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Effectiveness of special economic zones of Poland*[1]

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Abstract

Special Economic Zones (SEZ) are economic enclaves, created by the state in order to attract domestic and foreign investors, so as to stimulate economic growth in the region. One of the models related to SEZ presenting the way of measuring the effectiveness of their impact on the surrounding economy is P. Warr's enclave model (1983). The main purpose of the article is to verify the assumptions made in the original Warr model and adapt it to the economic conditions in transforming economy. Poland was chosen for the research because of excessive network of SEZs which influence Polish economy locally and create national and international economic relations. As a result of analysis of the effectiveness of SEZs in Poland, we conclude that the impact of SEZs on Polish economy is positive and additionally they are the source of value added for the market.

Key words: *Special Economic Zones, regional development, enclave model, investment efficiency, investment incentives*

JEL classification: *H25, O11, R11, R58*

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1. Introduction

Special Economic Zones (SEZ) are economic enclaves, created by the state in order to attract domestic and foreign investors, so as to stimulate economic growth in the region. SEZs have a long history, however, for this analysis, the last 40 years is important. It was the development of SEZs in countries such as South Korea, China, Malaysia, the Philippines, Mexico and other Latin American countries showing the opportunities and threats inherent in this form of support for regional development. It must be emphasized that the SEZ impact on the economy of the host country is not easy to explore. As it was shown by the results of many research, there are several examples of the positive impact, but there are many countries in the world where there were no benefits from the presence of special economic zones, as well as a few examples of countries where the foundation of such enclaves had negative consequences.

Model approach to analyze the effects of the impact of special economic zones on economy allows to compare the results and present the conclusions in this area. One of the models relating to SEZ, describing the way of measuring the effectiveness of their impact on the surrounding economy is P.Warr's enclave model. This model was first presented in the 80s of the twentieth century being developed on the example of the Far East countries. Since then, there has been a lot of structural changes in the economies offering special economic zones and therefore we can expect that the effectiveness of the SEZ is changing, and moreover the individual variables may take on a new meaning or lose it. The aim of this article is to verify the assumptions made in the original model of enclaves (Warr 1983) and adapt them to the economic conditions in transforming economy, therefore, the study is carried out on the example of the Polish economy.

Poland was chosen for the analysis because of the very extensive network of SEZs and their importance for the country's economy in terms of local and national economic relations. The impact of SEZ on the economic environment is emphasized by the local authorities and the managing boards of the SEZs organizations, however, this phenomena has not been clearly verified and measured in the global context. In addition, Poland is an example of a country that has found a consensus between liberal economy and privileges for entrepreneurs in the SEZs. Thanks to that Poland managed to attract significant capital which was also located in these areas. Interestingly, about 21% of these sources comes from Poland, thus the importance of SEZs has been appreciated by Polish entrepreneurs as well.

The following hypothesis is verified: application of Warr's model, after appropriate modifications, can be an effective tool for the value added impact assessment of SEZs on the Polish economy. Company operating in SEZs in Poland are the source of financial surplus for national economy and tax privileges for investors are effective tool in attracting investments in case of transition economy. Financial

incentives provided for investors in SEZs should depend on investment value or other microeconomic factors ase.g. number of new workplaces.

Studies presented in the article contribute to the literature in a following way. At first, the system of SEZs in Poland was analyzed as an example of Central – East Europe economies. It should be noticed that the whole region leads similar policy according to SEZs so it might be expected that the impact of SEZs on the economy will be similar and the results of the presented research might be treated as a basic for more detailed analysis in other economies. Additionally, Warr's model was modified due to the different structure of the Polish economy in comparison to countries on the basis of which the original model was developed. This may be the new proposal for analyzing the effectiveness of other related economic systems.

The first part of article is a brief literature review. Then, the economic determinants of Polish SEZs are described and the theoretical assumptions of enclave model are presented. The next part is a research method description including the adaptations and modifications used in P. Warr's model for the Polish economy and presentation of research results. Article is finished with the discussion and conclusions.

2. Literature review

Analysis of the impact of economic enclaves on the national economy have been carried out since the 60s of the twentieth century. The studies can be divided into several trends, depending on the period taken into consideration. First trend is related to the study of the effectiveness of the SEZ impact on the surrounding economy. Firstly K. Hamada tried to capture SEZ finances into one model (1974) focusing on investors' financial decisions motives but he did not explain clearly the impact of SEZ on the national economy of the zone founder. Then, based on the theories of foreign trade, other models were developed, whose authors were: Young (1987), Miyagiwa (1986) and Miyagiwa and Young (1987). They have been developed on the basis of the effects of zones functioning in China, other Asian countries, the Caribbean and the United States.

Another model related to the effectiveness of the SEZ that has taken, taking into account the real cash flow was the Warr's model (1983, 1987, 1989). He used the influence of different micro and macroeconomic factors that can determine the accumulation of capital in the country arranging SEZ. Thus he showed that the zone had been beneficial to the national economy and served its purpose as a tool of economic policy.

The model explaining the effectiveness of special economic zones is evolutionary. As far as there were new empirical data characterizing the operation of enterprises in the SEZ, the researchers refined the model by introducing more variables.

The second trend is related to the study of the relationship between SEZ and foreign direct investments FDI in the context of investors decision motives. Investments in SEZs significantly affect economic development, attracting FDI and cause spillover effects in high-tech industries. The main findings and research in the area of SEZ that have influenced the economic growth are represented by Willmore (2000), who analyzed the Caribbean SEZ, Kung (1985) Ge (1999) and Park (1997), who performed a detailed analysis of the SEZ in China. Rolfe and others (2004) studied the operating privileges in Kenyan SEZ. Aggarwal, Hoppe and Walkenhorst (2008), Aggarwal (2005), Shah (2008) performed a comparative analysis of the operating conditions of SEZs in India, Sri Lanka and Bangladesh and Willmore (2000) Caribbean zones. Devereux (2007) examined the impact of taxation on investment locations. Litwack and Qian (1998) developed the theory of transition economies (for example China), where there was introduced the development strategy based on SEZ.

Table 1: SEZ literature overview and the gerneral knoweledge gaps in each periods

Time	References	Research shortages
1980-1990	Warr (1983, 1987, 1989, 1995), Hamada K., (1974), Kung, K. S. (1985), Litwack, J. M., Qian Y., (1998), Miyagiwa K., (1986), Miyagiwa K., Young L., (1987), Young L., (1987).	There is no verification of the P.Warr's model assumptions for European countries.
1991-2000	Cheng, L. K., Kwan Y. K., (2000), Ge, W. (1999), Hale, G., Long C. X., (2007), Park, J. D. (1997), Willmore, L., (2000).	Lack of analysis of Polish SEZ in general aspect.
2001-2015	Abraham, F., Konings J., Slootmaekers V., (2010), Ambroziak A., (2009), Coe, D. T., Helpman E., Hoffmaister A.W., (2009), Desai, M. A., Foley C. F., Hines Jr. J.R., (2009), Devereux, M. P. (2007), Liu, Z. Q., (2008), McGrattan, E., Prescott E. C., (2009), Newfarmer, R., Shaw W., Walkenhorst P., (Eds.), (2009), Rolfe, R. J., Woodward D. P., Kagira B., (2004), Różański J., (2010), Shah, S., (2008), Siudak P., Wątorek B., (2011), Whalley, J., Xin X., (2006), Keller J, Pastusiak R, (2015), Lichota W. (2013), Lichota W. (2016), Jensen and Winiarczyk (2014).	There is no analysis of SEZ effectiveness in Poland, showing more than historical effects (like CBA models) and also including additional aspects of SEZ functioning, like shadow costs.

Source: Authors' own study

Another field of research analyses the impact of various factors attracting FDI, with SEZ among them. To the group of these studies we should include findings of Whalley and Xin (2006), McGrattan and Prescott (2009), Desai, Foley and Hines Jr. (2009). Other articles oriented to FDI were devoted to spillovers: Coe, Helpman and Hoffmaister (2009), Liu (2008), Hale and Long (2007) and Abraham and others (2010). Important research on China's SEZs have been included in the publications of Wei (1995), Cheng et al. (2000).

Summarizing the review of existing studies, the analyses describing Polish SEZs are also worth mentioning, especially the findings of Siudak at all (2011), who generally studied Polish SEZ, Keller and Pastusiak (2015), Pastusiak (2011), who analyzed the effectiveness of SEZ and Ambroziak (2009) dealing with legal issues.

To summarize the current literature analysis, it must be concluded that such studies as presented in following paper were not previously carried out. and the research has a unique character therefor. The literature in the area of SEZ presents multidirectional studies, trying to adapt theoretical solutions to the description of real economic phenomena taking place in a complex environment that eludes well-known models in the field of international trade.

3. Methodology

The model proposed by Peter G. Warr in 1983 describes the economic zone as a closed economy, to a small extent cooperating with the surrounding national economy. Zone is a specific economic enclave; hence it took the name of the model. Warr's "enclaves" model (...) compares the capital flows to the SEZ and the impact of production on the economy outside the zone. This model relates to the aggregate net cash inflow and can be expressed by the equation:[6]

$$N_p = (L_t w + M_t P_M + E_t P_E + R_t + T_t) \times S_F^* - \\ - (L_t w^* + M_t P_M^* + E_t P_E^* + B_t S_K^*) - A_t - K_t \quad (1)$$

Where:

N_p – net benefits,

L_t – employment in a year,

w – wages paid,

[6] T. Kusago, Z. Tzannatos, *Export Processing Zones: A Review In Reed of Update*, "Social Protection Discussion Paper" January 1998, No. 9802, Zob. także: P. G. Warr, *Export Processing Zones. The economics*……p. 67.

M_t – domestic raw material used in a year,

P_m – price for this raw material,

E_t– utilities used in year t,

P_e – price for the utilities,

R_t – interest and principal repayments of domestic loans in a year,

T_t – taxes paid in a year,

S_f* – ratio of the social value of foreign exchange to the official exchange rate,

w* – shadow price of labor,

P_m* – shadow price of domestic raw materials,

P_e* – shadow price of utilities,

B_t – domestic borrowing in a year,

S_k* – ratio of the shadow price of capital to its market price,

A_t – the administrative costs of the zone in year t,

K_t – capital cost (including maintains) of SEZ physical infrastructure in a year.

Enclaves model was developed on the basis of financial data characterizing the functioning of SEZs in the countries of the Far East in the 80s of the twentieth century. This means that the proposed formula summarizing the positive and negative impact of companies operating within SEZ will require adopting it to the specific state to estimate the effectiveness of the zones in the economies of countries with different levels of economic development and performing policies. The first part of the equation contains variables that present financial effects of the SEZ. The second group of variables describes the production scale and economic development, implemented in an open economy where SEZ is located. Analyzing the data in time series, cash flows vector can be built and after discounting for a specific date (the beginning of the operation of zone or for a specific year) the net value of the future cash flows is obtained, describing a financial surplus generated from the zone operation. Below the importance and impact of the individual factors of the model on the effectiveness of the SEZ, and consequently – the national economy is presented.

The model of evaluating the efficiency of the zone should include the costs of staff remuneration. The amount of remuneration is one of the most important elements influencing the effectiveness of the SEZ, due to the fact that the salaries of employees end up in economy and constitute one of the sources of consumer demand. The higher salaries, the better zone affection on the economy of the country. Another factor that must be taken into account in the model is the domestic

resources for production. In this case, the host country also generates inflows from the sale of raw materials to the zone. However, it is worth noting that when the SEZ is a highly technological and industrial one, and the economy of the country is not able to compensate for the demand for raw materials or semi-finished products, it is another cost of providing SEZ for the host country and therefore it should be recognized in the analysis of efficiency.

Companies operating in SEZs are typically manufacturing entities, that means that they consume large amounts of energy. In the case of over standard consumption of media it can be a problem for the host country in certain circumstances. Effectiveness analysis should compare energy tariffs paid by the recipient in providing that extra power. This means that in some cases the state will be subsidizing the investor by electricity even though it may happen that the company will be liable to pay expenses on its own. It depends on the marginal cost to deliver the next unit of energy which are associated with the free energy resources of the country.

Another factor that influences the effectiveness of SEZ in the enclave model is tax revenue associated with the operation of the special economic zone that shall be limited to the income tax paid by companies operating in the zones and the tax payable on the income of employees in companies that are located there. Thus, in the case of the communes where zones are located, lower tax revenue may be expected than in the case of municipalities without SEZ on its territory. More intensive business in the regions with SEZ can compensate the shortages in tax amount paid by companies operating there due to the scale of operations.

The capital invested in SEZ may come from different sources and should not be omitted in the analysis of the problem. Foreign investors are sometimes forced to borrow money in the local capital market. The loans in original Warr's model were provided with a guarantee of the treasuries of countries and therefore, the analysis of the effectiveness of the SEZ loan repayment and interest are recognized in the financial flows in the model. We have to add that it is the specificity of activities of foreign companies in the SEZ in the Far East in the 70s and 80s of the twentieth century.

Another variable taken into consideration in the model is the expenditure on the maintenance that are the expense of the zone administration. They reduce the direct effects that the host country can obtain while running the SEZ. However, in this case, the administration is necessary due to partly different economic conditions faced by entrepreneurs operating in economic zones, which necessitates adequate safety oversight and ensures smooth functioning of the zone. SEZ management entities bear the full burden of its service.

The factor related to the investment needs to be taken into consideration as to create a special economic zone that is attractive to the investors, the area must be prepared

for entrepreneurs. Often there is a need to make some investments in infrastructure, so that the access roads should be built or other utilities. These additional expenses debit the effectiveness of the zone because they force the additional costs on the host country.

Due to exchange rate differences between the local currency and the currency of the investor, there are gains or losses that can affect the efficiency of SEZ operation. They appear on the conversion of cash flow denominated in the foreign currency to the national currency that is used to pay for salaries or for goods purchased in the host country. In the case where the local currency is weakening against the major currencies, purchases in SEZs are beneficial for the country due to the presence of foreign exchange gains. If the currency of the country is getting stronger, then the economy would bear the foreign exchange losses for conversion of currency and subsequent purchases on the domestic market.

In the model of the effectiveness of the SEZ there are also opportunity costs presented. They are connected with the need to use an alternative solution for the economy without special economic zones. Often an alternative cost to the host country is the need to create jobs for the unskilled unemployed, which in practice may prove to be a lot more expensive. In the model presented we have to deal with alternative wage costs that are the wages for workers with comparable qualifications outside the economic zone. In most cases, the alternative costs of creating economic conditions for the investment of such magnitude are much higher than in the case of concentrating them in the SEZ.

As a basic tool for analyzing the effectiveness of SEZ the net present value – NPV method is applied. The net present value is the difference between the sum of discounted cash flows and capital expenditures and it can also be defined as the sum of net financial flows. Discount rate for the model is usually assumed on the basis of the level of interest rates prevailing in the global economy by adding an adequate margin for its risks. The discount period, that should be taken into account when calculating the NPV for the zone is expected period of its operation.

Enclaves model was developed on the basis of financial data characterizing the functioning of SEZs in the countries of the Far East in the 80s of the twentieth century. This means that the proposed formula summarizing the positive and negative impact of companies operating in SEZs and the operation of the state, may be inadequate and inaccurate when applied to estimate the effectiveness of the zones in other economies.

In the Polish case, to apply the enclaves model, the adjustments have to be done. This is related primarily to the fact that the economy in which businesses operates in Poland is liberal. Companies in SEZ buy media on the basis of the free market, they apply for the same principles of operation as the companies in a competitive

economy. The only difference is the tax benefits, the value of which depends on the investment and employment.

Due to the differences between the Polish economy and the economy of countries that have been an example for the development of the model, authors decided to adjust the model, because of different economic conditions, as follows:

– Omission of differences in economic conditions of business in SEZ and beyond.

– Reducing the importance of alternative cost model, which is associated with very small differences between the economic conditions of doing business in the SEZ and beyond. In Poland SEZs are not enclaves business, it is simply a group of companies operating in one place that have permission to use tax incentives.

– The results of operations of administrators are related to SEZ management companies, organizations that generate profits or losses, so their results are part of increasing or decreasing impact of the value added generated by the SEZ.

Therefore, the formula 1 has been modified to reflect as closely as possible the economic conditions of Polish Special Economic Zones.

$$\begin{aligned} Np = &(R_{kw} + E_x + CIT + S_{k_{SSE}} - I_{mp} - P_{publ} - I_{\inf r} + W_{SSE}) - \\ &- (R_{kw} + E_x + CIT^* + S_{k_{SSE}} - I_{mp} - P_{publ} - I_{\inf r} + W_{SSE}) \times S_F^* \end{aligned} \quad (2)$$

Where:

N_p – net benefit,

R_{kw} – annual remuneration costs,

E_x – export of enterprises in SEZ,

CIT – income taxes paid by companies in the SEZ,

CIT^* – income taxes paid by firms in the economy without SEZs, they are identical to the taxes paid in the economy with SEZ, enlarged by public assistance,

$S_{k_{SSE}}$ – value of sales of domestic production to the zone,

I_{mp} – value of import of zone enterprises,

P_{publ} – public support offered by the state,

$I_{\inf r}$ – infrastructure investments incurred by municipalities, management of SEZ and media providers,

W_{SSE} – performance results of the SEZ management companies,

S_F^* – *shadow cost* indicator.

The changes proposed in the model describing the Polish Special Economic Zones are consistent with the assumptions of the original enclave model. The new model assumptions represent the economic conditions in Poland in relation to SEZ.
Basic adjustments have been made in the area of alternative cost (shadow costs), the method of transferring the positive impact of economic zones, besides the value of export, import, purchases of means for producing on the internal market are calculated in a different way. Due to economic openness of SEZ, loan variable was omitted in the calculation because in Poland the SEZ companies incur liabilities on the same basis as other companies, moreover, they do not use the preferential financing. The situation is similar in the case of utilities, they have been omitted because there is no difference in the usage of them for companies in and outside the SEZ. Sf variable was replaced by separate factor representing opportunity costs.

When calculating the alternative cost, Warr (1989) originally used the assumptions made for countries with economic zones like Indonesia, Hughes (983) Pitt (1981), Munasinghe (1980), and South Korea Koo (1981) and Nam (1981a and 1981b), Malaysia: Veitch (1977, 1979 and 1984) and The Philippines: Medallai Power (1984) and Manalaysay (1979). These analyzes were the basis for further calculations, however, the author claimed that he had made the corrections, which correspond to the conditions of operation of a given SEZ. Table 2 presents the application of alternative costs index to the market costs in different countries.

Table 2: The use of alternative cost index to market costs

Category	Indonesia	Korea	Malaysia	Philipines
Labor	0,75	0,9	0,83	0,64
Foreign exchange	1,00	1,08	1,11	1,25
Domestic capital equipment	0,85	0,98	0,91	0,96
Electricity	1,05	1,33	0,93	1,30
Domestic financial capital	n.a.	n.a.	n.a.	1,58

Source: Indonezia: Hughes (1983), Pitt (1981), Munasinghe (1980); The Republic of Korea: Koo (1981) and Nam (1981a and 1981b); Malaysia: Veitch (1977, 1979 and 1984); The Philippines: Medallai Power (1984), Manalaysay (1979)

For the calculation of the alternative cost index for Poland, data in this area is highly incomplete, therefore, based on the cited literature the effort has been made to make our own calculations of the alternative costs. The result of this calculation is 0.85 for the whole economy and the value is related to the small difference between the operating conditions in the SEZ and the market in itself. The differences is related to the tax credits held by companies in the zone. When calculating the value of purchases of production means on the internal market, it is assumed that the size is dependent on the costs incurred by the company.

4. Data and empirical analysis

Special Economic Zones in Poland have been established under the Act on Special Economic Zones on 20 October 1994. From this moment of time the debate has been continuing over the economic consequences of their operations for businesses and for the people associated with the Special Economic Zone. The Incentive for the establishment of Special Economic Zone was economic activation of Polish regions characterized by the lowest level of economic development. A special enclave for companies was to encourage business development by getting the unemployed and improving infrastructure. Statutory privileges for enterprises operating within the zone guarantee income tax relief dependent on investment costs related to the acquisition of land, rental or purchase of its perpetual right to use, construction and modernization of fixed assets and the acquisition of intangible assets. Relief may also cover the cost of hiring new employees within a two-year period.

Companies operating within the SEZ benefit from tax exemptions. The consequence of this is that municipalities with SEZs within their area do not receive their rightful share of taxes on businesses operating within the SEZ. These are the lost profits arising from the operation of the subsidy in the form of tax, so it would seem that the situation is unfavorable from the point of view of finances of the municipality. However, business investment within the SEZ gives rise to a network of suppliers in a given municipality, e.g. subcontractors, which stimulate the development of entrepreneurship and, consequently, generate additional revenues from local taxes. Creating the infrastructure of companies around the SEZ is another incentive for stimulating the economy of the municipality. The main and most important consequence of this is the decline in unemployment. As a result, one can observe an improvement of the economic situation of society and municipalities since tax revenues are rising indirectly.

There are 14 SEZs in Poland that attracted about 1100 companies. As for the December 31, 2013, companies operating in the zones invested 55 billion PLN, and created 120 thousand of new jobs in Poland.

To foresee the dynamics of the zones development in Poland in the future, macro and micro-economic forecasts published by the leading research institutions in Poland and abroad were used. Detailed data are presented in Appendix 1. The variables used in the model are described below.

Capital expenditures of enterprises in the Polish Special Economic Zones in the years 2001 – 2012 ranged from 2.1 to 10.6 billion PLN per year. Data on forthcoming investment in SEZ are given in Appendix 1, line 10. The main effect of companies from SEZ generating positive cash flows for the economy is cumulated in the export and purchases on the domestic market. The referring data of revenues from the sales of companies from SEZ is set out in Appendix 1, line

11. As with other aggregates, in order to determine the import and export in the years 2000-2011, we estimate the model that is based on data obtained from reports of companies. Thus the data obtained up to 2011 is characterized by the value of export and import of companies in the SEZs. Detailed data is given in Appendix 1, line 3 and 4.

The efficiency of the Special Economic Zones is mainly determined by the structure of financial flows related to the export, import and purchase of raw materials for the production of the domestic market. Considering the technological gap between the Polish entrepreneurs operating in the SEZ and the rest of the country it is not large and the economy outside the zones can be successfully a source the raw materials needed for production of companies located in economic zones. Revenues from sales up to 2011 are the aggregate size achieved by the data originating from particular companies operating in SEZs. Detailed data are given in Appendix 1, line 6.

The employment is described by two variables, theoretical employment and the real (actual) employment. Theoretical employment is related to the jobs that have been created by companies operating in SEZs in accordance with their permits. Real employment are all jobs that have been created by companies operating in SEZs.

The following assumptions have been done:

1. The average cost of employing an employee – up to 2009 was calculated on the basis of the financial statements,

2. Annual benefits – up to 2009 was based on the financial statements.

Detailed data are given in Appendix 1, line 2.

In order to calculate the annual cost of wages paid by businesses up to 2009, the data on the basis of the financial statements was taken into consideration.

The primary benefit of investing in special economic zone is the ability to take advantage of the tax relief related to an exemption from income tax. SEZ tax benefits are one of the best instruments available to support investment in Poland. Currently, despite the restrictions on the size of public aid after the accession to the EU, SEZ are still strong and can offer relatively easily accessible instrument to support new investments. Numerous proposals for the expansion of local zones prove an interest of potential investors in starting business in the Special Economic Zone. The value of public aid in the period 2000-2012 was compared to investment value to provide the corresponding coefficient, so that the further forecasts can be done. Detailed data are given in Appendix 1, line 7.

Only some of the companies operating in SEZ pay CIT taxes. It is associated with the use of tax relief granted. In some cases, several companies under a single brand carries factories located in SEZs and beyond, the income derived from plants

outside the zone is taxed on general principles. In the case of this study, authors attempted to forecast the corporate income tax paid from 2013. For this purpose, the value of the tax paid in the years 2001 to 2012 was estimated, using the financial statements of companies operating in SEZs. Then, on the basis of the assumptions, the value of 9.51% of the annual increase in the value of income tax was taken into consideration. This is the arithmetic mean of the three smallest positive fluctuations in the value of the historical dynamics of CIT paid by companies operating in SEZs. In the model of economy without economic zones, it is assumed that the company will pay CIT as a value in the economy with SEZ, additionally increased by public aid. This is reflected at the level of alternative cost calculation. The tax paid by individuals working in business on their own behalf or members of the commercial companies included in the aggregate amount of the CIT partners. Detailed data are given in Appendix 1, line 5.

Organizations managing SEZ are capital companies and majority shareholders are the Treasury and local governments. These companies having some capital invested and adjusting to the current market situation, invest in infrastructure and increase the quality of the property. They also charge fees from businesses operating in the zones for the administration and management of the area, including the provisions of expert services. The financial results of the SEZ management companies are an important factor for the economy, and the effectiveness of operations. Therefore, the assumption that the financial results (profit or loss) of SEZ management should be included to the model.

Authors were unable to specify trend until 2012, so they adopted the previous results, and then assumed annual growth of 12.88% – this is the arithmetic mean of the three smallest positive growths in the period 2001-2012. This procedure was used because of the large historical fluctuations in the value of the net profit earned by the company managing the SEZ. This was also associated with the precautionary approach to the subject of SEZ efficiency. We sought to achieve passive variant in the estimation of the effectiveness of the SEZ. Detailed data are given in Appendix 1, line 9.

Investors who want to invest in the SEZ receive a whole range of tools to support their investment and among others, it is the infrastructure. However, in order to prepare the infrastructure for investment it requires certain expenditures, that debit the companies managing zones, the municipalities in which they are located and administrators of media. By 2012, the cumulative value of infrastructure expenditures amounted to 2.88 billion PLN. Detailed data are given in Appendix 1, line 8.

Table 3: The NPV Structure of Polish SEZ for 2013

– in million USD

Specification	NPV
Annual salary costs	2 719,3
Export	54 924,1
Import	-56 187,4
Taxes CIT	2 163,5
Domestic sales of the means of production to the zone	92 510,2
Public aid	-3 919,7
Expenditure on infrastructure	-821,3
Administrative expenses / operating result of SSE (-loss + profit)	-227,9
NPV	116 498,1

Source: Author's computation using data from Central Statistical Office

As a result of analysis of the effectiveness of SEZs in Poland, the net present value of their cash flows (NPV) is equal to 116.4 billion USD. It means that the impact of the SEZ on Polish economy is positive. To learn the structure of the NPV and the impact of individual parameters on the effectiveness of the SEZ, additional analysis was performed with the results as it is presented in Table 3.

4. Results and discussion

Assessment of the effectiveness of SEZs in Poland in the light of the assumptions made above is positive. We can conclude that special economic zones are a source of financial surplus for the Polish economy. The key elements that determine the effectiveness of the SEZ are salaries, export, and purchase of means for production on the domestic market. The primary cost is the import of inputs for production.

The functioning of the zones in Poland coincided with the period of economic development, therefore, results of research and analysis should be carefully interpreted especially as there are studies showing that the majority of foreign entrepreneurs would invest in Poland even without the tax benefits (Rozanski, 2010). The impact of companies operating in the zones on the national economy may be recognized in multidimensional way, however, empirical data and evidence of their real impact is much more difficult. In previous studies, presented in Table 4, it is shown that the impact of investments in zones on the economy of the country may vary according to the findings of P. G. Warr (1989).

Table 4: Impact of selected factors on the effectiveness of special economic zones in Asia

Factors	Zone		
	Bataan (Philippines)	Masan (Korea)	Penang (Malaysia)
Cash flow net	Negative	Positive	Positive
Infrastructure costs	High	Average	High
Foreign exchange gains	High	Significant	Significant
Tax revenues	Low	Low	Limited
National providers	Limited number	Increase	Limited number
Employment	Significant	Average	Significant

Source: P. G. Warr, *Export Processing Zones. The economics of Enclave Manufacturing*, IBRD/ World Bank, Research Observer, January 1989, Vol. 4, No. 1.

It turns out that, depending on the economy and individual factors characterizing the decisions of investors in the SEZ, the efficiency of zones for the host country may be different. Based on the studies shown in Table 5, we can see that the differences between the NPV of the different zones are significant (P. G. Warr, 1989).

Table 5: Impact of "enclaves" model elements on NPV in selected zones (1982)

– in million USD

Factors	Bataan (Philippines)	Penang (Malaysia)	Masan (Korea)	(Indonesia)
Employment	59	111	39	4
Foreign exchange gains	72	94	65	0
Domestic row materials	3	18	16	5
Domestic capital	0	10	0	0
Tax revenues	11	10	18	23
Utilities	-4	-53	-13	-1
Administrative costs	-23	-4	-17	-13
Infrastructure costs	-196	-43	-68	-3
Domestic loans	-147	0	0	0
NPV	-225	143	15	26

Source: P. G. Warr, *Export Processing Zones. The economics of Enclave Manufacturing,* IBRD/ World Bank, Research Observer, January 1989, Vol. 4, No. 1, p. 82.

The results indicate that there must be an optimal SEZ model for a specific economy, taking into account the individual characteristics of the location. Tab. 6 shows the percentage of NPV structure in surveyed SEZ (Warr, 1989). The results indicate that the individual zones derive financial benefit from the various components.

Table 6: Structure of the net present value NPV

– in %

Specification	Country			
	Indonesia	Korea	Penang (Malaysia)	Bataan (Philippines)
Employment	13	28	46	41
Foreign exchange gains	0	47	39	50
Domestic row materials	16	12	7	2
Domestic capital	0	0	4	0
Tax revenues	72	13	4	8
Utilities	-3	-9	-22	-3
Administrative costs	-41	-12	-2	-16
Infrastructure costs	-9	-49	-18	-135
Domestic loans	0	0	0	-101
Total	47	29	59	-155

Source: P. G. Warr, *Export Processing Zones. The economics of Enclave Manufacturing*, IBRD/ World Bank, Research Observer, January 1989, Vol. 4, No. 1, p. 82.

To obtain comparable data in relation to previous studies presented in the literature, it was decided to make the appropriate conversion on the results obtained for Poland. Converting NPV at the end of 2013 with the exchange rate (USD = 3.2181 PLN) results in 36.2 billion USD. Assuming a 5% discount rate and discounting NPV in USD for the year 1982 results in 7.977 billion USD. Compared with the results shown in the Table. 5, with the greatest NPV reached by the zone of Peneng in Malaysia (143 million USD), it turns out that disclosed effectiveness of Polish SEZ is much higher. This can be attributed to the following factors:

– Increased dynamics of the Polish economy is related with a greater impact of the investment in SEZ,

– Optimal conditions offered by the SEZ for investors result in increased effectiveness of investments and real benefits for the economy of the host country.

– There may be errors in calculation or incorrect assumptions to the model.

5. Conclusions

The study indicates the existence of economic conditions under which the special economic zones will provide the optimal results to the host country. It can be specified in a more detail way, with the disposal of three stages of economic development: growing, transforming and developed economy. It has to be defined what factors are supporting the economic growth and owing to the fact that for most developing economies in transition it is the export and the inflow of funds into the economy, these economies will be the most sensitive to the inflow of new investments. Further appropriate management will allow for export goods produced in the SEZ and will be conducive to further economic growth. Such conditions Polish economy has been meeting since 2000.

The failure of SEZ in the economies of the Far East and Caribbean countries is related to the incorrect investment incentives that had been chosen, making it impossible to take full advantage of the benefits of cooperation with investors in the zones. For this reason, a host country bears the costs of maintenance and the establishment of SEZ and the only achieved benefits was the low labor costs, which, however, did not offset the initial investment in infrastructure. Taxation of income of companies operating within SEZ was too small, and there was no effect of the transfer of technology to the host country's economy, which would result in the type of spillover effect that is influencing domestic economy as a result of new technology transfer from foreign companies with more developed economies than the host country. The adjustment of the model based on discounted cash flows in Polish conditions allows to carry out similar studies in other European countries with incentives in the form of zones, especially those after the transformation.

According to the methodology of P. G. Warr, the effectiveness of functioning of SEZ in Poland brings a financial surplus for the economy. Taking into account the prognostic nature of the analyzes, the adopted solutions and prevailing trends are correct from the point of view of improving the country's economic condition. This means that economic conditions created in SEZ for enterprises are sustainable and they take into account the interests of the companies and the host country. This means that in economies such as Polish one, it is possible to create mechanisms supporting investments, using tax incentives, while maintaining a balance between concessions for companies and income for the host country.

The conclusions drawn from Ge (1999) and Park (1997) research related to Chinese SEZs are in line with the results obtained by the authors in this paper. SEZs are a good stimulus for regional development and in the long term, under sustainable conditions, they are a source of financial surplus for the host country.

SEZ research in various countries around the world for the last 50 years indicates that not all economies have benefited from the founding of the special economic

zones. It is related to various infrastructural and economic conditions offered to investors by SEZ. This means that, depending on the socio-economic development of the country, it should offer adequate investment incentives that correspond to the biggest problems for entrepreneurs in a given country, but they should encourage investing process as well. An important element is to maintain a balance between the costs of operation of the SEZ and revenues for the economy of the host country.

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Učinkovitost slobodnih ekonomskih zona Poljske[1]

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Sažetak

Slobodne ekonomske zone (SEZ) su gospodarske enklave koje je stvorila država kako bi privukla domaće i strane investitore u cilju stimuliranja gospodarskog rasta u regiji. Jedan od modela koji se odnosi na SEZ je P. Warrov model enklave (1983) koji mjeri učinkovitosti njihovog utjecaja na regionalno gospodarstvo. Glavni cilj ovog rada je provjeriti pretpostavke u izvornom Warr modelu i prilagoditi ga ekonomskim uvjetima transformacije gospodarstva. Poljska je izabrana za istraživanje zbog svoje izuzetno razvijene mreže SEZ-ova koji utječu na poljsko gospodarstvo na lokalnoj razini kao i na stvaranje nacionalnih i međunarodnih gospodarskih odnosa. Kao rezultat analize djelotvornosti SEZ-ova u Poljskoj, zaključujemo da je utjecaj SEZ-a na poljsko gospodarstvo pozitivan i da predstavlja dodatan izvor dodane vrijednosti za tržište.

Ključne riječi: *slobodne ekonomske zone, regionalni razvoj, model enklava, učinkovitost investicija, investicijski poticaji*

JEL klasifikacija: *H25, O11, R11, R58*

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Appendix 1

Table A1: The dynamics of the zones development in Poland in 2000 – 2011

1	Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
2	Annual salary costs in million PLN	1 052,6	1 177,8	1 493,4	2 165,5	3 024,3	4 155,2	4 599,0	5 243,4	5 840,1	6 154,8	7 088,4	8 057,3
3	Eksport in million PLN	1 533,0	1 801,0	2 579,0	3 352,4	4 567,2	5 260,1	7 635,6	9 958,3	10 899,0	12 352,6	15 100,0	17 650,6
4	Import in million PLN	2 368,6	2 507,9	3 464,9	4 253,9	5 465,2	5 977,9	8 751,7	11 370,4	13 363,0	13 524,2	16 831,5	19 692,4
5	CIT Taxes in million PLN	156,0	188,2	226,9	273,7	330,0	244,7	280,4	414,8	372,7	404,4	211,0	710,1
6	Domestic sales of the means of production to the zone in millions PLN	5 104,3	7 208,8	8 286,1	9 563,5	10 649,5	12 435,0	16 174,9	20 158,1	21 787,8	24 797,6	29 331,2	32 429,3
7	Public aid in millions PLN	395,5	407,9	496,9	611,4	600,1	587,8	868,1	1 084,3	1 089,4	1 221,5	1 517,9	1 829,7
8	Expenditure on infrastructure in million PLN	71,5	68,8	58,6	87,1	60,8	56,6	193,0	387,4	355,1	198,2	352,0	343,4
9	Administrative expenses / operating result of SEZ (-loss + profit) in million PLN	7,9	10,9	12,9	19,7	3,1	32,4	34,9	80,7	107,5	43,9	70,9	51,8
10	Capital expenditures in SEZ in millions PLN	6 295,7	2 991,0	3 799,5	2 182,6	4 658,3	5 779,8	9 723,3	10 655,0	10 620,4	9 884,0	6 631,9	6 448,5
11	Revenues from sales in million PLN	13 418,4	15 942,7	18 941,8	22 505,1	26 738,7	30 400,2	41 580,0	53 664,0	63 953,0	69 874,6	80 344,2	91 458,0
12	Surplus amount in million PLN	4 663,2	6 978,1	8 095,4	9 852,8	11 817,6	14 818,0	18 032,0	21 745,8	22 577,1	28 809,5	33 100,1	37 033,7
13	Shadow costs 0,85 in million PLN	4 629,4	6 615,6	7 714,9	9 397,5	11 062,6	13 567,0	16 773,4	20 258,7	20 951,2	26 527,4	30 655,3	34 545,2
14	The difference for discount in millions PLN	33,7	362,5	380,4	455,3	755,0	1 251,0	1 258,6	1 487,1	1 625,9	2 282,1	2 444,7	2 488,5
15	Discount and FV in the year 2013	324,3	1 338,6	780,5	759,5	1 330,7	1 779,0	1 656,2	1 992,9	2 075,1	2 618,8	2 710,5	2 717,5
16	NPV in million PLN	116 498,1											

Source: Author's computation using data from Central Statistical Office

Table A2: The dynamics of the zones development in Poland in 2012 – 2026 (continued)

1	Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2	Annual salary costs in million PLN	8 919,8	9 795,1	10 978,8	12 327,5	13 771,2	15 330,1	17 084,3	19 094,9	21 330,0	23 802,0	26 060,1	27 894,7	29 612,3	30 488,1	30 856,8
3	Eksport in million PLN	19 069,1	20 906,8	23 007,2	25 426,9	28 236,3	31 524,4	35 094,9	38 731,8	42 538,3	46 537,4	50 081,9	52 794,5	55 457,5	57 050,4	58 389,7
4	Import in million PLN	20 504,6	22 237,2	24 223,4	26 516,4	29 182,2	32 304,1	35 673,6	39 069,1	42 595,5	46 274,8	49 466,5	51 811,4	54 089,3	55 312,7	56 287,3
5	CIT Taxes in million PLN	748,4	819,6	897,5	982,9	1 076,4	1 178,7	1 290,8	1 413,6	1 548,0	1 695,3	1 856,5	2 033,1	2 226,4	2 438,1	2 670,0
6	Domestic sales of the means of production to the zone in millions PLN	34 425,8	37 089,1	40 156,1	43 708,4	47 848,3	52 704,4	57 929,9	63 163,9	68 577,4	74 205,3	79 023,7	82 471,4	85 800,8	87 451,9	88 711,2
7	Public aid in millions PLN	1 633,3	1 340,4	1 668,6	2 037,8	2 402,3	2 522,9	2 639,2	2 766,8	2 847,5	2 893,7	2 896,6	2 939,8	3 010,0	3 026,2	3 016,7
8	Expenditure on infrastructure in million PLN	369,3	385,5	403,2	423,9	445,5	467,9	490,6	514,9	540,7	567,6	595,8	625,3	656,4	689,1	723,3
9	Administrative expenses / operating result of SEZ (-loss + profit) in million PLN	58,3	65,8	74,3	83.9	94,7	106,9	120,6	136,2	153,7	173,5	195,9	221,1	249,6	281,8	318,1
10	Capital expenditures in SEZ in millions PLN	6 163,1	6 676,4	7 570,8	8 499,1	9 929,4	10 801,1	11 611,7	11 895,5	12 115,5	12 361,5	12 457,6	12 654,9	12 901,3	12 962,9	12 940,0
11	Revenues from sales in million PLN	96 386,5	103 843,3	112 430,3	122 376,3	133 967,3	147 563,5	162 194,0	176 848,4	192 005,2	207 762,4	221 253,3	230 906,1	240 227,8	244 850,7	248 376,7
12	Surplus amount in million PLN	40 714, 1	44 713,4	48 818,7	53 551,6	58 996,9	65 549,5	72 717,1	80 189,6	88 163,7	96 677,4	104 259,2	110 038,3	115 591,0	118 682,4	120 918,4
13	Shadow costs 0,85 in million PLN	37 334,2	40 229,1	44 269,4	48 911,8	54 150,9	59 915,2	66 193,7	72 749,0	79 649,4	86 947,6	93 378,1	98 342,2	103 157,1	105 785,1	107 638,8
14	The difference for discount in millions PLN	3 379,9	4 484,3	4 549,2	4 639,7	4 846,0	5 634,2	6 523,4	7 440,5	8 514,3	9 729,8	10 881,1	11 696,0	12 433,8	12 897,3	13 279,6
15	Discount and FV in the year 2013	3 523,6	4 484,3	4 414,6	4 369,2	4 428,3	4 996,2	5 613,5	6 213,2	6 894,8	7 645,1	8 295,8	8 652,3	8 925,1	8 982,9	8 974,5

Source: Author's computation using data from Central Statistical Office