Spatial Distribution of JESSICA Funding Across Polish Municipalities. Perspective of Territorial Dimension of EU Cohesion Policy

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Piotr Idczak

Poznań University of Economics and Business, al. Niepodległości 10, 61-875 Poznań;
e-mail: piotr.idczak@ue.poznan.pl; ORCID: 0000-0002-3754-8956

Karol Mrozik

Poznań University of Life Sciences, Department of Land Improvement, Environmental Development and Spatial Management, ul. Piątkowska 94, 60-649 Poznań; e-mail: karol.mrozik@up.poznan.pl;
ORCID: 0000-0003-2169-5430

Ida Musiałkowska

Poznań University of Economics and Business, al. Niepodległości 10, 61-875 Poznań;
e-mail: ida.musialkowska@ue.poznan.pl; ORCID: 0000-0002-7054-7648

Abstract

The JESSICA initiative was set up to provide a more sustainable and efficient response to the needs of urban areas, as compared to non-repayable grants. Anchored in the literature on place-based policy and territorial cohesion, this paper addresses the question how the JESSICA funds were allocated among Polish cities – whether, intuitively, only to key urban centres, or to smaller cities as well. The results illustrate that the repayable assistance of JESSICA was dispersed throughout the regions, although the degree of dispersion remains mixed across them. Almost half of the JESSICA funds was transferred to small and medium-sized cities. It was also found that the bulk of the assistance went to the projects that were implemented in cities situated within metropolitan areas of the regional capital cities.

Keywords

JESSICA initiative, Cohesion Policy, territorial cohesion, cities, standard deviational ellipse, Poland

Rozkład przestrzenny pomocy finansowej JESSICA między polskimi miastami. Perspektywa wymiaru terytorialnego polityki spójności UE

Streszczenie

Inicjatywa JESSICA została ustanowiona w celu zapewnienia bardziej zrównoważonej i efektywnej – w porównaniu do tradycyjnych dotacji bezzwrotnych – odpowiedzi polityki spójności UE na potrzeby obszarów miejskich. Niniejszy artykuł, odwołujący się do literatury poświęconej polityce ukierunkowanej terytorialnie i spójności terytorialnej, odpowiada na pytanie, w jaki sposób wsparcie JESSICA było rozdysponowane wśród polskich miast – czy trafiło tylko do kluczowych ośrodków miejskich, czy skorzystały również mniejsze miasta. Wyniki wskazują, że pomoc zwrotną JESSICA rozdzielano w sposób stosunkowo rozproszony w ramach poszczególnych regionów, chociaż stopień rozproszenia był zróżnicowany. Blisko połowa dostępnej alokacji JESSICA trafiła do małych i średnich miast. Stwierdzono także, że większość pomocy przyznano na realizacje projektów zlokalizowanych w miastach położonych w obrębie obszarów metropolitalnych stolic wojewódzkich.

Słowa kluczowe

inicjatywa JESSICA, polityka spójności, spójność terytorialna, miasta, elipsa odchyleń standardowych, Polska

Introduction

The essence of the place-based approach implies that the development policy should aim to boost the competitive capacities of regions through development of their cities. In this light, cities are treated as drivers of development and economic growth that will inevitably spread from them through city networks and polycentric structures to small cities and then to surrounding areas (Rauhut and Humer 2020, pp. 2118–2120). Hence, the revision of the Cohesion Policy (CP) model of intervention from cohesion to competition and from weaker regions to cities stressed the greater importance of cities and urban agglomerations in bringing better results to regional development (Hamza et al. 2014). Several studies have shown that not only capital or other larger cities are at the forefront of generating economic growth and creating jobs, even though their role remains constantly significant in the national economy. Camagni and Capello (2015) in their research found that second-rank cities have become the crucial driving forces in national economic performance, and the intervention policies aimed at strengthening them seem to be more expansionary and especially more cohesive than the strategy focused on the concentration of public spending in larger cities.

Although cities and urban agglomerations have often been described as engines of economic growth and development for regions and countries, the same market forces that make them thriving and well performing may also result in the occurrence of intra-urban inequalities and the interlinked deprivations related to spatial variations among urban settlements. It is indeed important to acknowledge that cities also face a serious threat of economic stagnation or even decline (European Commission 2011; OECD 2018). Alongside the unprecedented growth in recent decades, cities are considered as the main locus of acute problems such as ageing, unemployment, exclusion, segregation, etc. A comparison of European cities' situation indicates that they suffer, to a varying degree, from the increasing share of the population at risk of poverty, low work-intensity households and post-industrial areas triggered due to increased global competitiveness challenges (Budde et al. 2010; Colini et al. 2013). Continuous depopulation, coupled with an intense process of suburbanisation, as well as growing social disparities also remain serious concerns for urban development in Poland. The progressive degradation of urban infrastructure and adverse demographic changes not only have a negative impact on the local labour market but also discourage businesses from investing (Jarczewski and Ziobrowski 2010; OECD 2011; Stryjakiewicz et al. 2012). In fact, these manifold urban changes concern various areas of public life, and their underlying causes are undoubtedly of a structural nature. Most importantly, however, these urban changes reflected in increasing inequalities become primarily very visible at the spatially concentrated levels of cities and their surroundings.

Given the urgent needs for urban regenerative measures aimed at increasing the liveability levels of deprived areas, the European Commission introduced the JESSICA initiative (*Joint European Support for Investments in City Areas*) in the financial perspective 2007–2013, as part of the CP. Since the public possibilities of spending to address the structural needs of cities still remain constrained, JESSICA has provided financial resources available on a repayable and recyclable basis that are complementary to the traditional grant-based funds. The aim was to revolve funds and thereby increase the financing capacity of the CP as well as create a scope for cooperation between various CP stakeholders involved in urban interventions (Musiałkowska and Idczak 2020). The literature review revealed only few studies which explicitly dealt with the importance of JESSICA for the transformation of urban areas, focusing mainly on qualitative research (see e.g. Dąbrowski 2014; Fotino 2014; Musiałkowska and Idczak 2018b), examining its institutional framework (Bode 2015; Nadler and Nadler 2018) or analysing the projects' repayability of JESSICA funding and their abilities to counteract urban decay (Musiałkowska and Idczak 2018a, 2020; Idczak and Musiałkowska 2019; Idczak et al. 2019). So far, however, there has been no discussion about the spatial allocation of JESSICA funding within particular regions. On account of the fact that the decisive criterion to obtain a JESSICA loan was the project's capacity to ensure the repayability of JESSICA funding, it may be assumed as follows: (i) the spatial factor is inadequately or not at all taken into account in the spending of JESSICA funding at regional level, (ii) JESSICA funding is mostly allocated to projects characterised by high financial and/or economic profitability, which may presumably imply that, (iii) the main beneficiaries of this kind of repayable assistance are the

strongest regional growth centres, namely, the largest cities. Such reasoning can be justified in particular in the light of the findings delivered by several studies (Smętkowski 2011; Churski et al. 2015; Murzyn 2018) which have suggested that the financial support from EU funds in Poland is focused on major economic development nodes created by the leading cities. Therefore, by addressing these questions, this paper seeks to broaden the current knowledge of the spatial allocation of EU funds with an emphasis on the repayable financial means provided by the JESSICA initiative.

The primary aims of this study are threefold. First, it explores the spatial allocations of JESSICA funding across cities within particular JESSICA regions. Though there is a "natural" tendency towards the accumulation of the EU funds around key urban centres, we set out to ascertain the extent to which smaller cities may also benefit from this instrument. Secondly, it attempts to determine whether the city size matters in terms of the project's capacity to ensure the repayability of JESSICA funding. In a study investigating JESSICA initiative, Idczak and Musiałkowska (2019) reported that the highest capacities to generate revenues on the basis of their primary business activities, and in such a way to ensure the repayment of the JESSICA loan, have projects of a high value and executed by private entities. Nevertheless, the main limitation in their study is that they did not make an attempt to take the city size into account. Finally, the study's uniqueness lies in applying a methodology that uses a geoprocessing tool to cope with the relatively small number of cases of JESSICA projects at regional level. The advantage of such a solution is that it allows to obtain further in-depth information on the spatial dependencies on the allocation of JESSICA funding, and consequently it complements the gaps identified in previous studies. By doing so, this study bridges a noticeable gap in the available literature and expands the spatial scope of research on financial engineering instruments.

This paper is organised as follows. The next section discusses the background to the debate regarding the urban contribution to growth under the CP and the role of JESSICA in stimulating urban development. The third section introduces the research methods and justifies their implementation. The fourth section analyses the data to examine the spatial dependencies of JESSICA funding. Our conclusions are drawn in the final section.

1. Cohesion policy and cities – towards territorial cohesion

The overarching objective of the European Union's (EU) Cohesion Policy is to promote harmonious development of its regions and cities in order to achieve continuous, coherent and sustainable development throughout the entire Community. More specifically, the EU makes every endeavour to support balanced economic, social and territorial development across all European regions, in particular those "lagging behind". It must, however, be acknowledged that a change in the CP has been observed in the last decade towards turning into an approach that builds on an territorial context and enhances an endogenous competitive potential of regions (Barca et al. 2012). This signifies a shift from traditional policy focused on reducing the disparities in socio-economic development between the EU's regions through sectoral interventions (subsidies targeted at relevant entities) to a place-based approach in which policy measures and financial resources are tailored to specific places (Szlachta and Zaucha 2010).

The territorial cohesion goal, as such, was introduced to the EU Treaty in 2009 and it was the latest goal to be defined when analysing the CP as a whole. The concept of territorial cohesion referred to the European Commission (EC) "Green Paper on Territorial Cohesion—Turning territorial diversity into strength" published in 2008. The definition of territorial cohesion was rather vague, but three main policy responses towards the above-mentioned balanced and harmonious development were proposed: (1) Concentration: overcoming differences in density; (2) Connecting territories: overcoming distance, and (3) Cooperation: overcoming division (European Commission 2008). One should note that, according to the literature, an accumulation of resources in an area with a high density of different activities may also lead to negative externalities such as e.g. traffic congestion, pollution, price increases and a lack of affordable housing, urban sprawl, rising costs of urban infrastructure, social tensions and higher crime rates, a degraded environment, health problems and as a result a reduced quality of life, that is, phenomena that frequently are related to overcrowding (Castells-Quintana and Royuela 2014; Duranton and Kerr 2018). In this context,

Medeiros (2019) argues that the EC (2008) identified in a non-explicit way several urban problems to be dealt with when implementing territorial cohesive policies, namely: "avoiding diseconomies of very large agglomerations and urban sprawl processes, combating urban decay and social exclusion, avoiding excessive concentrations of growth, promoting access to integrated transport systems and creating metropolitan bodies". In another study, Medeiros and Rauhut (2020) analyse Iberian and Nordic examples of "territorial cohesion cities" – development hubs – and underline the importance of not only metropolitan areas, but also the role of medium towns as crucial points in achieving territorial cohesion within a country. The second-tier cities should be recipients of investment triggered by wise policy-making that allow for overcoming their "lagging-behind" position. In their study, Bradley and Zaucha (2017) call territorial cohesion a missing link between economic growth and welfare.

Therefore, the recent findings have led the authors to the formulation of one of the aims of the paper on the relation between the size of the city and its ability to implement JESSICA projects and repay loans. The authors are aware of the fact of parallel appearance of possibilities in the use of JESSICA funds and the concepts and definitions of territorial cohesion. However, the findings may fuel the academic debate and the dialogue with policy-makers on the necessity of tailoring policy solutions to particular places.

2. Data and research methods

The data for this study come primarily from the personally compiled database of all JESSICA projects implemented in Poland in 2007–2015. The essential part of data originate from the Marshal Offices (*urzędy marszałkowskie*) of all the regions implementing the JESSICA initiative and institutions acting as managers of the Urban Development Funds. Since the data obtained in this way were of a general nature and did not exhaust the needs of the study, additional records were obtained from other sources. For instance, the data on beneficiary entities were matched with the National Court Register database in order to gain additional information on their legal form. Moreover, the data concerning the location of projects were acquired as a result of a wide-ranging analysis of publicly available information on all JESSICA projects, including information accessed through the internet and based on field studies. This, in turn, made it possible to carry out e.g. geocoding and, consequently, to convert a text-based description of the project locations into geographic coordinates (latitude and longitude). The remaining data come from the examination of other sources (multiple online resources), such as project descriptions, policy reports, but were also obtained by the participatory observation method and interviews. The source material collected in this way was properly edited, processed and entered into the database in the form of statistical variables.

When deciding on which procedure to apply for this analysis, two main aspects are relevant. The methods must be able to properly handle a relatively small population of the JESSICA projects and reveal whether the city size is of significance for the project's capacity to ensure the repayability of JESSICA funding. Therefore, following this paper's line of reasoning, we use two different methods. First, to analyse the spatial relationships of JESSICA projects, we employ the directional distribution method (standard deviational ellipse – SDE). Second, it was decided that the best procedure for the second aspect of the investigation was to show the characteristics of JESSICA projects with regard to the city size by mapping the aesthetics in a certain plot to the specific variables in our dataset. When it comes to the former method, it allows a prior mapping of projects to provide visual insights into the data that due to many reasons may not otherwise be apparent. The SDE is widely employed in many research fields mainly to explore the geographical distribution of some phenomena and thereby to detect a relationship with particular characteristics that are of interest to the investigation. As a spatial statistics method, it can be used to uncover accurately the economic characteristics of spatial distribution. Consequently, it may be conducive to promoting the policy formulation in response to the identified dependencies (Wang et al. 2015).

Overall, the SDE reflects the characteristics of the entirety of the spatial distribution of particular elements under investigation. It shows an average location, dispersion (concentration) and orientation of a specific data set (points) in a relatively simple and clear manner (Yuill 1971). In this case, the SDE was chosen to gain insights into the spatial distribution of JESSICA projects,

using geographic coordinates (the longitude – x_i, and the latitude – y_i) with the weight of the value of JESSICA projects and the value of JESSICA loans. Drawing on Yang and Grigorescu's work (2017), the computation formulas presented below are expressed as follows (separately for each of the regions):

Average location *(Mean Centre)*

$$\overline{x_w} = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i}, \quad \overline{y_w} = \frac{\sum_{i=1}^{n} w_i y_i}{\sum_{i=1}^{n} w_i} \tag{1}$$

Azimuth angle

$$tan\theta = \frac{\left(\sum_{i=1}^{n} w_i^2 x_i^2 - \sum_{i=1}^{n} w_i^2 \widetilde{y_i^2}\right) + \sqrt{\left(\sum_{i=1}^{n} w_i^2 \widetilde{x_i^2} - \sum_{i=1}^{n} w_i^2 \widetilde{y_i^2}\right)^2 + 4\sum_{i=1}^{n} w_i^2 \widetilde{x_i^2}\,\widetilde{y_i^2}}}{\sum_{i=1}^{n} w_i^2 \widetilde{x_i^2}\,\widetilde{y_i^2}} \tag{2}$$

Standard deviational distance of x

$$\sigma_x = \sqrt{\frac{\sum_{i=1}^{n} \left(w_i x_i - w_i x_i\right)}{\sum_{i=1}^{n} w_i x_i}} \tag{3}$$

Standard deviational distance of y

$$\sigma_y = \sqrt{\frac{\sum_{i=1}^{n} \left(w_i \widetilde{x_i} \cos\theta - w_i \widetilde{y_i} \sin\theta\right)^2}{\sum_{i=1}^{n} w_i^2}} \tag{4}$$

where x_i and y_i are the geographic coordinate data (respectively longitude and latitude), the value w_i refers to the quantity of the phenomenon being mesured at the *i* th point, and here it represents the value of JESSICA projects and the value of JESSICA loans. Finaly, *i* means a given JESSICA project. The study uses the SDE method to carry out a spatial analysis for JESSICA projects in each region separately. The calculation was performed using the *ArcGIS* sofware.

Turning now to the second method which was applied to reveal the dependence between the city size and the allocation of JESSICA funding as well as the project's capacity to ensure the repayability of JESSICA loans, we constructed a faceted scatterplot with all the variables involved. To this end, we used exploration tools available in the *R* environment. The three variables, namely: (1) value of the JESSICA projects and value of the JESSICA funding (loan), (2) class of the city size[1], (3) the project's capacity to ensure the repayability of JESSICA funding[2], were mapped to the visual properties (aesthetics) of the geometric objects (geoms) in a five-facet scatterplot. The particular facets display the subset of data for each of the JESSICA regions.

[1] All cities being recipients of JESSICA projects were divided into four classes depending on their populations. The population figures provided by Statistics Poland are based on the data from 2010 because this year can be considered as the starting year for the practical implementation of the JESSICA initiative. The classification of cities was based on the conceptual framework proposed by Runge (2012, p. 84). However, it was slightly modified so as to add one class more suggested in the Concept of the National Spatial Planning 2030 (CNSP 2012). As a result, the city classes are as follows: small cities (I) – less than 20,000 population, medium-size cities (II) – with 20,000 and less than 100,000 population, large cities (III) – with 100,000 and less than 300,000 population, extra-large cities (IV) – over 300,000.

[2] The term "repayability" refers throughout this study to the term "revenue-generating project" as defined by Musiałkowska and Idczak (2018a, p. 146). This is predicated upon the assumption that most of projects generating revenues on the basis of their primary business activities are able to ensure the repayment of JESSICA loan, while non-revenue-generating projects are required to guarantee reimbursement in the form of other operating revenue secured directly by investors from other sources. Due to the non-availability of the full projects' financial data, this variable has a form of a binary variable with integer values assigned as follows: 1 means "the project's capacity to ensure the repayability of JESSICA funding", and 0 otherwise.

3. Main results and discussion

This section presents the key empirical findings stemming from the study, consisting of the following: (1) discovering spatial dependencies through the SDE as a GIS technique for delineating the geographical distribution trend of the features of interest under study; (2) examining the spatial allocation of JESSICA funding across Polish cities with a view to investigating whether this kind of funding supported the implementation of the urban projects in cities of differing sizes in the five regions.

As noted, SDEs can be calculated on the basis of the locations of the features or some attribute values associated with the features. To put it simply, by drawing the features on a map one may get orientation, however, by computing SDEs one may receive a clear trend. Figure 1 shows the location of JESSICA projects in Poland as well as the standard deviational ellipse calculated for three aspects, i.e. the location of JESSICA projects, their total value and the value of JESSICA loan granted to particular projects. First, it highlights that JESSICA projects are scattered across the JESSICA regions, that is, are placed in different cities of regions, not only in the capital cities.

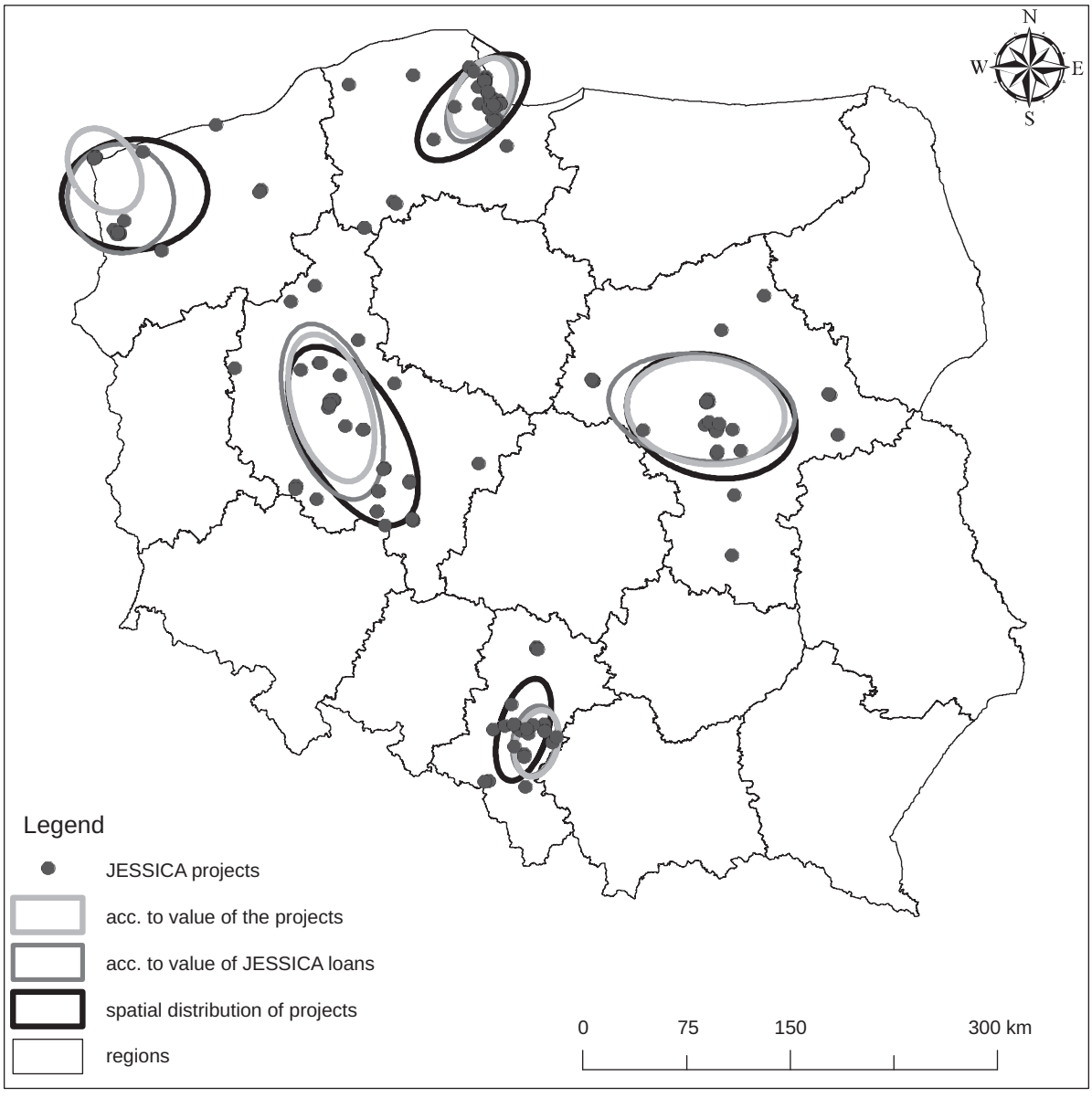

Figure 1. SDEs for the spatial spread of JESSICA projects in Poland

Source: own elaboration.

However, the direction of the project dispersion points to an unequal distribution of them in the regional space – in all cases the ellipses are neither located centrally in the particular regions nor are their shapes circular. Moreover, a similar conclusion is drawn from the analysis of the ellipse's areas. In all cases, the areas enclosed by the ellipses occupy actually smaller areas compared to the total surface of the individual JESSICA regions, indicating that the projects are thinly spread. Notwithstanding the above, the overall spatial patterns of projects revealed that the most uniform distribution of them can be found in the Mazowieckie and Wielkopolskie regions. As can be seen from Table 2, the azimuth (respectively 103.75° and 150.12°) reflects the trend directions, allowing one to see that the distribution of projects to a certain extent mirrors the shape of the regional boundaries, whereas the spatial dispersion of projects is more even in the Wielkopolskie region than in the Mazowieckie region. Furthermore, this spatial pattern is noticeably illustrated by the concentration index whose value at the level of approximately 65% in both regions proves a relatively wide distribution.

Table 1. SDE parameters of the JESSICA projects in five regions

Region	Ellipse	Ellipse centre		Area (km^2)	Azimuth° (orientation)	Eccentricity	Concentration (%)
		Major axis (km)	Minor axis (km)				
Maz	SDEofP	62.01	43.88	8548.46	103.75	0.71	64.52
	SDEofP-JL	67.80	38.29	8154.97	97.42	0.83	64.52
	SDEofP-JV	57.34	38.23	6885.64	97.20	0.75	64.52
Pom	SDEofP	49.83	24.23	3792.39	46.96	0.87	82.22
	SDEofP-JL	34.62	19.25	2093.67	34.89	0.83	80.00
	SDEofP-JV	30.68	18.70	1801.57	31.64	0.79	80.00
Slas	SDEofP	38.20	17.48	2097.26	16.97	0.89	61.54
	SDEofP-JL	25.57	15.73	1263.12	12.16	0.79	53.85
	SDEofP-JV	24.58	15.12	1167.33	14.57	0.79	46.15
Wiel	SDEofP	71.88	35.14	7934.76	150.12	0.87	65.00
	SDEofP-JL	65.89	32.59	6744.92	162.03	0.87	40.00
	SDEofP-JV	55.16	27.58	4779.47	162.22	0.87	40.00
Zach	SDEofP	52.82	39.95	6629.11	86.62	0.65	78.95
	SDEofP-JL	39.61	38.18	4750.43	157.16	0.27	78.95
	SDEofP-JV	32.75	24.01	2470.31	147.28	0.68	31.58

Note: *Maz, Pom, Slas, Wiel and Zach* denote the names of the JESSICA regions, respectively: Mazowieckie, Pomorskie, Śląskie, Wielkopolskie, Zachodniopomorskie. *SDEofP, SDEofP-JL and SDEofP-JV* mean respectively the SDE of the JESSICA projects, the SDE of the JESSICA projects weighted by the value of the JESSICA loan, the SDE of the JESSICA projects weighted by their total values. The *concentration* index was calculated as the ratio of points (projects) within the ellipse compared to the entire population of projects expressed in particular regions.

Source: own elaboration.

Conversely, in two other regions, namely Pomorskie and Śląskie, JESSICA projects are more concentrated in one locality than in other regions. The areas enclosed by ellipses in both regions are considerably smaller than their territories, and, if so, the smaller the area of the ellipse, the denser the distribution of JESSICA projects appears. In the case of the Pomorskie region, this fact is further confirmed by the concentration index (82%) showing the overwhelming majority of points occurring within the ellipse. These results may be explained by the fact that those regions are distinguished by special agglomerative linkages which means that one continuous urban area covers more than the only one city, that is, the so called Tricity (*Trójmiasto*) in Pomorskie, and in Śląskie – the cities being part of to the Upper Silesian conurbation. It is also noticeable that a relatively low level of project dispersion was also detected in the Zachodniopomorskie region, which coincides most likely with fact that 14 out of 19 projects were clustered in two cities – Szczecin and Świnoujście.

Furthermore, the most striking results to emerge from the data include the strong relationship between the value of JESSICA projects and the value of JESSICA loans, and the relatively comparable distribution of these two attributes with the locations of JESSICA projects across particular regions. This, on the one hand, indicates a strong correlation between the value of JESSICA projects and the value of JESSICA loans[3], but, on the other, shows that there are no significant differences between these two attributes and the locations of JESSICA projects. However, what is also interesting about the data in Figure 1 and Table 1 is the difference in the distribution of projects in terms of their value and the value of JESSICA loans in the Zachodniopomorskie region. The ellipse enclosing the projects in respect of the value of JESSICA loans has the azimuth of 157.16° and

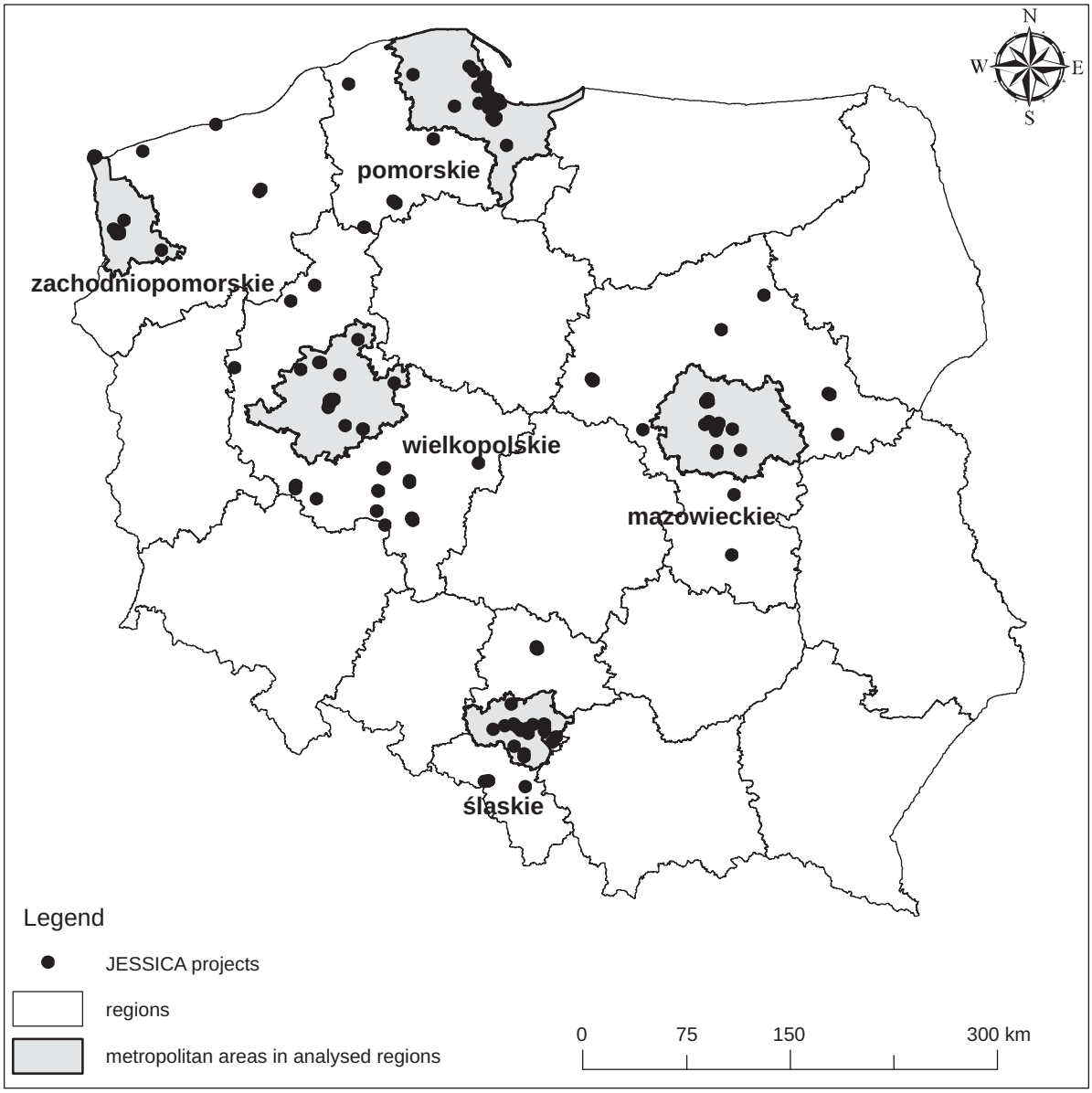

Figure 2. Location of the JESSICA projects in Poland in the context of the MA*

* Metropolitan areas were designated on the basis of the delineation provided for in the regional spatial managements plans. They are as follows: Functional Urban Area of the City of Warsaw in the Mazowieckie region (FUAW 2018), Tri-City Metropolitan Area (Gdańsk-Gdynia-Sopot) in the Pomorskie region (TCMA 2016), Metropolis of the Upper Silesian Valley in the Śląskie region (MUSV 2017), Poznań Metropolitan Area in the Wielkopolskie region (PMA 2019), Szczecin Metropolitan Area in the Zachodniopomorskie region (SMA 2020).

Source: own elaboration.

[3] The correlation coefficient between those two variables reaches .775, and is significant at $p < .01$.

the eccentricity index of 0.27. The former means that the JESSICA allocation was widely scattered, while the latter indicates a more circular distribution. The projects analysed by the same indices in terms of their values seem to be more linearly distributed. To conclude this part of the analysis, it can be suggested that the allocation of JESSICA funding across particular regions does not significantly differ from the location of JESSICA projects. These findings coincide with those of Idczak et al. (2019, pp. 212–213) which reveal that JESSICA projects in terms of their value and the size of the JESSICA loan do not vary by their location.

For the sake of completeness, the investigation was expanded to gain a deeper insight into the spatial dependencies of the JESSICA funding allocation with regard to the metropolitan areas of the regional capitals (MA). Such a breakdown is justified because, as argued by Smętkowski et al. (2009) and Śleszyński (2013), these areas, on the one hand, consisting of the major city (densely inhabited urban core) and its adjacent lower-density areas, form a spatially and functionally linked zones based on daily people's movements, whilst on the other, their peripheral surroundings often suffer adverse changes by reason of the polycentric development. Thus, cities located within MAs may have higher capacities to absorb funding due to their strong socio-economic ties than those lying outside. Figure 2 indicates that this statement might be reasonable. At first glance, one can observe that the higher number of JESSICA projects were located within MAs than those which are outside them. More detailed information is presented in Table 2. What emerges from the data is that two-thirds of JESSICA projects are situated in the interior of the MA. The only region in which the number of projects located outside the MA (22 out of 40) exceeds the number of projects placed internally is the Wielkopolskie region. Similar, relatively high levels of unequal distribution are shown in terms of the allocation of the JESSICA funding between inside versus outside MA-located projects. Nearly 70% of the total JESSICA funding was earmarked for urban projects implemented in cities covered by the MA. In this context, the Pomorskie region stands out against the other regions as 93% of the JESSICA assistance was allocated there to support the implementation of urban project located within the MA. Overall, urban projects in cities encompassed by the economic and functional extent of MA, as expected, received the greater part of the JESSICA assistance.

Table 2. Distribution of JESSICA projects and funding in five regions

	Mazowieckie	Pomorskie	Śląskie	Wielkopolskie	Zachodnio-Pomorskie	Total
Value of JESSICA funding in million PLN	160.00	236.00	263.00	330.00	149.00	1 138.00
Number of the JESSICA projects:						
– located outside the MA	12	6	9	22	4	53
– located within the MA	19	39	17	18	15	108
Total	31	45	26	40	19	161
The percentage of total JESSICA funding:						
– transferred outside the MA	38.15	7.13	46.43	40.45	10.26	30.42
– transferred within the MA	61.85	92.87	53.57	59.55	89.74	69.58
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: own elaboration.

The analytical work carried out so far has provided evidence on the spatial dependencies of the projects and JESSICA funding, but has not shown any information about the distribution of JESSICA funding among Polish cities. Therefore, we move on now to determine whether the size of the city is of significance for the allocation of JESSICA funding, and also for the project's capacity to ensure the repayability of JESSICA loans. Figure 3 shows all the mutual dependencies of the features under investigation. This Figure is quite revealing in several ways. First, it shows that JESSICA projects have been situated in all types of cities regardless of their size. Thus, the recipients of JESSICA funding are large, medium-sized and small cities. Second, the size of the city does not appear to be a relevant factor in examining the value of JESSICA loans. In other words,

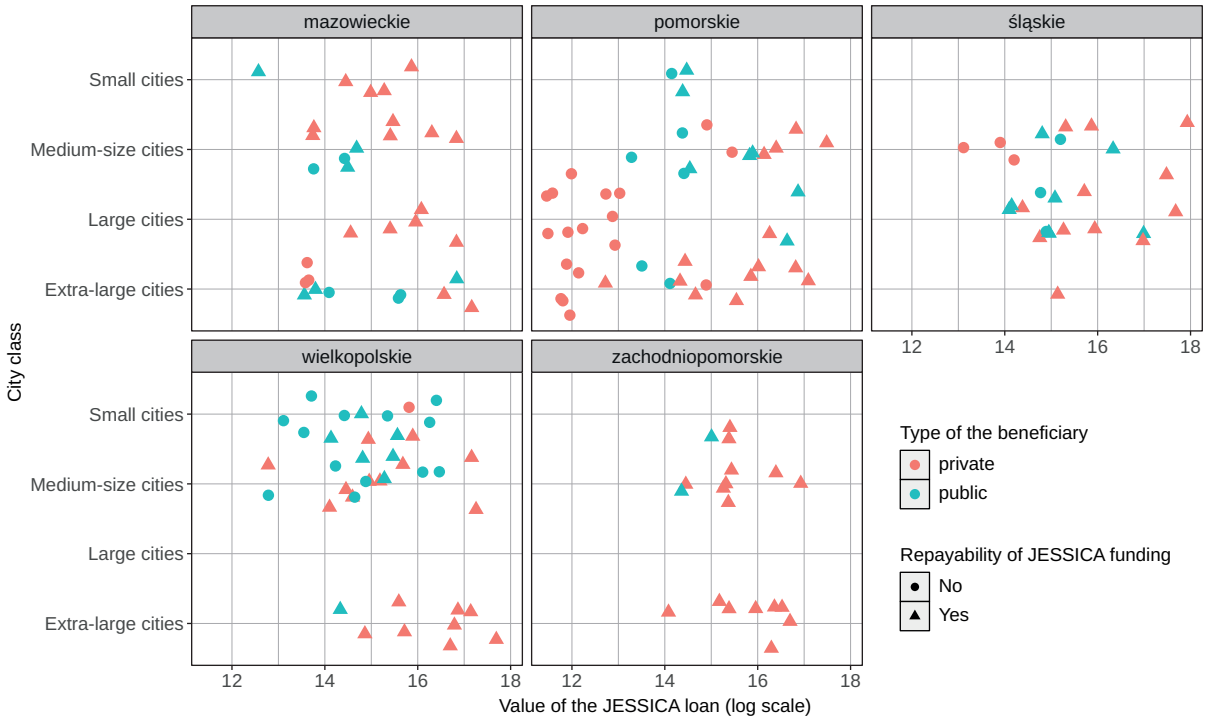

Figure 3. Mutual dependencies of the city's size and the value of a JESSICA loan

Source: own elaboration.

in small cities there were implemented both projects supported by the high and low value of the loans, and vice versa. Third, there is no linear relationship between the city's size and the project's capacity to ensure the repayability of JESSICA loans. This means that the capacity for generating revenues on the basis of the primary business activities, thus ensuring the repayability of JESSICA

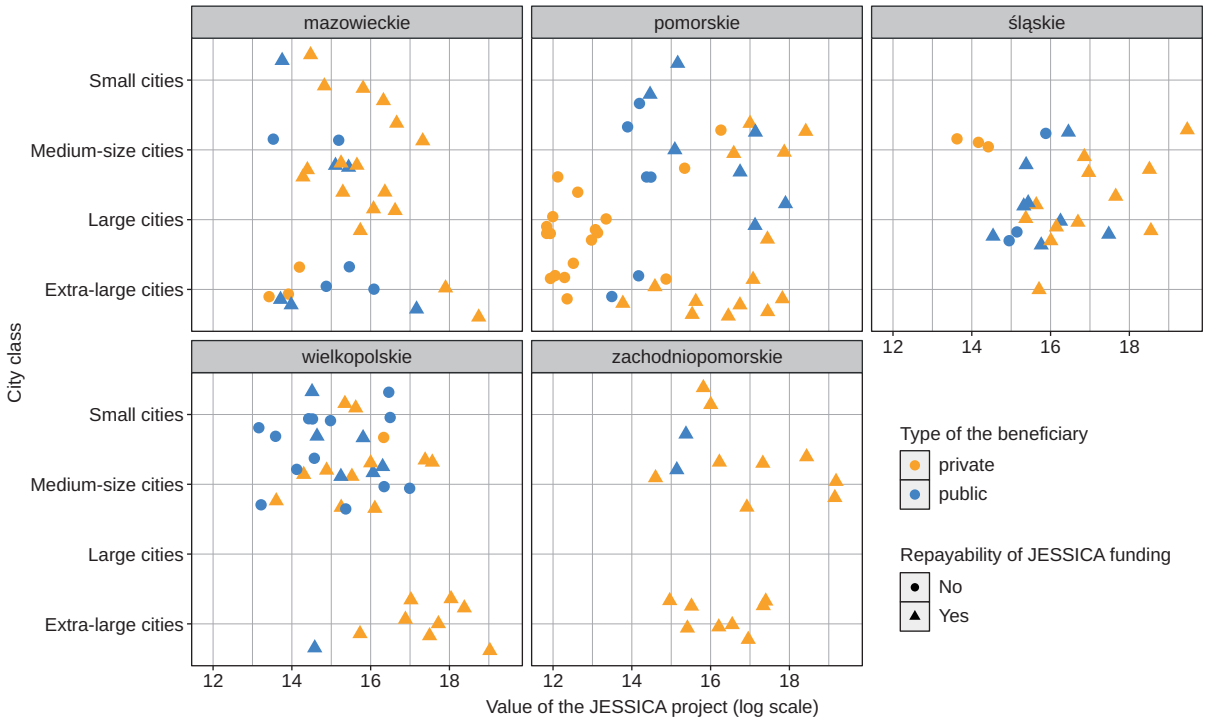

Figure 4. Mutual dependencies of the city's size and the value of a JESSICA project

Source: own elaboration.

loans, occur in all kinds of cities. Likewise, the type of beneficiaries does not show any significant relationships between the variables with the visible exception of the Zachodniopomorskie region, where the majority of projects were implemented by private entities. As shown in Figure 4, similar conclusions can be drawn when comparing the data on the city's size with the data on the value of JESSICA projects.

Table 3. Distribution of JESSICA projects and funding among Polish cities*

City class	Mazowieckie		Pomorskie		Śląskie		Wielkopolskie		Zachodnio-Pomorskie		Total	
	P-JF	N-P	P-JF	N-P	P-JF	N-P	P-JF	N-P	P-JF	N-P	P-JF	N-P
Extra-large cities	43.0	11	28.6	17	1.9	1	48.6	9	53.8	8	33.8	46
Large cities	21.6	5	24.1	12	45.9	15	0.0	0	0.0	0	18.7	32
Medium-sized cities	25.5	10	45.7	13	52.2	10	34.7	18	39.3	8	40.0	59
Small cities	9.9	5	1.6	3	0.0	0	16.7	13	7.0	3	7.5	24
Total	100.0	31	100.0	45	100.0	26	100.0	40	100.0	19	100.0	161

* P-JF means the percentage of total JESSICA allocation; N-P denotes the number of JESSICA projects.

Source: own elaboration.

To provide further insights into the analysis, Table 3 presents the percentage of the value of JESSICA funding granted to projects in particular cities. Closer inspection of the Table shows that almost half (47.5%) of the JESSICA funds was transferred to small and medium-sized cities. Half of the JESSICA funding was granted to support 83 projects (out of 161) implemented in small and medium-sized cities. However, the Figures demonstrate a relatively more diverse picture of these relationships at the regional level. Nonetheless, the findings clearly reveal that JESSICA funding was spread across the cities of different sizes, and not only concentrated in the largest ones.

Overall, the results are somewhat counterintuitive. Although it cannot be said that the projects and JESSICA funds were spread evenly throughout the five regions, it is noteworthy that this type of EU support was not only absorbed into the JESSICA projects implemented in the largest cities. About half of the total JESSICA assistance was passed on to beneficiaries who executed projects in small and medium-sized cities. More generally, it can thus be argued that the allocation of JESSICA funds in the spatial dimension seems to be dispersed and that not only major regional cities were supported by JESSICA funds but also other cities. This outcome, in turn, contrasts with previous results reported by Churski et al. (2015, pp. 188–192) who found that the funds under the CP (grants) are mainly absorbed by the strongest urban centres. Admittedly, the allocation of JESSICA funding was not conditional on any territorialised criteria, and its territorial pattern of distribution follows from an interest expressed by beneficiaries, as confirmed by the interviewees.

Conclusions

There is an abundant body of literature devoted to the issue of the relevant role played by cities in driving economic growth and development for regions and entire countries. More recent studies on this matter highlight the importance of smaller cities as crucial nodes for promoting territorial development of hinterland areas. However, the distribution mainstream of EU funding has rather tended to favour bigger cities as recipients of a larger share of these funds. Following this line of research, the paper provides further evidence by analysing the distribution pattern of the structural funds available under the JESSICA initiative in the form of repayable assistance. To our knowledge, it has been one of the first attempts to thoroughly examine the spatial allocations of JESSICA funding across Polish cities within particular JESSICA regions, having also regard to the size of the cities.

The main results emerging from the analysis are as follows. First and foremost, the analysis showed that JESSICA projects are neither tightly clustered nor widely scattered – they are spaced more or less evenly throughout the regions. A similar spatial pattern is also evident with respect to

the value of JESSICA projects and the value of JESSICA loans which indicates that JESSICA funds were allocated to many different urban settlements. Second, as for the city size, the repayable assistance of JESSICA was transferred to many cities of different sizes, and nearly half of these funds were used to implement projects in small and medium-sized cities. This clearly suggests that, contrary to expectations, smaller cities have also considerably benefited from this instrument. Third, evidence is found that there is no significant difference between projects ensuring the repayment of JESSICA loans on the basis of their primary business activities that were placed in larger cities and those situated in smaller ones. Hence, the spatial factor (understood narrowly here as cities) was not likely to reach a great significance in absorbing JESSICA funds. It therefore appears that projects best matching the assumptions of the JESSICA initiative were implemented in various cities, irrespective of their size and location. Fourth, interesting and original findings come from the analysis carried out in the context of the inside versus outside project location with regard to the MA. The findings show that the bulk of JESSICA funding was addressed to investments undertaken, admittedly, in different cities regardless of their size but most of them were located within the MAs. This may corroborate a more complex nature of the capacities in term of repayable assistance which accrues to project implementers in functionally linked cities. This field of interest for policy-makers turns out to be relevant in order to build a more territorially-targeted framework of EU financial instruments – more funds in the form of repayable aid allocated to MAs, whereas non-repayable grants being channelled to the outlying cities. This is, however, a vital issue for future research.

In conclusion, this study demonstrates the findings which have relevant implications for the CP. First of all, as illustrated, the repayable assistance of the JESSICA initiative provides an important incentive for triggering urban investments in more and less dynamic urban areas alike, so as to contribute to increasing cohesion and growth across the whole regions. The insights gained from this study may help to fill an important gap in developing an understanding the role of cities in promoting territorial cohesion, as proposed e.g. by Medeiros and Rauhut (2020) and Idczak and Mrozik (2021). In addition to that, this paper also adds to the current debate that calls for the use of the revolving instruments under the CP as efficient tools to support sustainable urban development (e.g. Nyikos 2016). Finally, this study provides a non-exhaustive view of some of the reasons for the dispersed distribution of JESSICA funding between cities of different sizes. This needs to be surely reinforced by additional examination, overcoming the limitations of the current work.

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References

Barca, F., McCann, P., and Rodríguez-Pose, A., 2012, “The Case for Regional Development Intervention: Place-Based versus Place-Neutral Approaches”, *Journal of Regional Science*, 52(1), 134–152.

Bode, M., 2015, “Financial Instruments in Cohesion Policy”, *European Structural and Investment Funds Journal*, 3(3), 173–186.

Bradley, J., and Zaucha, J. (eds.), 2017, *Territorial Cohesion. A missing link between economic growth and welfare. Lessons from the Baltic Tiger*, Gdańsk: Uniwersytet Gdański Katedra Makroekonomii, https://rcin.org.pl/dlibra/publication/83805/edition/64988.

Budde, R. *et al.* 2010 *Second State of European Cities Report*, Essen: Rheinisch-Westfälisches Institut für Wirtschaftsforschung, https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/urban/stateofcities_2010.pdf.

Camagni, R., and Capello, R., 2015, “Rationale and design of EU cohesion policies in a period of crisis”, *Regional Science Policy & Practice*, 7(1), 25–47.

Castells-Quintana, D., and Royuela, V., 2014, “Agglomeration, inequality and economic growth”, *The Annals of Regional Science*, 52(2), 343–366, doi: 10.1007/s00168-014-0589-1.

Churski, P., Borowczak, A., and Perdał, R., 2015, “Struktura inwestycji finansowanych ze środków unijnych a czynniki rozwoju w obszarach wzrostu w Polsce”, in: E. Małuszyńska, G. Mazu, and I. Musiałkowska, I. (eds.), *Polska – 10 lat członkostwa w Unii Europejskiej*, Poznań: Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu.

CNSP, 2012, *Koncepcja Przestrzennego Zagospodarowania Kraju 2030*, Monitor Polski, 252.
Colini, L. *et al.*, 2013, *Against Divided Cities in Europe*. Saint-Denis: URBACT, https://urbact.eu/sites/default/files/import/general_library/19765_Urbact_WS4_DIVIDED_low_FINAL.pdf.
Dąbrowski, M., 2014, "Engineering Multilevel Governance? Joint European Support for Sustainable Investment in City Areas (JESSICA) and the Involvement of Private and Financial Actors in Urban Development Policy", *Regional Studies*, 48(12), 2006–2019.
Duranton, G., and Kerr, W., 2018, "The Logic of Agglomeration", in: G.L. Clark *et al.* (eds.), *The New Oxford Handbook of Economic Geography*, New York: Oxford University Press.
European Commission, 2008, *Green Paper on Territorial Cohesion. Turning territorial diversity into strength*, Brussels.
European Commission, 2011, *Cities of Tomorrow: Challenges, Visions, Ways Forward*, Luxembourg: Publications Office of the European Union.
Fotino, F., 2014, "The JESSICA Action in Italy 2007–2013. Bottlenecks, Opportunities, and Directions for the Future", *European Structural and Investment Funds Journal*, 2(3), 245–255, https://estif.lexxion.eu/article/ESTIF/2014/3/9.
FUAW, 2018, Uchwała nr 22/18 Sejmiku Województwa Mazowieckiego z dnia 19 grudnia 2018 r. w sprawie Planu zagospodarowania przestrzennego województwa mazowieckiego, https://www.mazovia.pl/wojewodztwo/plan-zagospodarowania-wojewodztwa-mazowieckiego/.
Hamza, C. *et al.*, 2014, *The Role of Cities in Cohesion Policy 2014–2020*, Brussels: European Parliament.
Idczak, P., and Mrozik, K., 2021, "The The territorial impacts of JESSICA projects in municipalities: evidence from the city of Poznań", *Ruch Prawniczy, Ekonomiczny i Socjologiczny*, 83(1), 293–307.
Idczak, P., and Musiałkowska, I., 2019, "The Capacity of JESSICA Projects to Repay Loans Based on Own Revenues", *Entrepreneurial Business and Economics Review*, 7(2), 141–157.
Idczak, P., Musiałkowska, I., and Mrozik, K., 2019, "Zdolność projektów JESSICA do oddziaływania na procesy rynkowe w miastach", *Biuletyn KPZK*, 273/274, 202–222.
Jarczewski, W., and Ziobrowski, Z. (eds.), 2010, *Rewitalizacja miast polskich – diagnoza*, Kraków: Instytut Rozwoju Miast.
Medeiros, E., 2019, "Debating the Urban Dimension of Territorial Cohesion", in: E. Medeiros, (ed.), *Territorial Cohesion. The Urban Book Series*, Cham: Springer.
Medeiros, E., and Rauhut, D., 2020, "Territorial Cohesion Cities: a policy recipe for achieving Territorial Cohesion?", *Regional Studies*, 54(1), 120–128.
Murzyn, D., 2018, "Urban development under EU cohesion policy – an example of major cities in Poland", *Urban Development Issues*, 53(1), 27–35.
Musiałkowska, I., and Idczak, P., 2018a, "Is the JESSICA initiative truly repayable instrument? The Polish case study", *Research Papers of Wrocław University of Economics*, 536, 143–151.
Musiałkowska, I., and Idczak, P., 2018b, "Ocena dopasowania projektów realizowanych w ramach inicjatywy JESSICA do potrzeb występujacych na obszarach miejskich", *Studia KPZK PAN*, 184(2015), 233–246.
Musiałkowska, I., and Idczak, P., 2020, "JESSICA initiative to support sustainable urban development projects in Poland", in: I. Musiałkowska, P. Idczak and O. Potluka (eds.), *EU Cohesion Policy in Eastern and Southern Europe: Taking Stock and Drawing Lessons for the Future*, Warszawa–Berlin–Boston: De Gruyter.
MUSV, 2017, Rozporządzenie Rady Ministrów z dnia 26 czerwca 2017 r. w sprawie utworzenia w województwie śląskim związku metropolitalnego pod nazwą 'Górnośląsko-Zagłębiowska Metropolia', http://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20170001290/O/D20171290.pdf.
Nadler, M., and Nadler, C., 2018, "Promoting investment in sustainable urban development with JESSICA: Outcomes of a new EU policy initiative", *Urban Studies*, 55(9), 1839–1858.
Nyikos, G., 2016, *Financial Instruments in the 2014–20 Programming Period: First Experiences of Member States*, Brussels: European Parliament.
OECD, 2011, *OECD Urban Policy Reviews, Poland 2011*, OECD Publishing.
OECD, 2018, *Divided Cities. Understanding Intra-urban Inequalities*, Paris: OECD Publishing.
PMA, 2019, Uchwała Nr V/70/19 Sejmiku Województwa Wielkopolskiego z dnia 25 marca 2019 r. w sprawie uchwalenia Planu zagospodarowania przestrzennego województwa wielkopolskiego wraz z Planem zagospodarowania przestrzennego miejskiego obszaru funkcjonalnego Poznania, http://www.wbpp.poznan.pl/index.php?option=com_content&task=view&id=198&Itemid=1%0A.
Rauhut, D., and Humer, A., 2020, "EU Cohesion Policy and spatial economic growth: trajectories in economic thought", *European Planning Studies*, 28(11), 2116–2133.

Runge, A., 2012, “Metodologiczne problemy badania miast średnich w Polsce”, *Prace Geograficzne*, 129, 83–101.

SMA, 2020, Uchwała nr XVII/214/20 Sejmiku Województwa Zachodniopomorskiego z dnia 24 czerwca 2020 r. zmieniająca uchwałę w sprawie uchwalenia Planu Zagospodarowania Przestrzennego Województwa Zachodniopomorskiego, http://rbgp.pl/pzpwz-2020/.

Smętkowski, M., 2011, “Wpływ polityki spójności na dyfuzję procesów rozwojowych w otoczeniu dużych polskich miast”, *Studia Regionalne i Lokalne*, 5, 123–154.

Smętkowski, M., Jałowiecki, B., and Gorzelak, G., 2009, “Obszary metropolitalne w Polsce – diagnoza i rekomendacje”, *Studia Regionalne i Lokalne*, 1, 52–73.

Stryjakiewicz, T., Ciesiółka, P., and Jaroszewska, E., 2012, “Urban Shrinkage and the Post-Socialist Transformation: The Case of Poland”, *Built Environment*, 38(2), 196–213.

Szlachta, J., and Zaucha, J., 2010, “A new paradigm of the EU regional development in the context of the Poland’s National Spatial Development Concept”, *Institute for Development Working Papers*, 1/2010, https://instytut-rozwoju.org/WP/IR_WP_1.pdf.

Śleszyński, P., 2013, “Delimitacja Miejskich Obszarów Funkcjonalnych stolic województw”, *Przegląd Geograficzny*, 85(2), 173–197.

TCMA, 2016, Uchwała Nr 318/XXX/16 Sejmiku Województwa Pomorskiego z dnia 29 grudnia 2016 r. w sprawie uchwalenia nowego planu zagospodarowania przestrzennego województwa pomorskiego oraz stanowiącego jego część planu zagospodarowania przestrzennego obszaru metropolii, http://edziennik.gdansk.uw.gov.pl/eli/POL_WOJ_PM/2017/603/ogl/pol/pdf%0A.

Wang, B., Shi, W., and Miao, Z., 2015, “Confidence Analysis of Standard Deviational Ellipse and Its Extension into Higher Dimensional Euclidean Space”, *PLOS ONE*, 10(3), 1–17.

Yang, X. and Grigorescu, A., 2017, “Measuring economic spatial evolutional trend of Central and Eastern Europe by SDE method”, *Contemporary Economics*, 11(3), 253–266.

Yuill, R. S., 1971, “The Standard Deviational Ellipse: An Updated Tool for Spatial Description”, *Geografiska Annaler. Series B, Human Geography*, 53(1), 28–39.