizontal redistribution leads to a decrease in local public investment. Moreover, the strength of this relationship is found to be dependent on administrative status (republics vs. non-republics) and regional wealth.

The closest to this paper are empirical analyses of the relationship between revenue sources and investment expenditures in Polish municipalities. Previous studies explored time-series aggregated data for all municipalities (Sekuła, 2013; Sekuła & Basińska, 2016) and data broken down into broad subgroups of municipalities (such as rural municipalities) (Sekuła & Basińska, 2014). Thus, they did not account for inter-municipal variation. The bottom result of these studies is that higher own revenues translate into higher investment expenditures.

The empirical literature suggest that plenty of both fiscal and non-fiscal factors shape public sector investment policy. This paper investigates the set of fiscal, demographic and infrastructural determinants of local government investment activity.

Research hypotheses

The hypotheses regarding municipal fiscal characteristics read:

Hypothesis 1a: Own revenues per capita have a positive impact on municipal investment spending per capita.

Hypothesis 1b: Grants per capita have a positive impact on municipal investment spending per capita.

Hypothesis 1c: An indebtedness level has a negative impact on municipal investment spending per capita.

The hypotheses referring to demographic characteristics are as follows:

Hypothesis 2a: A population size has a negative impact on municipal investment spending per capita.

Hypothesis 2b: A population density has a negative impact on municipal investment spending per capita.

Hypothesis 2c: The share of young population has a positive impact on municipal investment spending per capita.

Hypothesis 2d: The share of old population has a negative impact on municipal investment spending per capita.

As for infrastructure endowment, I predict that:

Hypothesis 3: Infrastructure endowment has a negative impact on municipal investment per capita.

Operationalization of explanatory variables

Table 1 reports the set of independent variables divided into three groups: fiscal, demographic and infrastructural characteristics. To diminish endogeneity concerns, fiscal, demographic and infrastructural variables are lagged by one period. It also reflects the fact that decisions on investment spending in a year t depend on explanatory variables from year $t - 1$ and that respective budgetary plans are prepared before a given fiscal year (Välilä & Mehrotra, 2006, pp. 454, 456).

As for fiscal characteristics, I consider two sources of municipal revenues: own revenues and grants (jointly conditional and unconditional ones). I express them as natural logarithms of per capita values. Consequently, the respective coefficients represent elasticities of investment expenditures to specific sources of municipal financial means (in per capita terms). I also account for indebtedness level which until 2013 was subject to the subnational fiscal rule.

As regards demographic characteristics, I take into account the size of population (in a logarithmic form), the density of population and the share of pre-working and post-working population.

Variables that describe infrastructure facilities include the percentage of population with access to water supply and sewage systems. Unfortunately, data on municipal local public roads with hard improved surface is not available.

Table 1. Explanatory variables description and data sources

Group of variables	Variable label	Description	Source
Fiscal characteristics	ln_own_rev_pc	Natural logarithm of per capita own revenues (including shares in personal income tax and corporate income tax)	Central Statistical Office Local Data Bank
	ln_grant_pc	Natural logarithm of per capita grants (both conditional and unconditional ones)	Central Statistical Office Local Data Bank
	debt_to_rev	End of the year ratio of debt to revenues	Ministry of Finance database
Demographic characteristics	ln_pop	Natural logarithm of population according to actual place of residence	Central Statistical Office Local Data Bank
	pop_dens	Population density (in persons per square kilometer)	Central Statistical Office Local Data Bank
	young	Share of pre-working population (i.e. age group 0-17 years) in total population (in percentage)	Central Statistical Office Local Data Bank
	old	Share of post-working population (i.e. for men – 65 years and more, for women – 60 years and more) in total population (in percentage)	Central Statistical Office Local Data Bank
Infrastructural characteristics	water	Persons using water supply system in percent of total population	Central Statistical Office Local Data Bank
	sewage	Persons using sewage system in percent of total population	Central Statistical Office Local Data Bank

Source: own elaboration.

Empirical results

The baseline results are reported in table 2³. There are four regressions per each sample that contain different sets of explanatory variables. The sample is also restricted to municipalities with fewer than 20,000; 10,000 and 5,000 inhabitants. By so doing I verify whether the empirical results are robust across various specifications and with respect to various samples. In general, I observe changes in magnitude of analyzed coefficients whereas their signs remain stable.

In all regressions coefficients on both own revenues and grants per capita are positive and statistically significant (in line with hypotheses 1a and 1b). The empirical results also support the prediction that investment ex-

³ The results for restricted samples are available from the author upon request.

penditures per capita decreases in debt to revenues ratio (hypothesis 1c). This finding is consistent with Vålilä and Mehrotra (2006) and Heinemann (2006). The negative impact of population size (hypothesis 2a) and the share of old inhabitants (hypothesis 2d) is found to be statistically significant only for samples including municipalities with more than 10,000 inhabitants. One can conclude that these effects are driven by relatively large municipalities⁴. There is no empirical evidence for the impact of population density (hypothesis 2b) and the share of young population (hypothesis 2c).

As predicted, I find that investment spending per capita is negatively associated with the coverage of water supply and sewage systems (hypothesis 3). This result is in line with Heinemann (2006). It also corresponds with targeting investment grants to less developed municipalities.

Table 2. Fixed effects (FE) regression results for municipalities excluding cities with county rights in the years 2007–2014

Variables	ln_exp_inv_pc			
	(1)	(2)	(3)	(4)
ln_own_rev_pc	0.34*** (0.039)			0.32*** (0.040)
ln_grant_pc	0.41*** (0.040)			0.39*** (0.040)
debt_to_rev	-1.24*** (0.071)			-1.19*** (0.071)
ln_pop		-1.48*** (0.28)		-0.54** (0.26)
pop_density		-0.00091 (0.00070)		-0.00058 (0.00055)
young		-0.022 (0.013)		-0.026** (0.013)
old		-0.064*** (0.011)		-0.064*** (0.011)
water			-0.0089*** (0.0031)	-0.0099*** (0.0030)
sewage			-0.015*** (0.0015)	-0.014*** (0.0014)
constant	0.73* (0.38)	20.6*** (2.41)	6.84*** (0.24)	8.75*** (2.39)
Observations	19,295	19,295	19,295	19,295
R-squared	0.209	0.169	0.173	0.221
Number of code	2,412	2,412	2,412	2,412

All regressions include fixed municipality effect and fixed year effect. Independent variables are lagged by one year. Robust standard errors clustered at municipal level are reported in parentheses. Statistical significance is denoted in the following way: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: own calculations.

⁴ The average size of Polish municipality (including cities with country rights) is approximately 5.5 inhabitants.

Conclusions

The paper empirically investigates the determinants of municipal investment spending in Poland. The identification strategy exploits panel data for 2412 units over the period 2007–2014.

The study shows that investment spending increases both in own revenues and grants. On the contrary, I document the negative impact of indebtedness level and the coverage of water supply and sewage systems. The coefficients on population size and the share of old inhabitants cease to be negative and statistically significant for municipalities with fewer than 10,000 inhabitants.

The results indicate that, apart from fiscal capacity, the investment policies of Polish municipalities are affected by economies of scale, local communities' preferences and infrastructural endowment. The study also shows that incurring debt should be of particular concern for supervisory and control bodies.

An interesting avenue for further research would be an analysis of determinants of local public investments in Poland focussing on spatial interdependencies.

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