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Can public intervention improve local public sector economic performance? The analysis of Special Economic Zones in Poland

Katarzyna Kopczewska (iD)

Associate professor, Faculty of Economic Sciences, University of Warsaw
corresponding author: kkopczewska@wne.uw.edu.pl

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Abstract

Boosting the local economic growth and cohesion policy may be supported by using the public intervention. The local governments may benefit directly and indirectly from the place-based policy implemented as Special Economic Zones (SEZ). SEZ directly increase the employment and the number of firms, while, indirectly, they can raise the local public sector financial performance in the long run by increasing revenues from personal and corporate income taxes. This article assesses the efficiency of this policy at the local level in the context of an institutional environment and inter-agent local diffusion. It also uses the statistical methodology based on the comparison of the empirical density distributions of the economic and financial indicators within the institutional groups to detect the global shift or divergence or convergence patterns. This article examines the Polish experience of public intervention in 1995–2016 with 14 SEZ located in more than 350 different locations. It proves that in general, the financial and economic situation of the municipalities with SEZ did not improve. An institutional analysis of the SEZ operating conditions indicates that the weak operating requirements for SEZ firms together with a poor location cannot constitute a catalyst for local development.

1 Introduction

Government-led public interventions are expected to impact the economies, promote growth, employment, R&D, innovativeness or trade, support inferior areas, or provide the area with exogenous development factors. One example of long-term public intervention is Special Economic Zones (SEZ). The current literature offers many approaches to tracking its economic, social and ecological efficiencies. It is predominantly directed to explain the impact of SEZ on export growth, foreign exchange and technology transfer and R&D (Warr, 1989; Wang, 2013; Sigler, 2014; Taneja & Kumar, 2014; Lee, 2015), on the agglomeration economies, firms and workers' mobility (Kline, 2010; Wang, 2013) or looking for the direct and indirect effects impacting the place of intervention, surroundings and economy as a whole (Wei, 1995 and Alder, Shao, & Zilibotti, 2012 for GDP;

Ciżkowicz et al., 2017 for employment). Studies have been conducted on its role in the cohesive policy and whether SEZ can be expected to animate the local development (Nazarczuk, 2013; Dorożyński, Świerkocki, & Urbaniak, 2017; Jensen, 2018; Ambroziak & Hartwell, 2017). Also, the stream on SEZ impact on trade was deeply analysed (Nazarczuk & Umiński, 2018a, 2018b, 2019). Recent studies have more intensively analysed the disaggregated data for local communities, replacing the previous studies on the aggregated data that referred to the global level (Nazarczuk, 2013; Wang, 2013; Ciżkowicz, Ciżkowicz-Pękała, Pękała, & Rzońca, 2017). Also, the opposite questions of what impacts the SEZ dynamics are analysed (Frick, Rodríguez-Pose, & Wong, 2019).

However, even if one of the main goals of SEZ is to support the local economic environment, the studies on the financial (budgetary) performance of

the local authorities are still rare. Seeing SEZ from an institutional perspective, Hazakis (2014) proves that "*SEZs are administratively defined territories, influencing interactions and competitive/co-operative behaviour of economic agents, through dynamic and interrelated cognitive, normative, regulative and organizational structures, routines, incentives and processes.*" In consequence, SEZ are seen as a catalyst of the local and regional development that may "*bring simultaneous modification of institutional/structural elements of economic organization and patterns of economic action, locally and regionally*" as well as "*address market imperfections and collective action defects and provide necessary terms for fruitful interaction between local/regional structures, networks and incoming firms*" (Hazakis, 2014). An impact of SEZ in institutional changes was confirmed by Hartwell (2018). The institutional perspective allows for expecting SEZ as a non-silent agent, which in the long-term by its presence in the local community radiates around the development stimuli for local businesses and local authorities alike. This approach is consistent with the Evolutionary Economic Geography (Boschma, 2009) and even with co-evolution with Contemporary Economic Geography (Gong & Hassink, 2018).

This article seeks to close this gap and analyse the economic and financial effects of SEZ in local communities as the effects of the cohesive policy in the place of the location of public intervention.[1] There remains the explicit question: can the public intervention embodied with SEZ push forward the financial and economic position of local communities.[2] There are two mechanisms: financial and economic ones, which will be studied jointly to determine whether the public intervention for establishing the SEZ would be attractive for both state and business.

From the financial perspective, there are financial public costs and benefits of this intervention, and its balance determines the attractiveness of this type of public support. In most public finance regimes, the central and local governments share revenues from different taxes. The business-related and employment-related taxes, which at best mirror the economic and financial interactions, are the *Personal Income Tax* (PIT) and *Corporate Income Tax* (CIT). Public costs, such as CIT exemptions for SEZ and public infrastructure investment costs, which are the clue of this public support, reduce revenues and the total budgets of the local government. However, on the other hand, the public benefits include the lower expenditures on the unemployment benefits and subsidies, higher revenues from CIT in the long-term and the potential income from duties, positive investment multiplier effects and finally the incomes from PIT and wage wedge. Thus, the net financial impact on each level of government is unknown and is subject to efficiency analysis. This financial approach to state intervention is not very common in the literature, and when it appears, it is generally seen as global aggregated values from the government's perspective (Tantri, 2015).

From the economic perspective and public sector theory, public intervention may arise when some exogenous stimuli are required because of market mechanism failure and due to the fact that efficient intervention requires a joint public-private effort (Sen, Stern, & Stiglitz, 1990). Theoretical assumptions frequently point to the positive effects of both the spillover effects and the spatial concentration of economic activity (Wang, 2013). In this vein, one of the possible policy solutions is to place SEZ in economically weaker and remote locations to support the local and neighbourhood labour markets, which is in line with the institutional perspective on SEZ by Hazakis (2014). Inter-local labour mobility (*commuting*) should move the economic activity to neighbouring municipalities, *inter alia* by establishing companies supporting business in the SEZ. Also, the positive effects of the diffusion are to reinforce the implementation of the cohesion policy and equalise the opportunities and development potential between stronger and weaker territorial units.

The aforementioned mechanisms of inter-agent local spillover are not a typical analytical framework for SEZ. Still, they are crucial in the long term for the assessment of the financial and economic effects of public intervention. The core issue in this article is to test the long-term financial and economic per-

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1 SEZ were established in Poland with the 1994 Act on Special Economic Zones, but the first SEZs began operating in 1998. According to this law (par.3 point 6), "The zone may be established in order to accelerate the economic development of part of the country's territory", in particular by 'creating new jobs'. According to the reports of the Ministry of Economy, the main goal of creating SEZ was 'striving to mitigate the structural unemployment in selected regions of the country by directing new investments there, thanks to the financial incentives package'.

2 Public support of economic development can be implemented not only by public intervention as SEZ but also as public investment. This article develops mechanism of public intervention. Public investment issues, also with reference to SEZ, can be found in the study conducted by Kopczewska (2016).

formance of the municipalities with and without SEZ. It is to answer the fundamental question: have the communities, understood as local governments and local markets, where SEZ were located, benefitted from this fact? By theoretical assumption, there is a hypothesis, that SEZ provide a significant development shift for local communities. In initially weaker communities, one can expect that with the intervention stimuli, they converge, and in the case of initially, well-developed municipalities perform even better. It should to be emphasised that this is not an export or employment analysis as in many studies (Wang, 2013), but rather a public sector financial performance analysis. Moreover, the article tries to see the state intervention not only on the aggregated level but also on the micro-level of local communities. Those two things are a novelty in the literature.

Furthermore, the methodology is also novel. Most papers are based on case studies (Chou & Ding, 2015) or econometric analyses (Wang, 2013). A statistical analysis of the frequency distributions in groups and over time is proposed in this context, and its changes allow for concluding about the cohesion and convergence patterns with or without public intervention. It allows for observing the general trends and detecting the differences between groups and periods. The study is based on Polish data for 2474 NTS5 (LAU2) municipalities in 1995–2016.

The structure of this article is as follows. Section 2 presents the economic and institutional mechanism for the direct and indirect impacts of SEZ on the local municipalities, concerning the financial performance of the authorities. Section 3 describes the methodology of the statistical analysis and the methods of comparing the density distributions of the analysed variables. Section 4 illustrates the data used in the institutional and factual contexts of SEZ. Section 5 provides the results of the statistical comparisons of data. Section 6 outlines the framework of the other research studies and indicates that these results are in line with other studies. Section 7 outlines the policy recommendations, and Section 8 gives the synthesis of this article.

2 Channels of the impact of SEZ

There are more than 2,300 SEZ in the world. Aggarwal (2010) lists SEZ by countries from the 1970s. There is plenty of research on SEZ covering their sectoral and

technological compositions, economic performance, efficiency and so on, usually at a national level. The majority exhibits a positive impact on economies (Soundarapandian, 2012; Cizkowicz et al., 2017), but some arguments suggest a negative impact (Amitendu & Bhattacharjee, 2008; Aggarwal, 2010). SEZ are usually defined as "*contained geographic regions within a country with more liberal laws and economic policies*[3]" (Wang, 2013), but their goal is not clear. Wang (2013) indicates that they are to "*encourage foreign-invested manufacturing and services for export*", but other studies underline that they depend on the governmental policy, which can result from the level of development of the country.

The mechanisms that finally generate an impact on the financial and economic performance of local authorities and economies are multiple and not independent of the analysis framework. One of the core elements is the phase of development of SEZ. Aggarwal (2010) distinguishes three generations of SEZ, which follow the natural evolution of economies. The first-generation of SEZ is to imitate a developing structure of economies and is mainly based on the labour-intensive sectors. In the second-generation, firms in SEZ are to concentrate on the technical products, for the final consumers and on the chemical and engineering products.[4] The third-generation of SEZ focuses on the high-technology producers' goods. At all stages, SEZ play a role of centres of excellence, which are to support the local business. As the innovative firms, they reveal their technologies' advancement to the local workers, showing them so-called tacit knowledge.

The main direct channel of impact of SEZ is employment and investment (Figure 1). Beyond that, there are indirect channels of impact of SEZ as supporting export and trade, enhancing technological spillovers, building the regional know how, creating benefits for central and local governments as well as spatial spillovers to neighbouring areas. However, channels of impact of SEZ and their strength depend on the stage of the country's development. Following Aggarwal (2010), the goal of the first-generation of SEZ is to improve the situation of unemployment

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3 Poland does not limit SEZ geographically—the firms do not have to be located next to one another in a single contained geographic region, but within an umbrella-like SEZ, there may be a plenty of locations with one or more firms set as neighbours.

4 Manufacture-oriented Chinese SEZ in Africa are analysed by Breautigam and Tang (2014).
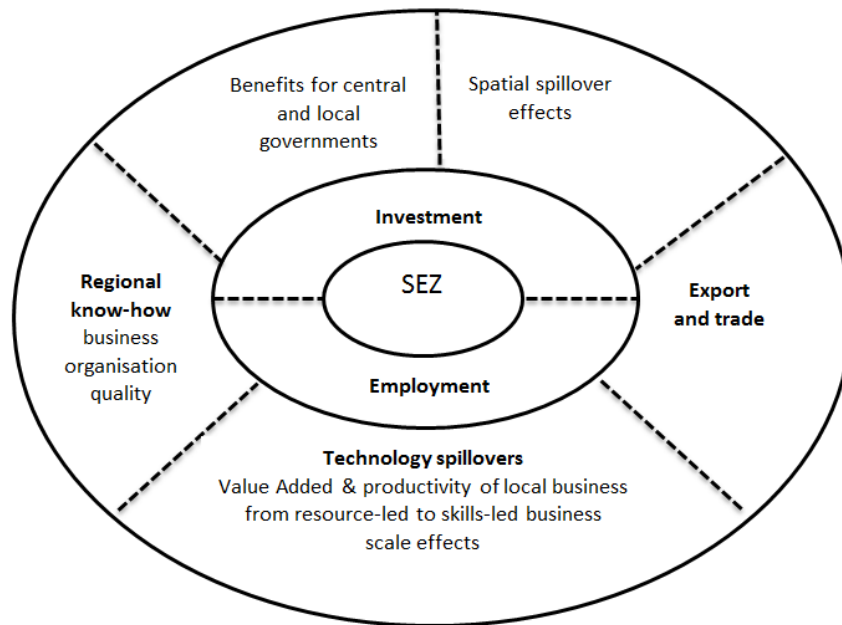
Fig. 1. The expected direct and indirect effects of SEZ. *Source*: The author.

and international trade; in the second-generation, the SEZ business concentrates on the improvement of human capital and diversification of export; in the third-generation, the SEZ firms are expected to import technical know-how, generate technology spillovers and impact the establishment of service zones. White (2011) confirms these mechanisms. However, those mechanisms are far from re-directing the support to local authorities, while backward linkages are generated when firms attracted to SEZ to meet the governmental requirements. Bräutigam and Tang (2014) confirm that in China, high-technology firms obtained more privileges than other investments in SEZ. They also note that if the discrepancy in technological level between SEZ and the local economy is too high, backward linkages and technology transfer will be successful only if SEZ companies are encouraged (legally or financially) to use local materials, inputs and other components. Local producers have various stimuli[5] to converge to the technological level of SEZ (Shrank, 2001). However, recent studies treat it as challenging that SEZ can upgrade the technological component or value added of the economy in long term (Frick et al., 2019).

SEZ can be regarded as just one possible tool for supporting the economic policy by the government, and it requires the costs to be incurred (by the state) to meet the assumed goals specifically. The design of the benefits for businesses depends on government policy. Countries may strengthen export, attract foreign direct investment (FDI)[6] and innovations, build so-called global cities (Zhang, 1999; Li, 2001) and so on. There is also the question of homogeneity of impact. Countries may treat every single SEZ as an individual case with tailored solutions and support or prepare the general framework of SEZ support and apply the same policy to all SEZ. This second rule is specific for economic and political environments with well-developed systems of market competition protection, like in the case of EU, and equal treatment of SEZ, consequently generating a homogenous impact of SEZ. However, this perspective, even if widely examined, concentrates on the country level rather than on the local or regional level.

Packages of incentives for businesses, beyond tax and tariffs exemptions (Chou & Ding, 2015), include the infrastructure, investor service, financial support in the land purchase or lease, industrial policies, more

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5 Breautigam and Tang (2014) also note that there is a risk that SEZ can become '*enclaves of low wages*' instead of '*development catalysts*' and the country's responsibility is to '*provide significant opportunities for domestic participation, knowledge-sharing, innovation, and skills development*.'

6 This mechanism also may fail, and SEZ (at its development stage) may not be an attraction factor for FDI (Cieślik, 2005 in study for Poland in 1993–1998 as well as Dziemianowicz, Łukomska, & Ambroziak, 2019 for Poland in 2008–2014).

flexibility in profit allocation, easier market entry and so on. The economic question is about the profitability of using this tool—the balance of benefits and costs is a consequence of SEZs' existence. One can indicate the direct and indirect effects of SEZ (Figure 1). The direct ones, easily measurable, are related to the operation of the business itself—an increase in employment and investment, as any newly established business, has to invest and employ. The indirect ones are much more complicated to assess. There, the consequences of SEZs' existence can acquire benefits not only from techno-logical spillover and know-how dissemination over a region, quality support, production management, indirect export and trade effects but also from spatial spillover effects including diffusion and financial benefits for local and central governments in the long run. The theoretical literature on these mechanisms (Figure 1)—a direct and indirect impacts of the public intervention on the investment, employment, export and trade—is rather exhaustive and constitutes the main stream of economics. Starting with the Keynes' approach and benefits of public intervention, through the von Mises' perspective that well-directed public intervention can correct failures and inefficiencies without engaging in all market operations but using selective actions, one should end with Krugman and Venables's (1995) approach explaining the persisting development inequalities. SEZ naturally follow the general mechanisms of public intervention.[7]

Even if the spatial spillover effects of the business development stimuli (spatial diffusion) were tested recently (mainly using spatial econometrics techniques) (Kopczewska, 2016; Ciżkowicz et al., 2017), the issues of the inter-agents diffusion of the benefits to the local governments hosting SEZ on their territory are rather under-examined. When analysing the mutual benefits of business and government, one should think about the *gift exchange* hypothesis (Brown, Horvath, & Neuberger, 1998; Mei, 2009). This hypothesis is well-known in labour market studies, but it can be applied to the long-term game in SEZ. In the context of public intervention, the *gift exchange mechanism* should be understood as an instance when governments attract investors to improve their situation in the long term. However, in the short term, this means higher costs and expenses (investments in infrastructure and tax exemption), but with the hope of increasing their

income from PIT and CIT[8] in the future. Following business rationality and the assumption that PIT and CIT are shared between local and central budgets, local authorities should treat SEZ as an investment: a long-term project that may generate costs in the short run. Still, the long-term overall impact should be positive. Local governments when deciding to locate SEZ in the municipality agree for lower CIT revenues (due to tax exemptions for companies in SEZ), which in turn reduce their revenues and they also often bear the costs of preparing land and infrastructure for investment. These adverse effects should be equalised by increased revenues from PIT, resulting from the improvement in the labour market and employment growth. This mechanism aims to break the path-dependence model, as the intensified infrastructure investment and business settlement should put the region on a higher (better) trajectory of development.

The cohesive functions of the SEZ are inseparably connected with the SEZ location. Both government and firms have a different perspective on deciding about the location of SEZ. From the government's perspective, the location of SEZ can be the derivative of the policy goals regarding the existence of SEZ. These can be *inter alia* (a) the specially designed global cities in transportation hubs (especially China), (b) border locations, in which SEZ are to take advantage of the site at the border with a better-developed region (especially Mexico and South Africa), (c) peripheral locations to reinforce the cohesion policy and econo-mic integration of territories (especially Poland) or (d) core locations to develop the technology. The decision about being in SEZ depends on the policy and incen-tives from the government. The peripheral locations give the cheaper land, but with poorer accessibility and a shallower labour market with less-skilled staff, which may conversely limit the business based on high technology and core locations. Thus, the high-

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7 The public intervention theory takes, on the one hand, the benefits of the intervention as an improving equality, repairing market failure or being countercyclical and, on the other hand, recognises the limitations as freedom limitations and interference in the free market.

8 In the public sector and public finance, there are different responsibilities and benefits on the different administrative levels. In general, very often, central and upper-level infrastructure is financed by central governments, and the local infrastructure is a responsibility of the local authorities. The development founding stems from the public revenues, mainly taxes, which are collected centrally and distributed. PIT and CIT taxes are partly transferred from the central authorities to the municipalities in the proportion they were collected from given territory, and this mainly constitutes the own revenues. It is usually supplemented by collecting the property tax, incomes from properties and others (as own revenues) and centrally distributed subsidies and subventions (as general revenues) locally.

tech business will perform better in the core than in a periphery.

The place of business generates two mechanisms: spatial spillover and agglomeration economies, and both are the consequence of the spatial interactions with and within an economic environment. Both mechanisms are crucial for the financial and economic position of the local community. Local spatial spillovers from SEZ are expected in all locations. From high-tech firms, it is through the R&D channels, mainly when located in cores. From any business, also located on peripheries, it is because of introducing exogenous economic stimuli with SEZ, which, in under-developed locations, uses a stronger perceptible. However, an appearance of spatial spillovers and agglomeration economies requires a significant investment in SEZ (the direct effect) and the institutional mechanisms that activate the local surroundings (the indirect effect) and engage SEZ in local cooperation. As indicated by Wang (2013), SEZ, by attracting new firms and increasing business density, can improve the agglomeration economies. In the case of SEZ in clusters, one can also expect, besides the agglomeration economies, the economies of scale and a reduction in search and transaction costs. This requires mass capacity, which is mainly present in cores and big cities (Combes, Duranton, Gobillon, Puga, & Roux, 2012). SEZ developed in peripheral locations will be the instrument of cohesion and economic integration of stronger and weaker regions and will rarely benefit from agglomeration economies. As noted by Bräutigam and Tang (2014), following the Foreign Investment Advisory Service (FIAS) 2008, p. 50, the location and the infrastructure expenditures decide about the success of SEZ. The financial support in SEZ (tax exemptions and investment co-financing), offered to business by public bodies, can be treated as a compensation for the high investment cost, resulting from technology advances or non-attractive business locations. They found that when countries decide to create new growth poles in remote areas with SEZ, high expenditures and significant business costs usually render those investments economically inefficient.

3 The methodology of statistical analysis

The public intervention, like SEZ, is expected to impact the local economic environment. This environment can be spatially limited to the territory of the community, region and so on. As the public intervention was designed to improve the situation when the market failures are observed or to boost the economic and financial performance in the 'average' (no problem and no success) locations, in the statistical analysis of the long-term *ex-post* public intervention effects, one can assume two main patterns:

a) that the territorial units under intervention (with SEZ) performed poorly before the intervention, and in consequence, they were expected to catch up with the other units and

b) that the units under intervention (with SEZ) were approximately similar to other units, but intervention was expected to result in the significant improvement of the situation for these units.

As illustrated in Section 4, SEZ in Poland were established in diverse locations, both in the peripheral ones in the municipalities performing poorly and in the central ones with the boosting economies. This gives the municipalities the full range of results to be matched with.

The methodology presented here relies on the comparative analysis of the density distributions of the variables of interest on a local/regional level. These distributions are statistically compared over time and across the institutional criteria. The given institutional group (e.g. with/without SEZ[9]) consists

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9 This statistical analysis, like most of the literature studies, uses the dummy variable approach to distinguish between SEZ-hosting and non-hosting regions and, based on these divisions, compare the differences in the fiscal position of local governments, unemployment rate, investments and so on. It is obvious that SEZ-hosting/ non-hosting municipalities are not homogenous and differ in terms of the number of firms in SEZ, absorption of SEZ stimuli, general development trends, magnitude of the direct and indirect effects and so on. They also have different dynamics of development, which is also dependent on the saturation of local economies with the private and public investments (Kopczewska, 2016). In general, the impact of SEZ is predominantly analysed with the econometric models, which seek to control for the differences in socioeconomic environment, while including (or not) the spatial effects of spillover (Kopczewska, 2016; Ciżkowicz et al., 2017). However, even when searching for the impact of the core variable, while controlling with many supporting explanatory variables in the model, the coefficients in the regression are always an average, and what is more, very sensitive to the outliers, the high variance resulting from the heterogeneity, impact of omitted variables and so on. This statistical approach is robust to the outliers because of the use of L-moments (Hosking & Wallis, 2005; Bílková & Malá, 2012; Kopczewska, 2016). Differences between

of all municipalities fulfilling the requirements, including the best and the worst ones. Thus, all existing municipalities are compared, which is further less selective than the case studies. This approach also overcomes the selection bias as the composition of the compared institutional groups is stable with the same territorial units. This approach considers the population, as all administrative units are included. It allows for tracking what happened in all municipalities with regard to public intervention factor, independently of their initial performance. This is not a case-tocase analysis, but a distribution-to-distribution method. The institutional factors defining the groups are treated as inter-group differentiating conditions, applied to maintain a high intra-group homogeneity. This is an unconditional (absolute) method, contrary to the conditional econometric models.[10]

The comparisons of the density distributions in institutional groups for a given moment of time allow for testing its significance in differentiating the municipalities. However, the core comparison is over time. One is to observe the relative shifts of the distributions. As noted by Kopczewska (2014), there are four possible changes in the distributions (Figure 2):

a) global shift, when all units shift in plus (to the right)—this situation appears when all units within the group have a higher level of variables than before;

b) divergence, when the best units improve their position by shifting in plus, and the rest stay on the same level—this situation means expanding of the distribution in its upper tail, while the body, reflecting the majority, stays unchanged;

c) convergence, when only weaker units become stronger, so they are closer to the best one—this situation appears when lower tail units shift towards a body (centre) of the distribution, thus increasing the frequency in the mode value;

d) no change, as the distributions may not shift and stay in the same relation.

the density distributions are easily testable, and the tests are sensitive to even slight changes, thus the risk of averaged results and biased conclusions is rather limited. This analysis is to answer whether, in general, SEZ influenced the financial performance, treated as an unconditional process.

10 This division refers to conditional and unconditional beta-convergence models (Rodrik, 2012).

The similarity of the empirical distributions can be efficiently compared using the Mann–Whitney's U (MWU) test (being the statistical equivalent of the Wilcoxon rank-sum test). It checks the differences of the entire distribution based on the ranks (scores) of the observations in both tested groups. The observations in groups are to be independent and unpaired. MWU, as a non-parametric test, formally does not require any assumption related to the distributions of scores, even if it performs best for similar shapes. It checks whether the locations of both distributions (sample means) are the same (H_0) since they come from the same population. Counting U-statistics requires sorting all values increasingly from both samples, keeping group labels assigned. The ranks of the observations are summed within the groups, and the minimum of them is selected. Statistics is defined as:

$$ U = \min\left(\sum_{i=1}^{N} R_{i,X}, \sum_{i=1}^{N} R_{i,Y} \right) $$

where $R_{i,X}$ and $R_{i,Y}$ are the ranks in groups X and Y for ordered data, N ($N = n_X + n_Y$) is the total number of observations and n_X and n_Y are the size of the sub-samples. For a big sample, one can use the normal approximation:

$$ z = \frac{U - \dfrac{n_X n_Y}{2}}{\sqrt{\dfrac{n_X n_Y (N+1)}{12}}} $$

what enables using critical values from a normal distribution. The MWU test is to compare the different groups of the observations, institutionally delimited with regard to SEZ, authorities and formal status, for the same or different moment of time.

For the paired observations, one uses the Wilcoxon signed rank-sum test. It operates on the non-zero differences between the values for a given unit. For the ordered absolute values of these differences ($|d_+|$, $|d_-|$), the ranks R_i are assigned. Its T-statistics is a minimum of a sum of the ranks from the groups of positive T_+ and negative T_- differences.

$$ T = \min(T_+, T_-) = \min\left(\sum_{i=1}^{N} R_i(|d_+|), \sum_{i=1}^{N} R_i(|d_-|) \right) $$

a)

b)

c)

The theoretical changes in the frequency distributions of the development patterns—the typical conversion paths from A to B:
(a) global shift (increase in competitiveness) of the whole economy;
(b) increase in competitiveness of the best units (divergence);
(c) increase in cohesion (convergence).
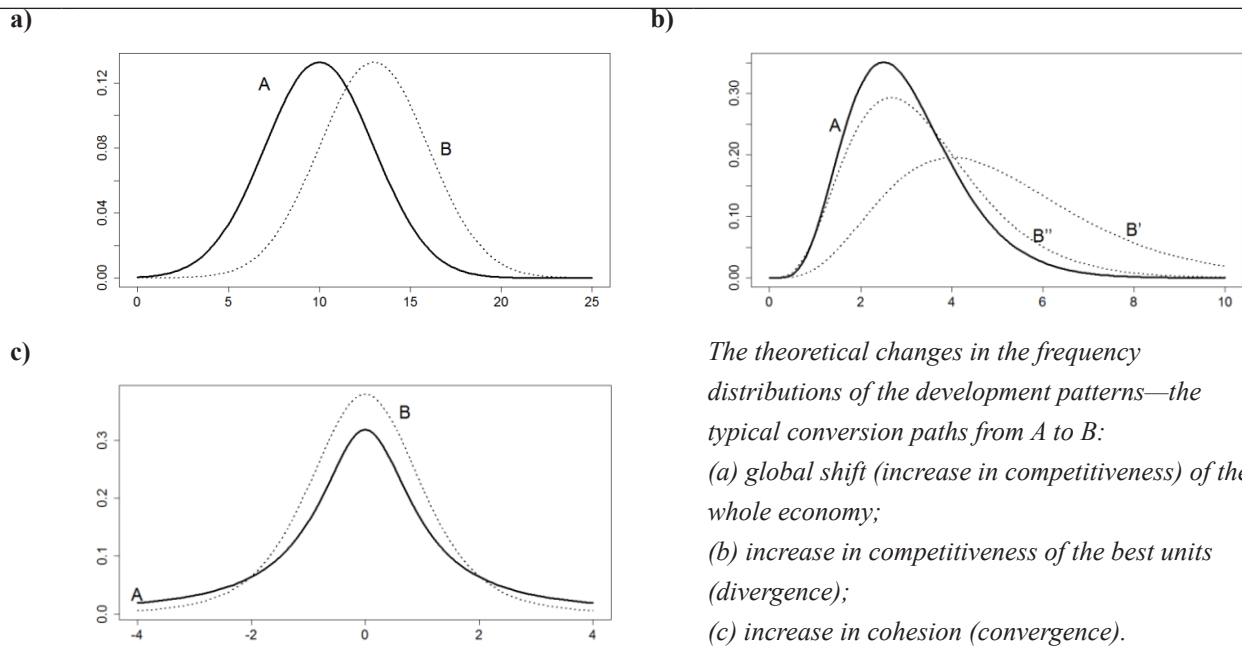
Fig. 2. Expected changes in density distributions under global shift, divergence and convergence. *Source*: Kopczewska (2014).

For a big sample, one can use the normal approximation:

$$z = \frac{T - \dfrac{n(n+1)}{4}}{\sqrt{\dfrac{n(n+1)(2n+1)}{24}}}$$

where n is the number of the units analysed. Wilcoxon signed rank-sum test can compare the changes in the same units over time.

The robustness of the analysis requires the stability of the data for which one is to avoid the random shifts over time and the slight cyclical fluctuations. This may be achieved when an average of three-year data instead of single-year data is used. For the long-term conclusions on the effect of the intervention, the extreme time spans (2005–2007 vs. 2014–2016) are to be compared. When no changes occur, or the intervention brings adverse effects, one can conclude about its inefficiency. Thus, when assessing the public economic policy, one can ask if municipalities, where the SEZ was established have significantly improved their socioeconomic performance, in comparison with other units. What are the patterns of change in all municipalities: convergence, divergence or structural stability (*path-dependence*)? This analysis is presented in Section 5.

For the supportive role in the analysis, the so-called panel plots are used. For the selected interest groups separated with the institutional criteria (e.g. rural or urban municipalities, with SEZ, with local authorities and core cities), the average value of the variables of interest over time is plotted, and the descriptive statistics are calculated. Regarding all the disadvantages of the arithmetic mean, those charts enable tracking the dynamics within the groups over time. With standard *t*-tests for the differences of means, one can assess the significance of the inter-group differences and the common trends or the heterogeneity of the selected groups.

The variables of interest, which are suitable for the statistical analysis of public intervention and its impact on local economies, are the data for local, territorial units and specific moments in time. Data must be compared between units and over time. Thus, economic variables, such as the unemployment rate or firms per capita, as well as financial variables including investment, PIT, CIT and own revenues of the local government fulfil this criterion and can reveal whether the intervention was efficient. Variables are to be selected on a theoretical basis and the perspective of research. The details are presented in Section 4.

4 Dataset: Polish municipalities and SEZ in 1995–2016

The study was conducted on Polish municipalities (2,474 NTS5 units) in the years 1995–2016 (22 annual periods) using the aforementioned methodology. Using that long time period enables studying the long-term effects, while starting date in 1995 shows the economic environment at the beginning of the process, not affected by previous SEZ activity. Data on municipalities' performance were collected from the Local Data Bank (Central Statistical Office, Poland), while the data on SEZ from the reports of the Ministry of Development. The institutional characteristics of the municipalities (rural/urban/mixed type, seats of authorities: NTS2—regional core city and NTS4—local core city) were included. SEZ were established by the decision of the ministry. In the group of 'municipalities with SEZ', all three types of NTS5 units (rural, urban and mixed) have a share of one-third, including one-third as the seats of NTS4 authorities.[11] There are three main financial variables that can accurately reflect the financial situation in the local community: own revenues, investment expenditures and PIT revenues, all counted per capita and/or per capita in the productive age.[12] Own revenues depend, in general, on the economic activity of inhabitants and businesses. In the Polish system at the local level, the own total revenues of municipalities consist of (a) collected by municipalities property tax, agricultural tax, forest tax, vehicle tax, lump-sum tax on economic activity (tax card), inheritance tax, stamp duty, market tall, local fees, climate fees and on possession of dogs, mining fee and (b) shares in the central government inflows of PIT[13] (37.53% of paid tax) and CIT (6.71% of paid tax). PIT and CIT revenues are included among the municipalities' own revenues, but the structure differs between them. Investment expenditures are to finance the local infrastructure. All the financial data were deflated, with the price deflator based on the CPI inflation rate, and all current prices were recalculated to the prices of 2016.

Besides the financial data, the economic performance of the municipality is being measured with the unemployment rate, potential labour force given with the share of the productive age population in the total population and number of firms per capita. Those variables measure the business attractiveness of the local economy and its institutional and social environment. In total, six variables were used, which for 2,474 units and 22 years give 326,568 observations in the database. The summary statistics of these data are presented in Table A1 in Appendix, while its trends are shown in Figures 4 and 5.

In the analysis, the data should reflect changes as a response to the given development policy. This is to note that the number of companies and revenues from PIT were recalculated per inhabitant in the productive age where the denominator allows one to separate the effect of uneven local indicators of an ageing population and assumes a real process: economic activity in conjunction with potential employees. The unemployment rate measures the share of the unemployed persons in the working-age population. In contrast, several inhabitants in productive age per capita give the age structure of the population and labour force potential. Finally, own revenues and investment expenditures were expressed *per capita* in the constant prices of 2016, with a total population in the denominator as revenues and expenses related to all residents.

Polish SEZ differ in their legal and economic construction from SEZ in other countries. SEZ were created in Poland under the Act of 1994 on SEZ, but they began to operate in 1998.[14] It was assumed that SEZ might be established to accelerate the economic development of the territory of the country, in particular by job creation.[15] Following the annual reports of

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11 NTS5 units (rural, urban and mixed municipalities) are the basic spatial units in territorial organisation. Higher level of administration at NTS4 (called poviats) is the groups of NTS5 units—in this organisation, one of NTS5 units becomes a seat of NTS4 authorities. Thus, NTS4 authorities are located in NTS5 units.

12 PIT revenues are generated only by inhabitants in productive age but spent (invested) on all inhabitants.

13 In Polish tax and statistical systems, there is an 'agriculture bias' as farmers do not pay PIT and are not counted as working force (status of farmer is declared). Thus, rural municipalities have different official ratios of active labour force, but their incomes are really lower (and thus supplemented by subsidies and grants from the central government).

14 European Union Regulations prohibit the state aid, which distorts the competition by favouring certain goods and affecting trade between EU member countries. The exception is the case of support related to the economic development and social reasons. It is given by Consolidated version of the Treaty on the Functioning of the European Union—Part Three: Union Policies and Internal Actions—Title VII: Common Rules On Competition, Taxation and Approximation of Laws—Chapter 1: Rules on competition—Section 2: Aids granted by States—Article 107 (ex. Article 87TEC), 2008).

15 Following Aggarwal's classification (2010), these are mainly second-generation of SEZ objectives.

the Polish Ministry of Development (*pl* MR) on SEZ, the main objective of creating SEZ was striving to alleviate the structural unemployment in some regions of the country by directing the new investments through the use of a package of financial incentives. SEZ were originally to run over 20 years from the date of their establishment. In 2008, their operation was extended until 2020, and in 2013 until the end of 2026. Initially, the location was predefined by the government, mainly in peripheral locations, while in the next years, business often negotiated it with authorities to be able to establish SEZ in cores. The unique feature of Polish SEZ is that within 14 general zones, there were more than 350 fragmentary locations, in 146 cities and 210 municipalities. The peripheral and core locations of SEZ can be tracked when compared to the density of business per capita within the municipalities (Figure 3). One can observe the clusters of SEZ, mainly in the South, which is historically more industrialised, as well as around big core cities (the darkest areas on the map). There are also individual SEZ, diffused in the non-core areas, mainly in the North.

When setting the business in SEZ, there were no requirements on the technology-involvement, export activity, research capacity, local suppliers' involvement, no institutional obligation of the backward linkages, and so on, independent of location, which was extremely attractive for the firms in SEZ and less for the regions and local economies. Any business was allowed. Business composition is as follows: manufacturing firms were predominantly established—in wood-processing and automotive sectors (most frequent) as well as in aviation, electric and optical devices, printing, paper, rubber and plastic products, household equipment, information and research and development services industries (KPMG, 2009).

In 2016, there were 14 zones located fragmentarily in 464 locations, and the area developed in the SEZ was 21,462 ha, which represents 17.7% of all industrial sites in Poland (121,492 ha) (MR, 2017). The share of industrial sites in the country is 0.38% of the total area (31,267,967 ha). In 2016, 2,263 permits were valid from 3,687 permits issued ever. Since 1995, about 28 billion Euro had been invested (112 billion PLN), which may constitute approximately 12% of the national total capital expenditures during this period (927.5 billion zl). At the end of 2016, SEZ employed 332,000 people, which is approximately 2.2% of all employees in Poland (14,964,411). SEZ were partly located not only in the industry region (mainly in the south) but also on the peripheries (predominantly in central and northern

parts) (Figure 3). The Ministry of Development (2017) reported that in 1998–2011, the total value of the tax exemption amounted to approximately 5 billion euro (19.7 billion PLN) while the infrastructure spending by the central and local governments amounted to 1 billion euro (4.3 billion PLN). So, the total cost of establishing a SEZ incurred by the state, compared with capital expenditures by companies, was approximately 21.5% of the costs incurred by businesses.

5 Results

Two sets of plots (Figures 4 and 5) present the results of the analysis for the years 1995–2016. An objective was to assess the changes over time and between the groups in the financial and economic situation. This study aims to answer a few questions: did the NTS5 units with the SEZ significantly improve the financial and economic performance compared with other municipalities over a period of 22 years? What is the pattern of developmental changes: convergence, divergence or perhaps path-dependence (stability over time) in the distinguished groups? Are there any significant differences in the development between the distinguished groups? The expectations are as follows: if SEZ are indeed an instrument supporting the cohesion policy, this should be reflected in the different rates of growth of the variables tested, including faster changes in the SEZ than in other locations without SEZ. If SEZ were dedicated to the vulnerable communities, thus in the first years of the study, the municipalities with SEZ are expected to perform more poorly (higher unemployment rates and lower values of the other variables), and finally, in the long-term to improve the economic situation.

The results for the economic environment (Figure 4) prove that the dynamics of the business unit growth were stable in all types of communities. The initial level of firms per inhabitant in productive age (referred to other units) is similar to the final one. Thus, SEZ are not the accelerator of the local business development. Also, SEZ were not relevant to the unemployment rate. Even if the disproportions in 1995 were higher, the unemployment rate changes in SEZ and non-SEZ units were consistent over two decades. Population age structure differs between urban and rural areas, while SEZ is not a differentiating factor.

Regarding the financial (budgetary) data of local authorities (Figure 4), own revenues *per capita*
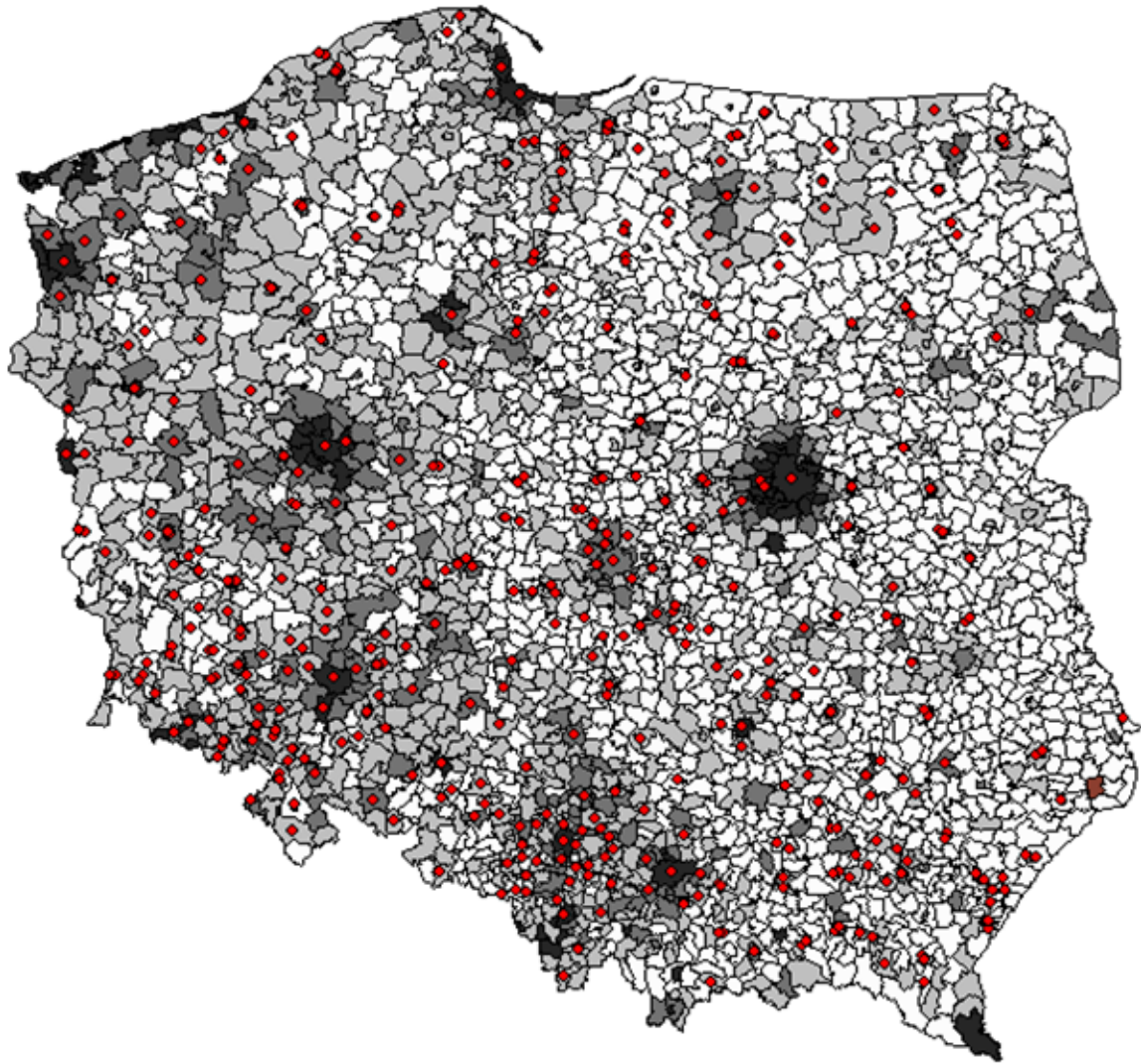
Fig. 3. Location of SEZ in comparison with non-SEZ business locations in 2016. *Note:* Firms *per capita* in intervals 0–0.1–0.15–0.20–0.5–0.75, from light to dark grey; SEZ are given with circles. *Source*: The author. The location of SEZ from MR (2017), the density of business from Central Statistical Office www.stat.gov.pl.

in municipalities with SEZ were higher than in rural communities but lower than in other units. Clearly visible is the divergence of own revenues, as it started in 1995 at a similar point, whereas in 2016, the difference between the best and worst groups is double. Urban units without SEZ have higher own revenues than those with SEZ. Revenues from PIT follow the same pattern as the own revenues and SEZ did not break the trend in own and PIT revenues in their hosting municipalities. The slight drop in PIT revenues in 2008–2009 is the effect of the global financial crisis. Public investments began to rise significantly after the Polish accession to the EU in 2004 and after the EU funds distribution started. The

rural SEZ units were the top investors, together with the non-SEZ urban units. This proves that attracting SEZ to the peripheries required public infrastructure. There was an evident change in investment spending after 2010 since when all municipalities invested less. These results lead to the conclusion that there is no reason to believe that SEZ were indeed an essential exogenous stimulus for economic development.

In most cases, the municipalities in which SEZ were established were the average ones, and after several years (more than two decades), the SEZ municipalities are in a similar position to the initial period. Figure 5 presents the density distributions for the 3-year average values for 1995–1997 and 2014–2016
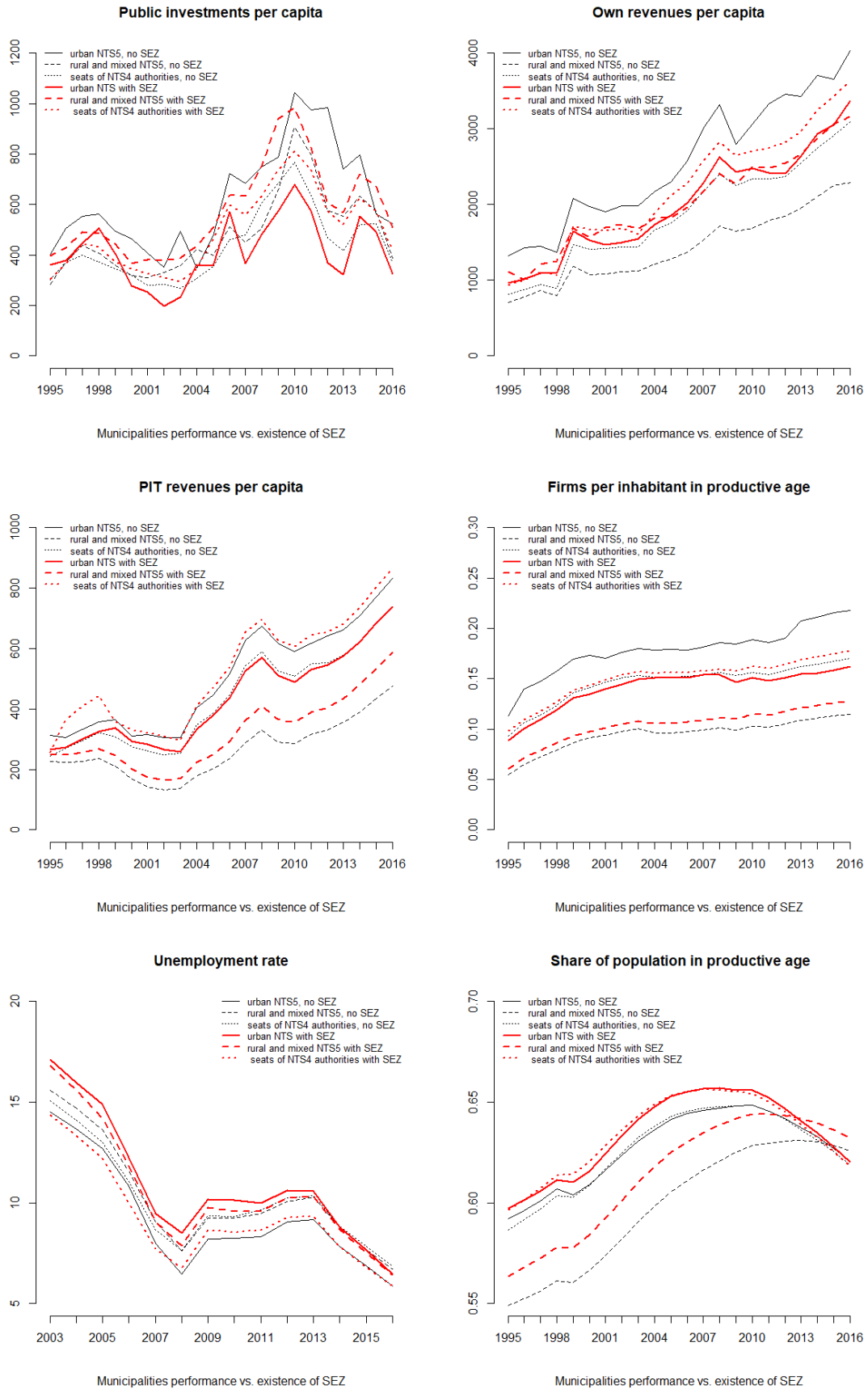
Fig. 4. Panel plots for selected groups of NTS5 units. *Source*: The author's results, estimated in *R*.
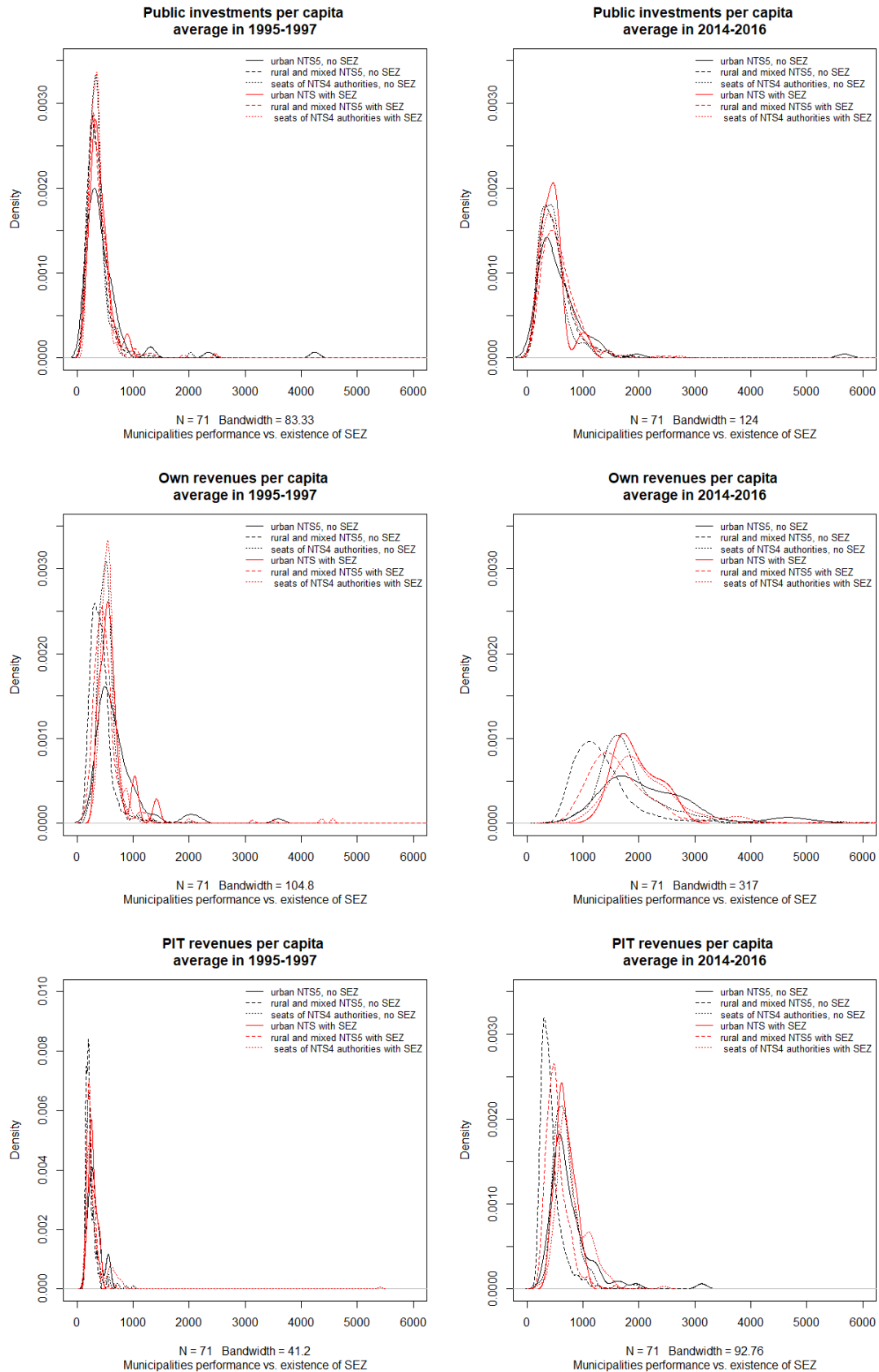
Fig. 5. Density distributions of 3-year average data in time spans: 1995–1997 and 2014–2016. *Source*: The author's results, estimated in *R*.
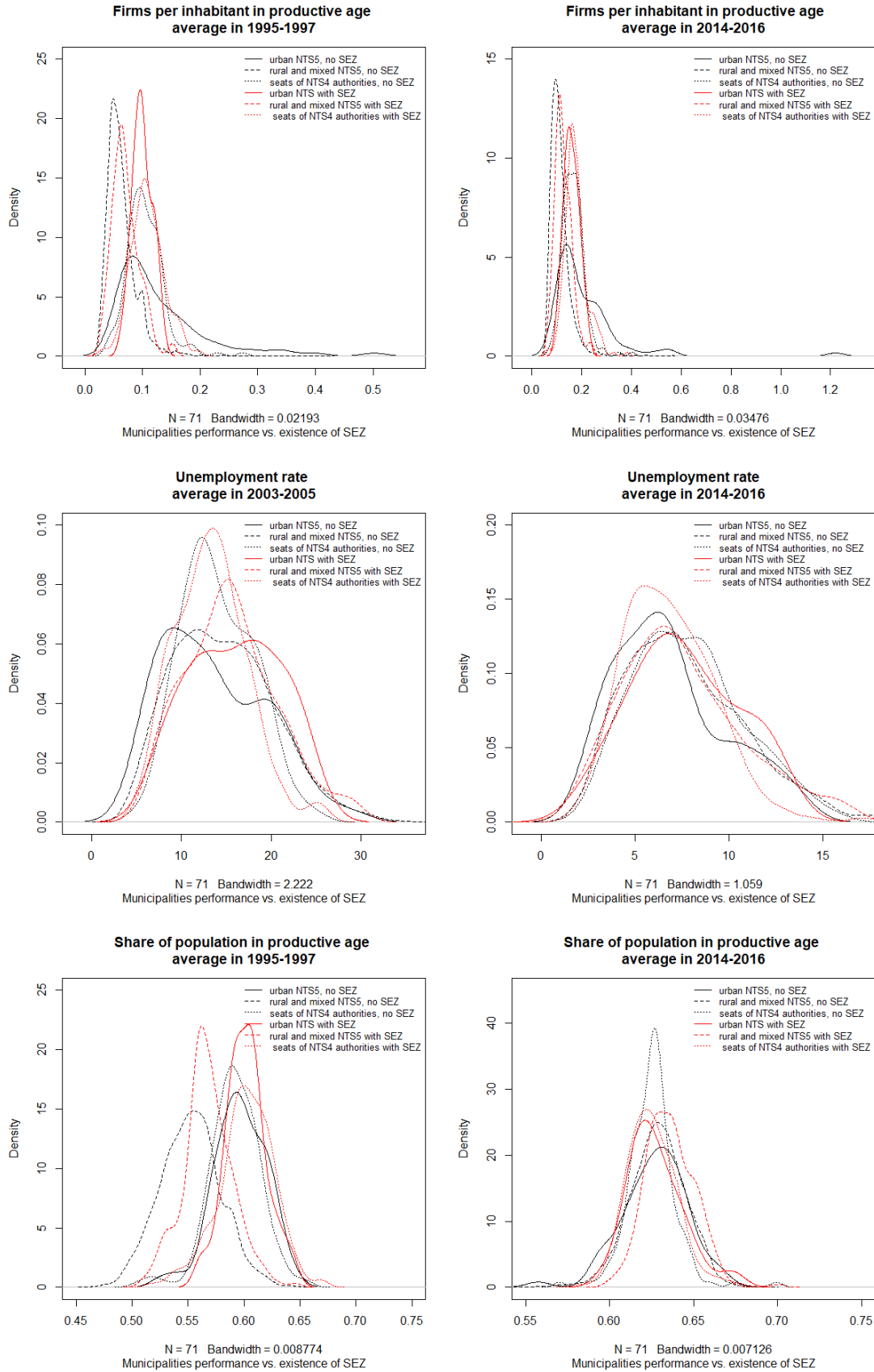
_{Continued} **Fig. 5**. Density distributions of 3-year average data in time spans: 1995–1997 and 2014–2016. *Source*: The author's results, estimated in *R*.

(gap in 1998–2013) for budgetary data. It assesses the changes in distributions over time in the groups of municipalities. This should answer the question of whether the situation of SEZ municipalities significantly improved over two decades. The assumption behind this is that SEZ give a significant impetus for development. Thus, the SEZ municipality should grow better than the other municipalities. Even if in 1995–1997, the densities' functions for municipalities with and without SEZ converged, there should be a visible distribution shift in 2014–2016 due to the development impulse impacting all SEZ units.

The statistical Wilcoxon tests for paired and unpaired samples were performed to compare the distributions analytically from Figure 5. Table A2 in Appendix presents the *p*-values of Wilcoxon tests.[16] In general, results confirm the aforementioned conclusions (Figure 4). Now and two decades ago, the distributions of the variables in urban locations with and without SEZ are mostly similar, what also applies to the seats of authorities, while rural locations mostly differ by lagging behind. There are no significant differences between those groups, both in 1995–1997 and 2014–2016, and there is no significant distribution shift (*global shift*) in the SEZ municipalities. Thus, these data prove that SEZ did not cause a substantial improvement in the financial and economic situation of municipalities. The density of business, relative investment and revenues, unemployment rate and population age structure, did not change significantly under SEZ in the urban and core locations over two decades.

The proposed methodology is rather novel, especially in studying the phenomenon of impact SEZ. Using the statistical distribution-to-distribution approach is between the popular case study method and common econometric techniques (as in Ciżkowicz et al., 2017; Jensen, 2018; Nazarczuk & Umiński, 2018b). However, each technique answers to some other questions and shades different light on the studied problem. Supplementing the presented study with case studies may reveal the micro-foundations of the global phenomenon, while adding econometric model can analyse the mutual relations and causality. This study opens the floor for prospective analyses in this field.

6 The context of the other research

The aforementioned results are not in favour of SEZ as a public intervention instrument to support the cohesion policy and generate the stimuli for the development. It needs reflection and linkage to other studies of this issue, as presented in the following paragraphs. Polish literature on SEZ is rich but divided: with some authors praising the SEZ, and on the contrary, others criticising the SEZ.

The first group, praising the SEZ, is mainly consulting firms' reports. KPMG (2012) expresses the opinions and demands of companies operating in the SEZ through interviews with the management of these zones. The report stresses that the Polish SEZ are particularly attractive due to the extended horizon of action, the possibility of combining aid with funds from the EU and other government grants (*double public aid*). Respondents postulated the improvement of the public infrastructure and the increase in the possibility of financial transfers between zonal and non-zonal companies. From a business perspective, SEZ are highly preferred instruments.

Similarly, E&Y (2011) indicates some theoretical mechanisms to attract other companies by SEZ spillovers, including the benefits of clustering and concentration, benefits from property tax and so on, which have not been empirically confirmed. The report stresses that the termination of SEZ in 2020 would already discourage investors already in 2011, as this would significantly reduce the attractiveness of SEZ for large companies. Similarly, Piwowarczyk (2013), in the analysis of the legal and institutional SEZ operations in the EU, indicates that investors are interested in investing in the SEZ provided that the extended period of operation of the SEZ lasts until the year 2026. Using the robust advanced econometric model, Cizkowicz et al. (2017) confirm that SEZ in Poland increased the employment—in the SEZ itself as well as in regions with SEZ and the neighbouring areas. However, they do not study the long-term benefits, non-linear SEZ effects and the design of the fiscal cost-sharing scheme.

The second group, criticising the SEZ, comprises the institutional and scientific reports. The first one, by the Supreme Audit Office (SAO) (*pl* NIK, 2009), clearly indicates that the intervention nature of SEZ is blurred. SAO demonstrates that the SEZ extensions were predominantly made at the request of busines-

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16 The paired tests were conducted for the groups with the same composition, but in a different moment of time.

ses, who were willing to invest in well-located SEZ in Poland or other countries. In addition, many sub-SEZ were located in economically well-developed regions, where government support is not required. SEZ were expanded despite the unused 30% of sites already included in the SEZ.

In addition, SAO proves that the exact costs of tax exemptions granted to companies operating in SEZs are still unknown. The benefit of SEZ for municipalities was to create new jobs and, consequently, reduce spending on social assistance. Municipalities also gained revenues from the sale of land and real estate and property tax. On the other hand, central and local budgets incurred high costs of grants and reduced tax revenues from the CIT.

There are few significant studies on the impact of SEZ on local economies. Domański (2008) emphasises that the SEZ have been successful only in old industrial areas and locations with good transport accessibility, that is, in principle, in places where most production companies can work well without individual support. Only SEZ that have acquired large and medium-sized investors could achieve their economic goals—improving the economic conditions of the community by, for example, reducing the unemployment rate. At the same time, the spillover, which is understood as the links between zonal and non-zonal municipalities and businesses, was weak. There is no evidence that SEZ stimulate local entrepreneurship. SEZ have lost their character of serving as a support tool and have become a standard element of public aid for large companies. Effectively, SEZ were located in different areas: mainly in peripheral locations indicated by the government during the 1990s, and mostly in places specified by the investors after 2001, and these were predominantly not the most deprived regions. Domański (2008) underlines that the support of areas by SEZ is not needed, as there are no significant development stimuli from SEZ. Also, the policy of returning to the original idea of SEZ and supporting remote areas should be reconsidered.

Przybyła (2010) studies the impact of SEZ on the economic base of cities and emphasises that, despite many positive effects of SEZ, in many cases, it is difficult to find the transmission of good results of companies from the SEZ on the quality of life in municipalities with SEZ. Gryczka (2009) emphasises that investments in SEZ are mainly in traditional sectors with a low level of innovation, slow modernisation and without R&D centres. The impact of SEZ on the labour market has been ambiguous until now. Smetkowski (2002) proves that the development stimuli from SEZ were visible only in the stronger regions, while in weaker, backward regions they are rather weak. This means that the cohesive impact of SEZ is very limited. Opposite conclusions for the unemployment rate are given by Ambroziak (2016) and Ambroziak and Hartwell (2017). Augustyński (2017) studies the fundamental questions inquiring whether without SEZ the same investment would appear, if SEZ are dangerous competitors for non-SEZ businesses, or if the unemployment rate falls in SEZ. The answer is rather pessimistic, while the conclusions are close to this research suggesting that the main effect of SEZ is a decrease in local budget revenues.

In addition, the low bargaining power of the local authorities against the domination of SEZ is underlined. Dorożyński et al. (2017) also claim that SEZs do not reduce the regional economic differentiation in Poland, even if they raise the attractiveness of the NTS2 regions. Jensen and Winiarczyk (2014) show in the panel data analysis for the NTS5 municipalities that "*the positive effect of the policy however mainly comes through foreign direct investment (FDI), whereas the effects on e.g. investment and employment are small or insignificant*". They also claim that "*despite high levels of FDI, the zones policy has not managed to overcome the legacy of backwardness or lagging regions*". Kopczewska (2016), in a cumulative spatial panel model for the NTS5 municipalities, proves that the SEZ limited the public investment efficiency and no spatial spillover of SEZ appeared. Ambroziak (2009) confirms that SEZ have had a significant positive impact on employment, as they have created some workplaces above the contracted volume.

In general, studies show that the significant majority of the companies operate locally, using the employees from the given municipality only. The dynamics of unemployment were very similar to the municipalities without SEZ. A strictly limited spillover to other businesses means that a large company becomes a monopolist in the labour market and can consequently lower the wages, which is a negative social effect. SEZ were established near large cities, without an impact on the local markets, in the business-attractive areas. Since 2001, the SEZ locations indicated by the investors have served as the centres of development, however, without the diffusion. They were raising the attractiveness of an already attractive region (Walkiewicz, 2017). Ambroziak (2009) confirms the SAO findings (NIK, 2009) that SEZ were an incentive to invest in the country (Poland) and not an instrument of reducing regional disparities.

In the theoretical approach, there are at least two government strategies for SEZ: (a) the traditional businesses in the periphery to boost the economic integration and (b) the modern business centres to improve innovation, exports and so on. The development of technology requires a central location, and at the same time, steering SEZ to peripherals reduce the technological advancement. The Polish strategy, by assumption, was based on building the economic cohesion using the SEZ. Due to the inconsistency of the authorities and significant business bargaining power, the mechanism of the integration of the outermost regions to the economy by the SEZ has stopped. This means that an increase in the efficiency of SEZ, placed at central locations, can only be achieved by the requirement of high-technology investments. In a developing country, FDI is an important part of development. In an efficient market economy, SEZ distorts market forces. The adverse effects associated with the SEZ and which occurred in Poland are idle run (planned investments were completed anyway, but cheaper), substitution (closure of the company outside the SEZ and the opening of companies in the SEZ) and the distortion of competition. At the same time, SEZ do not always to attract FDI, as it is often used by national capital. Tax exemptions are a safe and rational instrument of the support, because they do not require the capital investment, and are spread over the years. The fiscal preferences build the attractiveness of Poland internationally.

7 Policy recommendations

The policy recommendations from this particular study are that SEZ in Poland should be redirected or redesigned. From the theoretical background, there is a clear trade-off: (a) the support for the local development and catching-up process with the SEZ located in peripheries and hope that the spillover from SEZ will appear and (b) building an innovative environment when SEZ are located in centres. Currently, in Poland, neither of these mechanisms is present. The reason is simple: there were weak restrictions on the profile of the activity, export performance, innovativeness, backward linkages, engaging local suppliers and so on. In fact, Polish SEZ were designed in the early 1990s as an instrument of supporting peripheries in transition, so any business was welcome. However, following Aggarwal (2010), directing SEZ to peripheries evokes the negative technological auto-selection and almost

automatically limits the innovative capacity of the business. Thus, business willing to introduce any technology and even basic innovations preferred the more central locations, as the peripheries were too peripheral for the efficient operation of the big firms. The government's agreement to shift SEZ to the better-developed locations did not imply any requirements in the more advanced profiles of SEZ firms. Innovativeness or export-oriented profiles were not introduced, which meant that any business could locate itself quite easily in SEZ, to be exempt from taxes. The miracle of diffusion did not appear as there were no requirements of local cooperation. A lesson from this for the government is that for SEZ, they should formulate new objectives to pursue and understand that public support is not a standard package for any business ('*no free lunch*') and that some trade-off exists for the business.

The efficient SEZ should be located in cores and should be based on technology development, innovation and high technologies. The core locations can provide them with high-quality specialists who can understand and co-develop the new technologies. The idea that SEZ will support the cohesion policy being located outside the cores, in consequence, limited the agglomeration forces dramatically, which are claimed to be the driving factor of the economies of scale and spillover in the literature but require the mass capacity to operate (Combes et al., 2012). The study supports the results by Bräutigam and Tang (2014) that peripherally located SEZ have a reduced chance to support the economies significantly. This drives to the conclusions known from the previous studies and theoretical assumptions: SEZ should be forced to build the backward linkages when located in peripheries as the second-generation of SEZ. Together with the economic development of the country, the government should promote the third-generation of SEZ, developing R&D and technology, and locating it in cores. This type of research can be applied to different kinds of public intervention. These can be SEZ as well as other instruments of promoting and supporting local growth and development.

This analysis also reveals the necessity of a midpoint efficiency evaluation. As it may be observed from this study, *a priori* efficient tools do not always prove to be that attractive in practice and *ex post*. If the development policy is to be oriented for the fine-tuned selective actions, its effects should be controlled to plan the activities for the following periods better. The ability to compare the impact of the different actions

and interventions can help in further decisions, for example, which actions should be further supported and which substitution and complement tools should be applied. Also, the point is that government bodies should consciously articulate their assumptions on the effects of a given tool. This enables the efficient design of the institutions and mechanisms for the given support. In the case of SEZ, as presented in Figure 1, there are many expected outcomes, depending on the economic situation, location, rules of the game and so on. As indicated by different government documents, authorities are prone to believe in economic miracles, including the diffusion mechanisms. However, one should remember that businesses are the most rational agents in an economic environment and prefer to internalise rather than externalise benefits, and of course, reduce costs. Thus, the well-designed rules, laws and institutions by well-defined expectations are the core element of the success of any public intervention in the economy.

8 Summary

This article analyses SEZ as a particular form of public intervention. It develops the institutional framework based on Hazakis (2014), treating SEZ as a non-silent agent, whose presence in the local community in the long-term may spillover the development stimuli for a local business as well as for the local authorities. The article distinguishes and discusses the direct and indirect effects of SEZ. It seeks to explain the economic and financial effects of SEZ, especially in local communities, which are an expected effect of a cohesive policy in the place of the location of public intervention. The article deals with two mechanisms, the financial and economic ones, which are studied jointly to determine whether SEZ as the form of public intervention can be attractive for the state and businesses alike. It tries to answer the explicit question, whether the public intervention embodied by SEZ can push forward the financial and economic position of local communities.

There are two goals of this article: (a) to expand a quantitative statistical methodology of assessing the efficiency of economic intervention policy from the public sector perspective and (b) to assess the effectiveness of SEZ in Poland in 1995–2016 using this methodology with regard to the financial performance of local communities. The novelty of this article is twofold: it deals with quantitative methods

as the panel charts, and the density distributions applied to municipalities' data (NTS5) and study the financial performance of the local self-government. This approach is unusual compared with popular case studies or macroeconomic analyses. Also, the statistical conclusion about convergence, divergence and global shift processes does not find any predecessors. It is difficult to see a study with this toolset and/or a perspective in the literature on SEZ or other interventions. The results obtained with those two methods give an insight into the nature of intervention mechanisms from a public sector perspective. Despite its simplicity, they are reliable tools for long-term *ex-post* policy analysis.

It is also to support the literature with evidence on the particular type of SEZ and the long-term effects of this public intervention within a given institutional framework. Polish SEZ, unlike the other SEZ, were targetted institutionally on increasing regional cohesion rather than competitiveness in export or technology. Reduced requirements from business in SEZ and peripheral locations caused that mostly big manufacturing firms, which were self-sufficient in organising the production and distribution chains, were headquartered in SEZ. This article shows the extent to which this kind of intervention can be efficient, and reference studies to this are rather rare.

The assessment of public intervention in Poland proved that the impact of SEZ on the economic environment of host municipalities is rather weak. The hypothesised '*gift exchange*' consisting of bearing the increased cost of investment in the local infrastructure for settling SEZ with a hope to increase later own revenues from CIT and PIT revenues was rejected. SEZ set up in peripheral municipalities did not cause spillovers of exogenous development stimuli. It cannot be claimed that SEZ became the driving factor of local economies and a catalyst for local development. SEZ business did not generate positive external effects within the municipalities. The only consequences are nominal and direct, mainly for a labour market, resulting from the existence of given businesses and employment of workers in those firms. SEZ companies are likely instead to externalise the costs and internalise the benefits. This limits the indirect effects for the community and local authorities as to the increased budgetary inflows.

As noted in other reports and studies, also by the Supreme Audit Office (2009) or by Domański (2008), large international companies treated Polish SEZ as a standard investment package not as a *trade-off* solution

where the requirements are to be met. Lobby activities allowed for the extension of SEZ both in time (until 2026) and in space (30% of new areas). However, these new SEZ, which were expected to improve economic cohesion and to support weaker regions, were located in the above-average-performing municipalities, with high financial independence and a relatively low unemployment rate. This study proves that SEZ in Poland have lost their character serving as an instrument of public intervention and have become a tool on the highly competitive international investment market.

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Appendix

Tab. A1: Summary statistics

Variable	Year	Urban NTS5, no SEZ	Rural and mixed NTS5, no SEZ	Seats of NTS4 authorities, no SEZ	Urban NTS with SEZ	Rural and mixed NTS5 with SEZ	Seats of NTS4 authorities with SEZ
Public investments per capita	1995	403.01	283.21	301.00	359.49	397.02	303.20
	2005	477.10	399.78	355.03	357.10	508.80	462.50
	2015	562.01	573.53	523.73	491.96	671.12	574.01
Own revenues per capita	1995	1,323.31	706.38	817.77	959.60	1,113.19	937.29
	2005	2,299.77	1,285.73	1,758.46	1,859.01	1,825.00	2,122.48
	2015	3,659.58	2,250.30	2,911.66	3,053.13	3,062.19	3,432.31
PIT revenues per capita	1995	312.86	227.43	242.79	265.13	248.52	255.70
	2005	447.29	201.19	387.97	379.16	249.47	470.69
	2015	769.64	433.52	682.69	684.79	533.43	803.61
Firms per inhabitant in productive age	1995	0.11	0.05	0.09	0.09	0.06	0.10
	2005	0.18	0.10	0.15	0.15	0.11	0.16
	2015	0.22	0.11	0.17	0.16	0.13	0.18
Unemployment rate	1995	NaN	NaN	NaN	NaN	NaN	NaN
	2005	12.71	13.63	13.01	14.91	14.20	12.22
	2015	6.87	7.69	7.84	7.65	7.49	6.79
Share of population in productive age	1995	0.59	0.55	0.59	0.60	0.56	0.60
	2005	0.64	0.61	0.64	0.65	0.63	0.65
	2015	0.63	0.63	0.63	0.63	0.64	0.63

Source: The author's results.

Tab. A2: *P*-value of Wilcoxon paired and unpaired tests for similarity of distributions

Firms per inhabitant												
	sub10	sub20	sub30	sub40	sub50	sub60	sub1	sub2	sub3	sub4	sub5	sub6
sub10	1	0	0.27	0.5	0	0.74	0	0.85	0	0	0.04	0
sub20	0	1	0	0	0	0	0	0	0	0	0	0
sub30	0.27	0	1	0.6	0	0.09	0	0.06	0	0	0	0
sub40	0.5	0	0.6	1	0	0.13	0	0.21	0	0	0	0
sub50	0	0	0	0	1	0	0	0	0	0	0	0
sub60	0.74	0	0.09	0.13	0	1	0	0.86	0	0	0	0
sub1	0	0	0	0	0	0	1	0	0.2	0.26	0	0.79
sub2	0.85	0	0.06	0.21	0	0.86	0	1	0	0	0	0
sub3	0	0	0	0	0	0	0.2	0	1	0.5	0	0.09
sub4	0	0	0	0	0	0	0.26	0	0.5	1	0	0.1
sub5	0.04	0	0	0	0	0	0	0	0	0	1	0
sub6	0	0	0	0	0	0	0.79	0	0.09	0.1	0	1

_{Continued}**Tab. A2**: *P*-value of Wilcoxon paired and unpaired tests for similarity of distributions

PIT revenues per capita

	sub10	sub20	sub30	sub40	sub50	sub60	sub1	sub2	sub3	sub4	sub5	sub6
sub10	1	0	0	0.3	0	0.08	0	0	0	0	0	0
sub20	0	1	0	0	0	0	0	0	0	0	0	0
sub30	0	0	1	0.04	0.94	0.01	0	0	0	0	0	0
sub40	0.3	0	0.04	1	0.03	0.61	0	0	0	0	0	0
sub50	0	0	0.94	0.03	1	0.01	0	0	0	0	0	0
sub60	0.08	0	0.01	0.61	0.01	1	0	0	0	0	0	0
sub1	0	0	0	0	0	0	1	0	0.39	0.95	0	0.02
sub2	0	0	0	0	0	0	0	1	0	0	0	0
sub3	0	0	0	0	0	0	0.39	0	1	0.62	0	0
sub4	0	0	0	0	0	0	0.95	0	0.62	1	0	0.06
sub5	0	0	0	0	0	0	0	0	0	0	1	0
sub6	0	0	0	0	0	0	0.02	0	0	0.06	0	1

Own revenues per capita

	sub10	sub20	sub30	sub40	sub50	sub60	sub1	sub2	sub3	sub4	sub5	sub6
sub10	1	0	0	0.35	0	0.08	0	0	0	0	0	0
sub20	0	1	0	0	0	0	0	0	0	0	0	0
sub30	0	0	1	0.11	0.01	0	0	0	0	0	0	0
sub40	0.35	0	0.11	1	0.01	0.88	0	0	0	0	0	0
sub50	0	0	0.01	0.01	1	0	0	0	0	0	0	0
sub60	0.08	0	0	0.88	0	1	0	0	0	0	0	0
sub1	0	0	0	0	0	0	1	0	0	0.44	0	0.83
sub2	0	0	0	0	0	0	0	1	0	0	0	0
sub3	0	0	0	0	0	0	0	0	1	0.05	0.01	0
sub4	0	0	0	0	0	0	0.44	0	0.05	1	0	0.36
sub5	0	0	0	0	0	0	0	0	0.01	0	1	0
sub6	0	0	0	0	0	0	0.83	0	0	0.36	0	1

Public investment per capita

	sub10	sub20	sub30	sub40	sub50	sub60	sub1	sub2	sub3	sub4	sub5	sub6
sub10	1	0.06	0.13	0.98	0.38	0.39	0	0	0.15	0.32	0	0
sub20	0.06	1	0.77	0.18	0.07	0.05	0	0	0	0.01	0	0
sub30	0.13	0.77	1	0.23	0.3	0.18	0	0	0	0.02	0	0
sub40	0.98	0.18	0.23	1	0.45	0.5	0.04	0.03	0.3	0.5	0	0.03
sub50	0.38	0.07	0.3	0.45	1	0.88	0	0	0	0.07	0	0
sub60	0.39	0.05	0.18	0.5	0.88	1	0	0	0	0.04	0	0
sub1	0	0	0	0.04	0	0	1	0.54	0.07	0.28	0.33	0.83
sub2	0	0	0	0.03	0	0	0.54	1	0.02	0.36	0	0.66
sub3	0.15	0	0	0.3	0	0	0.07	0.02	1	0.96	0	0.03
sub4	0.32	0.01	0.02	0.5	0.07	0.04	0.28	0.36	0.96	1	0.05	0.3
sub5	0	0	0	0	0	0	0.33	0	0	0.05	1	0.05
sub6	0	0	0	0.03	0	0	0.83	0.66	0.03	0.3	0.05	1

Continued **Tab. A2**: *P*-value of Wilcoxon paired and unpaired tests for similarity of distributions

Unemployment rate

	sub10	sub20	sub30	sub40	sub50	sub60	sub1	sub2	sub3	sub4	sub5	sub6
sub10	1	0.1	0.25	0.07	0.01	0.78	0	0	0	0	0	0
sub20	0.1	1	0.42	0.19	0.02	0	0	0	0	0	0	0
sub30	0.25	0.42	1	0.08	0.01	0.11	0	0	0	0	0	0
sub40	0.07	0.19	0.08	1	0.56	0.02	0	0	0	0	0	0
sub50	0.01	0.02	0.01	0.56	1	0	0	0	0	0	0	0
sub60	0.78	0	0.11	0.02	0	1	0	0	0	0	0	0
sub1	0	0	0	0	0	0	1	0.02	0.01	0.2	0.13	0.67
sub2	0	0	0	0	0	0	0.02	1	0.33	0.89	0.4	0
sub3	0	0	0	0	0	0	0.01	0.33	1	0.85	0.19	0
sub4	0	0	0	0	0	0	0.2	0.89	0.85	1	0.69	0.17
sub5	0	0	0	0	0	0	0.13	0.4	0.19	0.69	1	0.07
sub6	0	0	0	0	0	0	0.67	0	0	0.17	0.07	1

Share of population in productive age

	sub10	sub20	sub30	sub40	sub50	sub60	sub1	sub2	sub3	sub4	sub5	sub6
sub10	1	0	0.14	0.36	0	0.09	0	0	0	0	0	0
sub20	0	1	0	0	0	0	0	0	0	0	0	0
sub30	0.14	0	1	0.05	0	0	0	0	0	0	0	0
sub40	0.36	0	0.05	1	0	0.72	0	0	0	0	0	0
sub50	0	0	0	0	1	0	0	0	0	0	0	0
sub60	0.09	0	0	0.72	0	1	0	0	0	0	0	0
sub1	0	0	0	0	0	0	1	0.61	0.22	0.73	0	0.22
sub2	0	0	0	0	0	0	0.61	1	0	0.47	0	0
sub3	0	0	0	0	0	0	0.22	0	1	0.76	0	0.82
sub4	0	0	0	0	0	0	0.73	0.47	0.76	1	0.01	0.68
sub5	0	0	0	0	0	0	0	0	0	0.01	1	0
sub6	0	0	0	0	0	0	0.22	0	0.82	0.68	0	1

Note: Similar distributions ($p > 0.05$) were highlighted in red, diagonal elements not for interpretation in grey.

sub10-sub60 for period 1995–1997 (unemployment 2003–2005), sub1-sub6 for period 2014–2016.

sub10, sub1: urban municipalities, no authorities' seats, no SEZ.

sub20, sub2: rural and mixed municipalities, no authorities' seats, no SEZ.

sub30, sub3: municipalities with seats of authorities, no SEZ.

sub40, sub4: urban municipalities, no authorities' seats, with SEZ.

Sub50, sub5: rural and mixed municipalities, no authorities' seats, with SEZ.

sub60, sub6: municipalities with seats of authorities, with SEZ.

Source: The author's results.