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ASSESSING OF THE INFLUENCE OF THE LOCAL GOVERNMENT'S FINANCIAL SITUATION ON AWARDING CIRCULAR PUBLIC PROCUREMENTS

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ABSTRACT: This paper investigates the relationship between the financial situation of local governments (LGs) and the awarding of circular public procurements (CPP) within the circular economy. The investigation was based on a population research sample of 200 LGs representative for all Polish LGs (district (powiat), city on district rights, urban, urban-rural, and rural municipality (gmina)) selected in stratified random sampling. The empirical research was conducted using CATI research. Logistic regression analysis was used to predict the binary outcome of awarding CPP (dependent variable) or not awarding CPP by analysing the relationship with the set of defined financial indicators (independent variables). The conducted study revealed that the higher the level of LG expenditure, the more eager LGs are to award CPP. Surprisingly, LGs with deficits, lack of operating surplus ratio or low level of financial independence were as active in awarding CPP as LGs with no deficit, high level of operating surplus ratio or high level of financial independence.

KEYWORDS: local circular economy, circular public procurements, local governments, the financial situation of local governments, sustainable development

Introduction

In the 1990s, many European countries like Poland, Estonia, Croatia, and Czechia witnessed a decentralisation trend of activity and power shift from upper to lower levels of government (Godlewska & Pilewicz, 2022). In 1999, the Polish local governments (LGs) shifted to a three-level structure, i.e. municipality (urban, urban-rural, rural and cities on district rights), districts and voivodeships with a particular scope of statutory tasks and own financial resources allocated to support their function (Malinowski, 2022). LGs, regardless of their financial situation, face a variety of contemporary challenges, such as high energy consumption, excessive emissions of CO^2, loss of biodiversity, hazardous waste management, environmental pollution, and climate fluctuations (Geissdoerfer et al., 2017). It is postulated that circular public procurements (CPP) may play a key role in addressing those issues by focusing on recycling, repairing, reusing, refurbishing, or remanufacturing goods purchased by LGs (Godlewska & Godlewski, 2024). Moreover, CPP awarded by LGs may accelerate the transformation towards a local circular economy by creating a new demand for resource and energy efficiency (Alhola et al., 2019; Rainville, 2021; Kristensen et al., 2021). In addition, LGs undertake a variety of initiatives to support the transformation toward a local circular economy, but only awarding CPP may support changing the production and consumption patterns toward sustainable and circular ones. For example, awarding CPP for works (constructions) based on energy-efficient evaluation criteria may prompt economic operators to use environmentally friendly building materials with lower energy requirements (both in production and in use) or design zero-energy infrastructure.

In 2007, the Treaty of Lisbon made climate change and sustainable development a priority for the European Union (EU) and its member states. Transformation to a local circular economy may support the achievement of the UN 2030 Agenda for Sustainable Development. The concept of circular economy in recent years received a lot of attention in policy agendas of the EU and their member states as a tool of particular interest to overcome unsustainable production and consumption patterns while at the same time allowing for economic growth through highly extended circulation of goods or resources and minimal generation of waste (Geissdoerfer et al., 2017; Alhola et al., 2019). In China, the circular economy is promoted as a top-down national policy, while in the EU, Japan or the USA, it functions through a set of bottom-up policies (Ghisellini et al., 2016), with the particular role of LGs in its support at a local level. The transition towards a local circular economy requires actions from all actors, especially from LGs (Kristensen et al., 2021), due to their purchasing power. The LG's public procurements represent approximately EUR 1800 billion, equivalent to 14% of the GDP in the EU annually (European Commission, 2020; European Commission, 2017a). Above certain thresholds, LGs are obliged by the EU public procurement law and national legislation to purchase goods, services or works needed to fulfil their functional objectives through a public procurement (PP) process. Apart from "regular" PP focused on price, guarantee and tender completion date award criteria, LGs may award green public procurements (GPP)[1] focused on environmental criteria, sustainable public procurements (SPP) focused on environmental, social, and economic criteria or CPP focuses not only on environmental, social, and economic criteria but also on waste generation, emission, energy leakage, or renewable resources. Moreover, CPP may be defined as: "*the process by which public authorities purchase works, goods or services that seek to contribute to closed energy and material loops within supply chains, whilst minimising, and in the best case avoiding, negative environmental impacts and waste creation across their whole life-cycle*" (European Commission, 2017b).

Dimand and Cheng (2023) highlight green PP as an innovative, often overlooked and strategic management tool for LGs. However, in real life, "regular" PP dominate, based on a linear model with the assumption that fuel energy or natural resources are readily available, abundant, cheap to dispose or easy to source, hence, public authorities, the LGs, usually act based on "take-make-consume and dispose" pattern of growth (European Commission, 2014). In addition, according to Michelsen and de Boer (2009) the indirect impact of goods, services or works purchased by LGs has often the major environmental impact. An example is the city of Trondheim in Norway, where the activities related to the production of goods purchased by LGs generated emissions of 116 000 tons of CO_2 compared to 7000 tons of CO_2 emissions directly resulting from LGs activities utilising those goods. In addition, Alhola et al. (2019) highlight that CPP may promote a circular economy by setting award criteria and requirements, such as the extension of product life spans, efficiency, using energy from

DOI: 10.34659/eis.2024.91.4.985

renewable sources, intensity of use, and efficient cycling of biological or technical materials, that support the concept of the six "Rs" in CPP (repairing, reusing, remanufacturing, refurbishing, recycling or retrieving), especially in construction, waste, and wastewater management, transportation, food, catering, furniture, or textiles.

LGs around the world struggle with a decreased number of available financial resources and increased demand from their citizens for better quality public services (Brusca et al., 2015). Uryszek (2013) emphasised that LGs are responsible not only for fulfilling their own tasks but also those requested by central governments. The financial resources of LGs are essential for their development and functioning (Grzebyk et al., 2022), as well as for enabling the implementation of GPP, SPP, or CPP. However, research results on the dominance of the lowest prices and the lack of use of environmental, economic, innovative, or social award criteria of public procurement are inconclusive. For many LGs, GPP, SPP or CPP present a trade-off between environmental, sustainable, or circular demands and direct costs, which incentivises many LGs to avoid GPP, SPP or CPP, to have more cash available for current public tasks or necessary local investments (Michelsen & de Boer, 2009). On the other hand, Lerusse and van de Walle (2022) underlined that LGs do not exclusively buy from the cheapest bidder (economic operators) and award PP based on environmental, innovative, or social award criteria. **That is why the aim of the paper is to investigate the relationship between the financial situation of LGs and the awarding of CPP based on environmental, economic and social award criteria by LGs.**

The empirical analysis was based on the data collected through computer-assisted telephone interviewing (CATI) research conducted in June 2023 with a representative population of Polish LGs. The sample of n=200 LGs who participated in the study was composed of districts, rural, rural-urban, urban municipalities, and cities on district rights. The financial indicator analysis was based on data published by Statistics Poland in the Local Data Bank for the year 2022. The dependent variable, e.g. awarding CPP in the year 2022 by LGs, was based on data received from LGs who participated in CATI research. The logistic regression analysis was performed to predict a binary outcome, such as awarding CPP by LGs (dependent variable), by analysing the relationship with the set of defined financial indicators (independent variables).

This paper is organised as follows. The first section presents the findings of a literature review of the influence of the financial situation of LGs on the transformation towards a local circular economy through circular public procurements. The second section describes the research approach, and the third section discusses the results. The summary highlights the most important conclusions of the study.

An overview of the literature

LGs (understood by authors as district, rural, rural-urban, urban municipality and city on district rights) worldwide have undertaken a variety of sustainable activities in response to the Earth Summit, the United Nations Conference on Environment and Development held in Rio de Janeiro, in 1992 and approved Agenda 21 (United Nations, 1992; Saha & Peterson, 2008). Agenda 21 underlines the key role of LGs for sustainable development. Wrzosek and Kisała (2019) underlined that LGs are responsible for environmental protection as one of their key public tasks and should take actions that facilitate the use of techniques for environmental management. For example, they should be awarding CPP or supporting economic operators (bidders) to invent inexpensive technologies that enable recycling or reusing of previously purchased goods or works. Meanwhile, Bąk et al. (2023) argued that achieving sustainable development goals (or awarding CPP) will require substantial financial involvement of all Polish LGs and not all LGs may be committed to achieving environmental goals priority nor to award CPP. In addition, Bartoszczuk (2023) highlighted that further investigation should be conducted related to the closed-loop solution costs, for example, enabling inexpensive recycling, refurbishment or reusing of goods. Today, there is often no technology to break down some garbage structures or clean some fluids. High costs of the closed-loop solution influence the cost of awarding CPP and may have a negative impact on LG's eagerness to later awarding of CPP. Meanwhile, Wojarska (2024) emphasised that sustainable development indicators (such as demographic changes, public health, poverty and living conditions, education, access to the labour market, public safety, economic development, employment, transport, climate change, freshwater resources, land use, bio-

DOI: 10.34659/eis.2024.91.4.985

diversity, waste management, social capital, equality in management) decreased as the financial gap between LGs revenues and expenditures widened.

LGs around the world also play a key role in facilitating local development (Martinez-Vazques & Smoke, 2011), as well as contributing to the transition towards a local circular economy through award criteria of CPP (Zijp et al., 2022). Similarly, Alhola et al. (2019) stressed that public authorities like LGs may support transformation towards a circular economy through awarding CPP, undertaking activities that support a circular economy or investments in circular ecosystems. However, Zijp et al. (2022) showed that the effect of CPP on the circular economy is inconclusive because two-thirds of CPP applied in 2017 and 2018 in the Netherlands did not result in reduced environmental impacts or reduced material use. However, one-third proved that CPP may contribute to the transition toward a circular economy. The circular economy idea aims to implement sustainable and circular processes and products to increase environmental sustainability or carbon neutrality and change the business model from linear to circular (Ghisellini et al., 2016; Prieto-Sandoval et al., 2018). Charef and Lu (2021) stressed the importance of public procurement policies, like CPP policy or SPP policy, to accelerate the transformation towards a circular economy. In addition, the European Commission (2008) underlined that through PP, public authorities, including LGs, should shape "greener" production and consumption trends, which in turn will enlarge or create markets for environmentally friendly goods, services and works, providing incentives for cheaper and more accessible environmental technologies. On the other hand, Kyriacou and Roca-Sagales (2021) emphasised, based on a sample of 30 European countries, that decentralising PP down to LGs affected their quality of governance.

LGs may also support transformation towards a local circular economy through CPP by not going for the lowest price criteria in PP, instead introducing the need for eco-labels, life cycle assessments and life cycle costing of goods, services and works (Sönnichsen & Clement, 2020). Without the engagement of LGs and other public authorities in awarding CPP, it will be impossible to achieve a climate-neutral economy by 2050, according to the European Green Deal (European Commission, 2021). Unfortunately, in the short run, CPPs are usually much more expensive for LGs than "regular" PPs due to the lack of cheap technologies that enable the recycling or remanufacturing of previously purchased goods or works, not to mention that CPPs are much more complex than "regular" PP due to obligation to cover additional awarding criteria or effects such as environmental, social and economic. In addition, Dziekański et al. (2022) underlined that LG financial resources may condition the implementation of current and future LG development tasks or support transformation towards a local circular economy. However, the European Commission (2008) stressed that GPP (as well as CPP) may be cost-effective in particular sectors where green or circular products are cheaper than the non-green or non-circular alternatives (based on overall life cycle cost of the goods or utilisation charges). Moreover, European Commission (2014) highlighted that circular economy modelling demonstrates significant material cost-saving opportunities for the EU industry and a potential to boost the EU GDP by up to 3.9% by creating new markets, products and value for business. However, Tudose (2013) argued that LGs face a shortage of their own resources, which limits both the investment capacity and financial autonomy of LGs. So, higher investment activity of LGs may limit the awarding of CPP.

Finances of LGs are a development factor, according to Dziekański (2019), because they are the basis for the implementation of public tasks or determine the condition of local economic development. In addition, LG's finances are significant for dealing with contemporary challenges such as global warming, environmental pollution, energy shortages, food security concerns (Martinez-Vazques & Smoke, 2011) or transition towards a local circular economy. The financial situation of LGs has a significant impact on all activities conducted by LGs (Dziekański, 2017) as well as on investment activities or CPP awarding by LGs. Moreover, the financial situation of LGs may be shaped by the area (e.g., the type of local government or available resources as revenues and own revenues) or independent of it (Dziekański, 2019). In addition, the financial situation of LGs is determined by their ability to raise income and limit spending needed for fulfilling mandatory tasks, and lack of funds influences the degree and quality of performed tasks (Grzebyk et al., 2022; Dziekański et al., 2022). LGs need financial resources not only for performing their statutory tasks but also for undertaking investment activities or supporting transformation towards a local circular economy. Similarly, Grzebyk et al. (2022) highlighted that the financial situation of LGs has the key importance for implementing sustainable development (or circular economy) principles, with the lack of financial resources

DOI: 10.34659/eis.2024.91.4.985

hampering LGs' activities to support local entrepreneurship (Godlewska & Morawska, 2020) as well as the local circular economy. For measuring the financial performance of LGs, Turley et al. (2015) underlined the importance of financial indicators assessing autonomy as the financial independence ratio, operating performance as the operating surplus ratio or efficiency as the efficiency ratio (the expenditure as a percentage of revenue). On the other hand, Rodriguez Bolivar et al. (2014) highlighted the importance of annual LG budget results (deficit or surplus) for LG's financial sustainability based on analyses of 116 LGs in Spain. So, in theory, deficit-free LGs should be much more eager to award CPP than those with the deficit, as CPP tend to have a more complex nature and, thus, may be more expensive than "regular" PP. Meanwhile, Jastrzębska (2023a) underlined the significance of a healthy financial system for LGs that guarantees the financial independence of LGs, increased revenues and efficiency of expenditures.

LGs with advantageous financial situations are, according to Malinowski (2022), able to implement investments that, for example, capitalise on favourable natural environmental developments, which, later, may translate to higher standards of living for the local population. Similarly, Hajilou et al. (2018) argued that LGs with access to favourable revenues play a more active role in protecting the natural environment. On the one hand, Rodriguez Bolivar et al. (2016) underlined that LGs play a key role in promoting sustainable development through environmental policies based on the financial sustainability of LGs' public services. On the other hand, LGs with good financial health are, according to Cuadrado-Ballesteros et al. (2014), characterised by the successful provision of essential public services provided by LG such as natural environment, culture, social services, urban services, leisure, or security services.

The financial situation of LGs according to the literature (Heller, 2006; Tudose, 2013; Kotarba & Kolomycew, 2014; Rodriguez Bolivar et al., 2014; Turley et al., 2015; Dziekański, 2017, 2019; Poniatowicz & Jastrzębska, 2021; Kowalska, 2022; Kołoszko-Chomentowska, 2022; Malinowski, 2022; Grzebyk et al., 2022; Dziekański et al., 2022; Jastrzębska, 2023a; Zawora, 2023) may be shaped by their: i) financial independence/autonomy; ii) operating surplus; iii) level of own revenues (or level of revenues per capita); iv) level of total revenues; v) level of income (or level of income per capita); vi) level of expenditures (or level of expenditures per capita); vii) level of investment expenditures; viii) level of investment activities; xi) debt servicing expenditures; x) level of deficit (or level of deficit per capita), or xi) debt burden.

In Poland, LGs such as municipalities have higher financial freedom than districts and may increase their revenues through local taxes or charges, like property tax or fair charges, or decrease revenues through tax reductions or exemptions. Similarly, Uryszek (2013) stressed that the scope of revenue autonomy of Polish LGs is limited, especially for districts and voivodeships, which are not allowed to create local taxes to draw revenues. Polish LGs are forced to rely on external funding sources not only to finance investments but often to cover running costs, with their debt having a variety of consequences, from triggering a leverage effect to even bankruptcy (see Ostrowice municipality) (Malinowski, 2022). On the other hand, Polish LGs may also obtain co-financing from the EU funds in the form of non-returnable funds (Grzebyk et al., 2022). Kołoszko-Chomentowska (2022), on the example of Polish rural municipalities of the podlaskie voivodeship, argued that municipality financial independence relates to their right to receive their own revenues and expend it freely. Meanwhile, Kowalska (2022) underlined that in 2022, the value of the operating surplus in all types of Polish LGs had a significant decline in its value, which may have an impact on the LG's capacity to finance investments, thus an impact on awarding CPP. In addition, Kotarba and Kolomycew (2014) emphasised the importance of the financial independence of Polish LGs, understood as the independence of LGs in shaping their budgets for the quality of public services delivered locally. This may influence the awarding of CPP by LGs, which are more complex than "regular" PP. Heller (2006) argued that in Poland, there is a view that municipalities have limited possibilities to generate their own revenues that would satisfy the expectations and needs of LGs. So, instead of adjusting the level of self-government to the existing income potential, they demand an increase in payments from the central government budget in the form of grants and subsidies. That is why LGs with higher amounts of own revenues may have a higher potential to award CPP as they are more efficient in generating their own revenues. In addition, Poniatowicz and Jastrzębska (2021) emphasised that Polish LGs, such as municipalities and cities on district rights, are heavily indebted due to previous and current investments. Thus, LGs with a level of debt above 60% of their total revenues may be less eager to

DOI: 10.34659/eis.2024.91.4.985

award CPP. It raised the question of whether the financial situation of LGs influenced the number of awarded CPPs and if LGs with budget deficits, high levels of investment expenditures or debt servicing expenditures, low levels of own revenues, or no operating surplus would even consider awarding CPP.

In response to a call from scholars (Dziekański et al., 2022; Alhola et al., 2019), who underlined the need for further research on indicators accelerating transformation towards a circular economy, the aim of our research was to investigate the relationship between financial situation of LGs represented by a defined set of financial indicators and awarding CPP, which later may accelerate transformation towards local circular economy. The authors, based on above mentioned studies, introduced the following hypotheses:

- H1: The following set of financial indicators: i) level of income per inhabitant (INC), ii) level of own revenue per inhabitant (ORE); iii) level of total own revenue (TOR); iv) level of total revenue (TRE); v) level of operating surplus ratio (OSR); vi) level of financial independence, have positive influence on the number of circular public procurements awarded by local governments.
- H2: The following set of financial indicators: i) level of expenditure per inhabitant (EXP), ii) level of investment expenditure per inhabitant (IEX); iii) level of total expenditure (TEX); iv) level of debt servicing expenditures (EPD); v) level of deficit per inhabitant (DEF); vi) level of total deficit (TDE); vii) level of investment activity; viii) level of debt above 60% of total revenues, have negative influence on the number of circular public procurements awarded by local governments.
- H3: The financial indicators mentioned in H1 and H2 have no influence on the number of circular public procurements awarded by local governments.

Research methods

The concept of circular economy highlights the key importance of CPP (Sönnichsen & Clement, 2020; Alhola et al., 2019) and the key role of LGs, who are one of the biggest groups among public authorities obliged to provide PP. Moreover, scholars (Witjes & Lozano, 2016) argued that there is still too little research focusing on possible pathways in which CPP may lead to transformation towards a circular economy. Despite the widely held belief that the financial situation of LGs matters when it comes to purchasing green or circular products, no studies have provided evidence of whether (and which aspects of) the financial situation of local governments matters for the awarding of CPP. Addressing this perceived gap in the literature was, accordingly, the main objective of the current study.

Empirical research into Polish public authorities, the LGs, was carried out in June 2023. Data were acquired using CATI research. The sample n=200 Polish LGs (the minimum size of the research sample was n = 183 of LGs), was selected in a random stratified manner from the entire population of LGs. The sample of LGs (see Table 1) was composed of 11% of districts (22), 2.5% of cities on district rights (4), 10.5% of urban municipalities (18), 23.5% of urban-rural municipalities (48) and 52.5% of rural municipalities (108). The sample had a 7% maximum error (2SE) and the confidence interval were set at 5% and 95% trust level. The research sample was fully representative.

The dependent variable (CPP) had a value of "0" if local government did not award CPP in the year 2022, and "1" if they did award CPP in the year 2022.

The list of independent variables was as follows: i) level of income per inhabitant (INC); ii) level of own revenue per inhabitant (ORE); iii) level of total own revenue (TOR); iv) level of total revenue (TRE); v) level of expenditure per inhabitant (EXP); vi) level of investment expenditure per inhabitant (IEX); vii) level of total expenditure (TEX); viii) level of debt servicing expenditures (EPD); ix) level of deficit per inhabitant (DEF); x) level of total deficit (TDE); xi) level of operating surplus ratio (OSR); xii) level of financial independence (FII); xiii) level of investment activity (INV); xiv) level of debt above 60% of total revenues (DEB).

DOI: 10.34659/eis.2024.91.4.985

Table 1. Type of local governments (TYP)

TYP					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rural municipalities	105	52.5	52.5	52.5
	Rural-urban municipalities	47	23.5	23.5	76.0
	Urban municipalities	21	10.5	10.5	86.5
	Cities on district rights	5	2.5	2.5	89.0
	Districts	22	11.0	11.0	100.0
	Total	200	100.0	100.0	

Source: authors' work based on IBM SPSS version 29.

The control variable was type of local government (TYP). The above-mentioned financial indicators were based on data published by Statistics Poland in the Local Data Bank for the year 2022 except for variable level of debt above or below 60% of total revenues (DEB) for year 2022 who came from the CATI research. Statistical analyses were conducted using the IBM SPSS Statistic Program Version 29.

Table 2. List of independent variables used in the empirical analysis

No.	Variable symbol	Explanation of the variable	The expected direction of impact on awarding CPP by LGs
1	INC	Total income of LG per capita (up to PLN 5,500 – 1; from 5,500.01 to 6,000 – 2; from 6,000.01 to 6,500 – 3; from 6,500.01 to 7,000 – 4; from 7,000.01 to 7,500 – 5; over PLN 7,500.01 – 6).	positive
2	ORE	Total own revenue of LG per capita (up to PLN 2,000 – 1; from 2,000.01 to 2,500 – 2; from 2,500.01 to 3,000 – 3; from 3,000.01 to 3,500 – 4; from 3,500.01 to 4,000 – 5; over PLN 4,000.01 – 6).	positive
3	TOR	Total own revenue of LG (up to PLN 20,000,000 – 1; from 20,000,000.01 to 40,000,000 – 2; from 40,000,000.01 to 60,000,000 – 3; from 60,000,000.01 to 80,000,000 – 4; from 80,000,000.01 to 100,000,000.01 – 5; over PLN 100,000,000.01 – 6).	positive
4	TRE	Total revenue of LG (up to PLN 40,000,000 – 1; from 40,000,000.01 to 100,000,000 – 2; from 100,000,000.01 to 200,000,000 – 3; from 200,000,000.01 to 300,000,000 – 4; from 300,000,000.01 to 400,000,000 – 5; over PLN 400,000,000.01 – 6).	positive
5	OSR	Operating surplus of LG in relation to total revenues *100 (from -31% to -15% [-2]; from -14.99% to -0.01% [-1]; PLN 0% [0]; from 0.01 to 14.99% [1]; from 15% to 31% [2]).	positive
6	FII	Financial independence of LG as own revenues in total revenues *100(up to 35% – 1; from 35.01% to 40% – 2; from 40.01% to 45% – 3; from 45.01% to 50% – 4; from 50.01% to 55% – 5; over 55% – 6).	positive
7	EXP	Total expenditure of LG per capita (up to PLN 5,500 – 1; from 5,500.01 to 6,000 – 2; from 6,000.01 to 6,500 – 3; from 6,500.01 to 7,000 – 4; from 7,000.01 to 7,500 – 5; over PLN 7,500.01 – 6).	negative
8	IEX	Total investment expenditure of LG per capita (up to PLN 1 000 – 1; from 1,000.01 to 1,500 – 2; from 1,500.01 to 2,000 – 3; from 2,000.01 to 2,500 – 4; from 2,500.01 to 3,000 – 5; over PLN 3,000.01 – 6).	negative
9	TEX	Total expenditure of LG (up to PLN 40,000,000 – 1; from 40,000,000.01 to 100,000,000 – 2; from 100,000,000.01 to 200,000,000 – 3; from 200,000,000.01 to 300,000,000 – 4; from 300,000,000.01 to 400,000,000 – 5; over PLN 400,000,000.01 – 6).	negative

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No.	Variable symbol	Explanation of the variable	The expected direction of impact on awarding CPP by LGs
10	EPD	Total LG debt servicing expenditures (PLN 0 – 1; from 0.01 to 500,000 – 2; from 500,000.01 to 1,000,000 – 3; from 1,000,000.01 to 1,500,000 – 4; from 1,500,000.01 to 2,000,000 – 5; over PLN 2,000,000.01 – 6).	negative
11	DEF	Deficit of LG per capita (from PLN −2 900 to −1000 [−2]; from −999 to −0.01 [−1]; PLN 0 [0]; from 0.01 to 999 [1]; from 1,000 to 2,900 [2]).	negative
12	TDE	Total deficit of LG (from PLN −75,000,00 to −15,000,000 [−2]; from −14,999,999 to −0.01 [−1]; PLN 0 [0]; from 0.01 to 14,999,999 [1]; from 15,000,000 to 75,000,000 [2]).	negative
13	INV	Investment activity of LG as investment expenditures to total expenditures *100 (up to 15% – 1; from 15.01% to 20% – 2; from 20.01% to 25% – 3; from 25.01% to 30% – 4; from 30.01% to 35% – 5; over 35% – 6).	negative
14	DEB	Level of LG debt (above 60% of total income -1, below 60% of total income – 2)1.	negative
15	TYP	Type of LG (rural municipality – 1; urban-rural municipality – 2; urban municipality – 3; cities on district rights – 4; districts – 5).	positive

The strengths of proposed methodology are: i) a representative research sample of LGs, who awarded at least one CPP; ii) CATI research with the general treasurers or secretary of LGs; iii) the logistic regression model which predicts awarding CPP by LGs by analyzing the relationship with financial indicators; iv) a large sample of LGs (62) who awarded at least one CPP. This allowed for detailed examination whether financial situation of 62 out of 200 LGs (31%) influenced awarding a CPP.

Results of the research

Statistical results (see Table 3) showed that LGs who participated in the study had by average: i) 7,081 PLN of total income per capita (from 4,975 to 14,605 PLN); ii) 3,116 PLN of total own revenue per capita (from 1,553 to 11,409 PLN); iii) 66,878,066 PLN of total own revenue (from 5,587,429 to 788,733,769 PLN); iv) 137,596,963 PLN of total revenue (from 16,323,441 to 1,495,722,151 PLN; v) 7,176 PLN of total expenditure per capita (from 5,131 to 11,782 PLN); vi) 1,301 PLN of investment expenditure per capita (from 249 to 4,523 PLN); vii) 141,915,698 PLN of total expenditure (from 15 088 532 to 1 512 649 338 PLN); viii) 2,068,177 PLN of debt servicing expenditures (from 0 to 48,796,553 PLN); ix) – 95 PLN of total deficit per capita (from – 2,069 to 2,823 PLN); x) – 4,318,735 PLN of total deficit (from -73,134,902 to 33,576,833 PLN); xi) – 2% of operating surplus ratio (from – 31 to 19%); xii) 44% of financial independence (own revenues in total revenues *100) (from 23 to 78%); xiv) 17% of investment activity (investment expenditures to total expenditures *100) (from 4 to 41%). Moreover, 97% of all LGs who participated in the study, had the level of debt below 60% of their total revenues for 2022 (see Table 4).

Table 3. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Dev.
INC	200	4975	14605	7081	1181.58
ORE	200	1553	11409	3116	972.73
TOR	200	5587429	788733769	66878066	109186295.01
TRE	200	16323441	1495722151	137596963	208622767.77
EXP	200	5131	11782	7176	1184.37

[1] Authors deliberately have chosen the level of LG debt above or below 60% of total income instead of individual debt ratio according to Article 243 paragraph 1, item 4 of the Public Finance Act, which since 2014 has replaced the above-mentioned limits of debt to total income.

DOI: 10.34659/eis.2024.91.4.985

	N	Minimum	Maximum	Mean	Std. Dev.
IEX	200	249	4523	1301	751.99
TEX	200	15088532	1512649338	141915698	214974033.83
EPD	200	0	48796553	2068177	5036932.06
DEF	200	-2069	2823	-95	582.16
TDE	200	-73134902	33576833	-4318735	12243068.15
OSR	200	-31	19	-2	7.12
FII	200	23	78	44	9.94
INV	200	4	41	17	7.51
Valid N (listwise)	200				

Source: authors' work based on IBM SPSS version 29.

Table 4. Level of debt above 60% of total revenues (DEB)

DEB					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00 (Yes)	6	3	3	3
	2.00 (No)	194	97	97	100
	Total	200	100.0	100.0	

Source: authors' work based on IBM SPSS version 29.

Pearson correlation coefficient was performed between independent variables, such as INC, ORE, TOR, TRE, EXP, IEX, TEX, EPD, DEF, TDE, OSR, FII, INV and dependent variable of CPP. Surprisingly, only TRE and TEX were correlated with a dependent variable of CPP (see Table 5). These correlations were significant at the 0.05 level (two-tailed).

Table 5. Pearson Correlation

CPP	Pearson Correlation	Sig. (2-tailed)	N
INC	0.006	0.936	200
ORE	0.102	0.150	200
TOR	0.118	0.097	200
TRE	0.156*	0.027	200
EXP	0.036	0.615	200
IEX	-0.019	0.792	200
TEX	0.160*	0.023	200
EPD	0.090	0.206	200
DEF	-0.102	0.150	200
TDE	-0.111	0.119	200
OSR	-0.099	0.162	200
FII	0.067	0.349	200
INV	-0.052	0.464	200

* Correlation is significant at the 0.05 level (2-tailed).
Source: authors' work based on IBM SPSS version 29.

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For control variable and independent variable (categorical ones) the so-called contingency table was prepared, and Cramer's V coefficient was chosen to evaluate the relationship between dependent variable of CPP and the type of local government (TYP) as control variable and level of debt above 60% of total revenues (DEB) as independent variable. Surprisingly, the type of local government and level of debt above 60% of total revenues were not related to the number of CPP awarded by LGs (see Table 6). This meant that all: rural, urban-rural, urban municipalities, cities on district rights and districts were similarly active in awarding CPP.

Table 6. Contingency Coefficient

CPP		TYP	DEB
Nominal by Nominal	Phi	0.175	-0.055
	Approximate Significance	0.191	0.441
Nominal by Nominal	Cramer's V	0.175	0.055
	Approximate Significance	0.191	0.441
N	200	200	200

Source: authors' work based on IBM SPSS version 29.

The logistic regression was performed to estimate the probability of an event occurring, such as LG's awarding CPP or not, based on a given financial indicators, such as TRE and TEX. This event is represented by the random variable Y, and we record occurrence by $Y = 1$ and non-occurrence by $Y = 0$. The logistic model according to Kleinbaum and Klein (2010) methodology is based on the following logistic function:

$$f(z) = \frac{1}{1+e^{-z}}, \tag{1}$$

To obtain the logistic model from the logistic function, we express z as the linear sum α plus β_1 times X_1 plus β_2 times X_2, and so on to β_k times X_k, where the X_k are independent variables (financial indicators) such as level of total revenue (X_1); level of total expenditure (X_2); and α and the β_i are constant terms representing unknown parameters.

$$z = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_k X_k, \tag{2}$$

We substitute the linear sum expression for z in the right-hand side of the formula for f(z). The probability being modelled can be denoted in terms of the following:

$$P(D = 1 \mid X_1, X_2, \ldots, X_k) \tag{3}$$

Further, the logistic model for the probability of awarding CPP by LGs may be as following:

$$P(D = 1 \mid X_1, X_2, \ldots, X_k) = \frac{1}{1+e^{-(\alpha+\sum \beta_i X_i)}}. \tag{4}$$

Logistic regression analysis is the most frequently used modelling approach for analysing binary response variables however when dealing with binary data in ecology or CPP, it happens that the number of observations with ones ($Y = 1$) is much smaller than the number of observations with zeros ($Y = 0$) and both unbalanced as well as balanced data has been used in the literature for fitting logistic regression models (e.g. Salas-Eljatib et al., 2018; Young et al., 2017; Jones et al., 2010). Instead of balancing data by some rule (which may be debatable), we decided to weight data and perform weighted logistic regression, assigning different weights to each class based on their prevalence in

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the dataset. The higher weights were assigned to the minority class and lower weights to the majority class, thus, the model was encouraged to pay more attention to the minority class, thereby reducing the bias towards the majority class and focusing on correctly classifying instances from the minority class. This improved the model's ability to predict rare events. Later, the logistic regression model was evaluated with tests of model fit as Hosmer-Lemeshow goodness-of-fit statistic, choosing the right model according to automated variable selection and ROC curve with assessing area under the ROC curve.

Independent variables, which were correlated with dependent variables such as TRE and TEX, were introduced into the model. The research hypothesis has not been confirmed because only one introduced financial indicator, the TEX, was statistically significant and had a positive instead of a negative influence on awarding CPP, while TRE was statistically insignificant. We fitted the logistic regression model by maximum likelihood. The model based on TEX in 73.9% of the cases was able to predict not-awarding CPP by LGs and in 43.5% of the cases of awarding CPP by LGs. The overall percentage of correct prediction was 59.5% (see Table 7).

Moreover, the Hosmer and Lemeshow test confirmed that the chosen model fits well with the data. Goodness-of-fit statistics helped to determine whether the model adequately describes the data. The Hosmer-Lemeshow statistic indicated a poor fit if the significance value is less than 0.05. As in our case, the fit was 0.408, well above 0.05, thus confirming the validity of our model.

Receiver operating characteristic (ROC) analysis enabled the assessment of the accuracy of model predictions by plotting sensitivity versus (1-specificity) of a classification test (IBM, 2021) (see Figure 1). The area under the curve was 0.599 with a 95% confidence interval (0.513, 0.685). Also, the area under the curve was significantly different from 0.5 since the measured p-value was 0.024, meaning that the logistic regression classified the group significantly better than by chance.

Table 7. Logistic regression analysis

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	7.456	2	0.006
	Block	7.456	2	0.006
	Model	7.456	2	0.006

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	355.004a	0.028	0.037
a Estimation terminated at iteration number 4 because parameter estimates changed by less than 0.001.			

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	2.898	3	0.408

Classification Tablea					
Observed CPP 1.00 (No) 2.00 (Yes)			Predicted		
			Percentage Correct		
Step 1	CPP	1.00 (No)	102	36	73.9
		2.00 (Yes)	70	54	43.5
	Overall Percentage				59.5
a. The cut value is 0.500					

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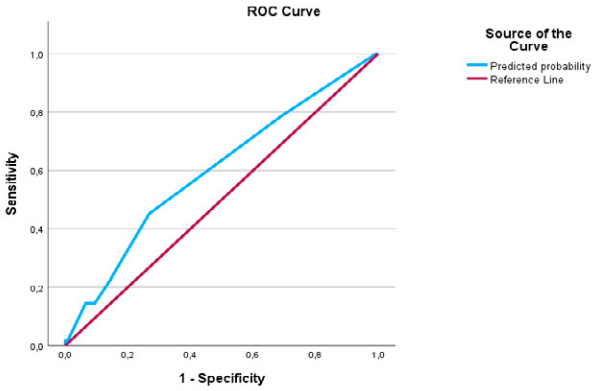
Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1a	TEX	0.234	0.088	7.121	1	0.008	1.263
	Constant	-0.686	0.249	7.582	1	0.006	0.504
a. Variable(s) entered on step 1: REV, EFU.							

Variables not in the Equation					
			Score	df	Sig.
Step 1	Variables	TRE	0.223	1	0.636
	Overall Statistics		0.223	1	0.636

Source: authors' work based on IBM SPSS version 29.



Area Under the ROC Curve				
Test Result Variable(s):				
Area	Std. Errora	Asymptotic Sig.b	Asymptotic 95% Confidence Interval	
		Lower Bound	Upper Bound	
0.599	0.044	0.024	0.513	0.685
The test result variable(s): Predicted probability has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.				
a. Under the nonparametric assumption		b. Null hypothesis: true area = 0.5		

Figure 1. ROC Curve

Source: authors' work based on IBM SPSS version 29.

Discussion

This study examined the financial indicators (independent variables) like: i) level of income per inhabitant; ii) level of own revenue per inhabitant; iii) level of total own revenue; iv) level of total revenue; v) level of expenditure per inhabitant, vi) level of investment expenditure per inhabitant; vii) level of total expenditure; viii) level of debt servicing expenditures; ix) level of deficit per inhabitant; x) level of total deficit; xi) level of operating surplus ratio; xii) level of financial independence; xiii) level of investment expenditures to total expenditures; xiv) level of debt above 60% of total revenues. Variables that correlated with awarding CPP by LGs namely level of total revenue and level of

DOI: 10.34659/eis.2024.91.4.985

total expenditure were introduced into the model and logistic regression was performed. The level of total own revenue, level of debt servicing expenditures, level of total deficit, level of operating surplus ratio, level of financial independence, level of investment activity or level of debt above 60% of total revenues, did not matter for awarding CPP. Surprisingly, LGs with deficits, lack of operating surplus ratio or low level of financial independency, were as active in awarding CPP as LGs with no deficit, high level of operating surplus ratio or high level of financial independence.

According to an OECD report (2021), Polish LGs are key public investors responsible for 50.2% of total public infrastructure investments in Poland. Furthermore, Polish LGs fund it, with the highest share among Central European countries, from their own resources (OECD, 2021). Similarly, Sierak (2019) argued that the key reason for Polish LGs to go into debt is the municipal infrastructure gap in Poland in terms of public investments. This situation in Poland may have influenced the awarding of CPPs by Polish LGs due to a lack of resources, as CPPs are more complex than "regular" PPs and, thus, often more expensive. Surprisingly, the results of our study showed that as many as 31% of LGs who participated in the study (62 out of 200) were awarded at least one CPP based on environmental, economic, and social criteria. Meanwhile, Lerusse and van de Walle (2022) argue that awarding PP based on non-price criteria relates to LG politicians' preferences as ideological reasoning and, to a limited extent, to strategic reasoning. Nonetheless, LG politicians' preferences were not the subject of this study and thus cannot be commented on. In addition, Uryszek (2013) stressed that LGs use public debt to finance their investments, and many LGs acquired huge deficits and are near the maximum level of debt allowed under Polish law. This may explain why the majority of Polish LGs were reluctant to award CPP, which is usually more expensive than "regular" PP. Moreover, the limited financial resources of LGs or their lack may disallow circular or sustainable purchasing attitudes among LGs. Conversely, as mentioned above, studied LGs with deficits were as much active in awarding CPP as LGs with no deficit.

According to Jastrzębska (2023b), increasing expenditures by, for example, awarding CPP may have a negative impact on LGs and voivodeships fiscal health. However, the conducted study revealed that the higher the level of LGs expenditure, the more eager LGs were in awarding CPP. So, our results showed that LGs were not concerned about their fiscal health.

Kowalska (2022) underlined that in 2022, the value of the operating surplus in all types of Polish LGs and voivodeships had a significant decline. This may explain why the level of operating surplus in relation to total revenues of LGs had no statistical impact on our results on awarding CPP. LGs who participated in our study were similarly active in awarding CPP regardless of whether their operating surplus ratio was – 31% or 19%. The above-mentioned decline, according to Kowalska (2022), may also have an impact on LG's capacity to finance investments from the operating surplus. This corresponds with our findings that the investment activities of LGs did not have any statistical impact on awarding CPP.

Bąk et al. (2023) underlined that undertaking sustainable and "green" investments depends on financial possibilities, which are spatially differentiated according to the type of local government and their seat in particular districts, especially among urban and rural municipalities. Thus, awarding CPP based on circular evaluation criteria, i.e. sustainable and "green" ones, should also be spatially differentiated according to the type of local government. However, according to the results of our studies, rural or urban-rural municipalities were as active as cities on district rights or districts in awarding CPP. So, in our case, spatial differentiation among LGs, according to the type, did not matter for awarding CPP.

Dziekański et al. (2022) argued that the financial situation of Polish voivodeships (regional government) has a negative relationship with a green economy and that the financial situation of voivodeships may be a barrier to the transition towards a green economy (or circular economy). In our study of LGs, voivodeships as representatives of regional government were not covered. However, we did not observe a negative relationship between the financial situation of LGs and the awarding of CPP (considered the same as GPP by many scholars). Surprisingly, only the total level of LG expenditures and the total level of LG revenues were positively correlated with awarding CPP. However, in further logistic regression analysis, the total level of LG revenues turned out to be statistically insignificant. The conducted study revealed that only LGs with a higher level of LG expenditures were more active in awarding CPP. Other financial indicators were not correlated with the awarding of CPP by LGs.

DOI: 10.34659/eis.2024.91.4.985

Interestingly, Rodriguez Bolivar et al. (2014), based on an analysis of 116 LGs in Spain, stated, in contrast to our results, that deficit of LGs is a key indicator of their financial sustainability and may determine undertaking activities like supporting sustainable development or awarding CPP, indicating that deficit-free LGs should be more eager to award CPP then LGs with annual deficit. In contrast, our results showed, that deficit did not matter for LGs in awarding CPP and LGs with deficit were as active in awarding CPP as LGs with no deficit.

Wuni (2022), based on the analysis of barriers in the scientific literature for circular economy adoption in the construction industry, highlighted that the most cited barriers were the higher upfront investment costs connected with circular economy or lack of central government financial support mechanisms for circular economy. So, LGs with higher investment expenditures should be less eager to award CPP. Our results contradicted those findings because LGs with higher level of investment expenditures were as active in awarding CPP as LGs with low level of investment expenditures.

Malinowski (2022) emphasised that Polish municipalities and cities on district rights financial situation may be affected by the amount and structure of LGs revenues, which was in line with our findings, or by their ability to make proper use of repayable resources that influence LGs capacity to fulfill their tasks, or in our case award CPP. In the current study, the level of LGs revenues was positively correlated with awarding CPP by LGs.

Cheng et al. (2018), in line with our results, argued that transformation towards a circular economy through CPP is in a nascent stage. However, Dimand and Cheng (2023) highlighted that GPP or CPP may be an innovative, often overlooked, and strategic management tool for LGs. Unfortunately, LGs have a problem with internal incapacity to see long-term cost-benefits of maintenance, repair, remanufacture or recycling of purchased goods provided by CPP, focusing instead only on the current purchasing costs (Bratt et al., 2013). Meanwhile, Patrucco et al. (2019) emphasised that what matters for LGs is the organisational model of PP as authoritative procurement, silo procurement or local procurement. So moderate amount of awarded CPP by Polish LGs may be also explained by lack of an organisational model tailored to the specificity of CPP.

Conclusions

This study provides a comprehensive view on the phenomena of CPP awarded by LGs in Poland as a possible accelerator of transformation towards local circular economy in a context of LGs limited financial resources, discussed with findings from other countries. LGs struggle to find necessary financial resources for increasing demand for higher quality public services, activities needed to achieve local sustainable development goals or to support transformation towards circular economy through CPP. This study highlighted that awarding of CPP by LGs is gaining on popularity year by year. In 2023, as many as 31% of LGs (62 out of 200) who participated in the study awarded at least one CPP compared to study done in year 2021 by Godlewska and Godlewski (2024), when only 2.06% of LGs (12 out of 581 of LGs who participated in the study) awarded at least one CPP.

The authors' contribution to filling the gap of knowledge in research of CPP and circular economy concept and LGs financial situation was done by revealing that the proposed model based on financial indicators of LGs, was able to predict non-awarding CPP by LGs in 73.9% of the cases and awarding CPP by LGs in 43.5% of the cases. The overall percentage of correct prediction was 59.5%. Hence, the authors found that the main goal of their paper, which was to indicate how financial situation of LGs corresponds with awarding CPP, was fulfilled.

Surprisingly, exclusively, the total level of LG expenditures and total level of LG revenues were positively correlated with awarding CPP by LGs. However, further logistic regression analysis indicated the significance of only the total level of LG expenditures, thus suggesting that the higher the level of LG expenditures, the more eager LGs are to award CPP. Other financial indicators were not correlated with the awarding of CPP by LGs.

Today awarding CPP is usually much more expensive than "regular" PP due to a variety of reasons, like lack of inexpensive technologies enabling fast and cheap recycling, refurbishing or reusing of previously produced goods or modest fees for environmental pollution. This makes creation of environmental pollution more profitable for entrepreneurs when compared to the cost of implemen-

DOI: 10.34659/eis.2024.91.4.985

tation of environmentally clean technologies. Without financial support or more stringent waste management costs introduced at the level of central government, which will mitigate the gap in cost between "regular" PP and CPP, the introduction of circular economy principles will be limited both in scale and in the region.

Furthermore, central government should introduce at least some mandatory CPP award criteria for public procurements above national thresholds. Similar action should be considered by the European Union for public procurements above European thresholds.

Finally, further investigation is required to identify other indicators that may influence LGs decisions towards awarding CPP and whether CPP award criteria and CPP contract clauses support conversion towards a circular economy.

The contribution of the authors

Conceptualisation, M.G. and M.M.G.; literature review, M.G.; methodology, M.G.; formal analysis, M.G.; writing, M.G. and M.M.G.; conclusions and discussion, M.G. and M.M.G.

The authors have read and agreed to the published version of the manuscript.

Notes

[1] Scholars like Sönnichsen and Clement (2020) or Alhola et al. (2019) underline the equality between terms: green public procurements, sustainable public procurements and circular public procurements.

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WPŁYW SYTUACJI FINANSOWEJ JEDNOSTEK SAMORZĄDU LOKALNEGO NA UDZIELANIE ZAMÓWIEŃ PUBLICZNYCH O OBIEGU ZAMKNIĘTYM. W KIERUNKU ZRÓWNOWAŻONEGO ROZWOJU

STRESZCZENIE: W artykule zweryfikowano związek pomiędzy sytuacją finansową jednostek samorządu lokalnego (JST) a udzielanymi przez te jednostki zamówieniami publicznymi o obiegu zamkniętym. Badanie zostało przeprowadzono na reprezentatywnej dla całej populacji próbie 200 polskich JST (powiatów, miast na prawach powiatów, gmin miejskich, miejsko-wiejskich i wiejskich) w doborze losowo-warstwowym. Analiza regresji logistycznej została zastosowane do przewidzenia binarnego wyniku udzielania (lub nieudzielenia) cyrkularnych zamówień publicznych (zmienna zależna) przez JST w zależności od zdefiniowanych wskaźników finansowych tych jednostek (zmienne niezależne). Wyniki badania CATI pokazały, że im wyższy poziom wydatków ponoszonych przez JST tym chętniej udzielają one cyrkularnych zamówień publicznych. Co zaskakujące, JST z deficytem, brakiem nadwyżki operacyjnej lub niskim poziomem niezależności finansowej były tak samo aktywne w udzielaniu zamówień publicznych o obiegu zamkniętym jak JST bez deficytu, z wysokim poziomem nadwyżki operacyjnej lub wysokim poziomem niezależności finansowej.

SŁOWA KLUCZOWE: lokalna gospodarka o obiegu zamkniętym, zamówienia publiczne o obiegu zamkniętym, sytuacja finansowa jednostek samorządu lokalnego, rozwój zrównoważony

DOI: 10.34659/eis.2024.91.4.985