

Special Economic Zones – 20 Years After

A panel data evaluation of Poland's regional policy

by

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RQ1: Are SEZs effective?

- Past evaluation studies
 - Most of the available econometric studies have been conducted for China
 - UK also has similar policies, however, they are not called SEZs
 - A wealth of case studies that are often inconclusive in a broader societal or business-economics perspective

RQ2: And when effective, how exactly?

- Policy analysis – should be conducted on the premise of the policy rather than a general premise
- For example, the premise of chinese policy (re-urbanization) is very different from that of the polish policy (re-industrialization of typically non-urban areas)



Specific objectives

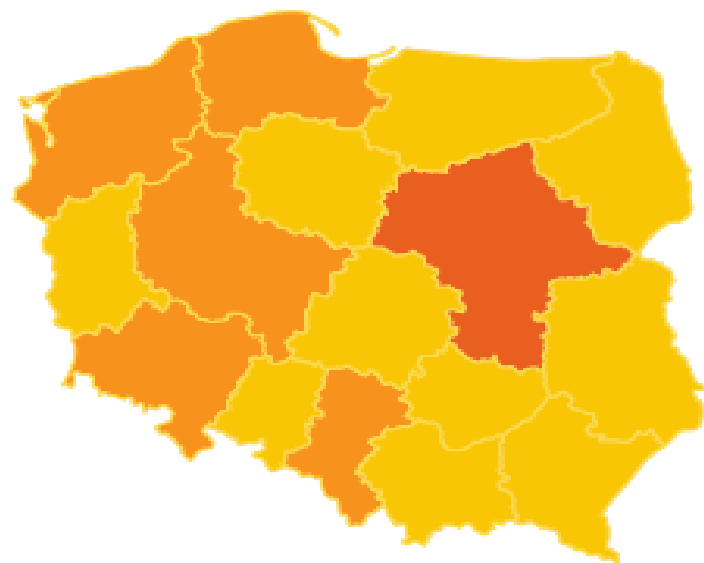
- Specific objectives with the Polish policy (Law of 1994):
 - Develop the designated areas for economic activity
 - Facilitate technology transfer through e.g. FDI
 - Boost exports
 - Increase competitiveness of the goods and services produced
 - Develop existing industrial make up and upgrade the economic infrastructure
 - Create new places of employment
 - Facilitate adoption of sustainable technologies and energy sources

Tax incentives (exemption)

Maximum support limits in individual voivodships



Until 31 December 2010



From 1 January 2011

- 30% – maximum aid intensity
- 40% – maximum aid intensity
- 50% – maximum aid intensity

About the data

Table 1 – Study variables

VARIABLE	DESCRIPTION	AVAILABILITY
Code _j	Number that identifies the territorial unit j. The code also has an alphabetic descriptor. The code is the cross section unit of analysis.	-
Dependants _{jt}	Calculated as the difference between the total population and the working population. Observations of zeros are removed from the data.	1995-2011
Education _{jt}	Expenditure on education, in PLN. Observations of zeros are allowed.	1995-2011
Emissions _{jt}	Emission of air pollutants from manufacturing plants considered especially noxious to air purity, quoted in tons of particulates emitted from known pollutants in each geographical area. Observations of zeros are allowed.	1996-2011 (nuts4) 1996-2005 (nuts5)
Employment _{jt}	Employed persons. Observations of zeros are removed from the data.	1995-2011
EUsubsidies _{jt}	Revenue to finance EU-sponsored programs and projects, in PLN. Observations of zeros are allowed.	2006-2011
Firms _{jt}	All firms listed in REGON (Polish company register). Observations of zeros are removed from the data.	1995-2011
Foreign _{jt}	Private sector firms with foreign capital participation in REGON. Observations of zeros are allowed.	1995-2011
Greeninvest _{jt}	Outlays on fixed assets serving environmental protection, in ths PLN. Observations of zeros are allowed.	1999-2008
Invest _{jt}	Investment outlays in enterprises, in mln PLN. Observations of zeros are allowed.	2002-2008 (nuts4)
Nuts41 _{jt}	A dummy for cities with Powiat status.	-
Nuts51 _{jt}	A dummy for urban Gminas.	-
Population _{jt}	Total population. Observations of zeros are removed from the data.	1995-2010(nuts4) 1995-2011(nuts5)
Local _{jt}	Locally owned, privately held firms listed in REGON. Observations of zeros are allowed.	1995-2011
SEZ _{jt}	A dummy for territorial units with a special economic zone using the alphabetical listing published in KMPG, 2004 and the alphabetic descriptors in the regional database published by GUS	-
State _{jt}	State owned firms in REGON. Observations of zeros are allowed.	1995-2011
Subsidies _{jt}	Grand total of general subsidies in public sector revenue. Observations of zeros are allowed.	1995-2011
Wages _{jt}	Average wage index with Poland=100.	2002-2011(nuts4)
Working _{jt}	Population at working age, women 15-59, men 15-64. Observations of zeros are removed from the data.	1995-2010(nuts4) 1995-2011(nuts5)
Year _t	The year of the observation time t is the time series unit of analysis	-

Coefficient of variation at nuts4 and nuts5

Table 2 – Coefficient of variation for the dependent variables, comparing nuts4 and nuts5

	Powiat (nuts4)		Gmina (nuts5)	
	All	SEZs	All	SEZs
Emissions	2.46	2.26	6.62	2.80
Employment	2.15	1.45	6.23	2.45
Firmpop	1.99	1.41	5.41	2.51
Forfirmpop	6.18	2.47	15.14	3.85
Greeninvest	2.01	1.68	5.62	2.75
Invest	3.64	1.91	-	-
SEZ	1.06	-	3.38	-
Wages (indexed)	0.15	0.15	-	-

Difference-in-difference estimates

Table 3 – Difference-in-difference estimates for the SEZ policy

Equation	1			2		
Difference at time:	D(t=1)	D(t=T)	DiD	D(t=1)	D(t=T)	DiD
Dependent vars:						
Log Employment (nuts5)	1.70***	1.76***	0.06***	0.08***	0.07***	-0.01***
Log Firmpop (nuts5)	1.48***	1.40***	-0.08***	-0.01	-0.07***	-0.06***
Log Forfirmpop (nuts5)	1.22***	1.57***	0.35***	0.16***	0.12**	-0.04***
Log Investment (nuts4)	0.53***	0.48***	-0.05***	0.09	0.12**	0.03***
Wages (nuts4)	1.17	1.00	-0.17	-2.00*	-1.30	0.70*
Log Emissions (nuts5)	2.55***	1.98***	-0.57***	0.38***	0.28***	-0.10***
Log Greeninvest (nuts5)	2.47***	2.81***	0.34***	-0.06	0.18	0.24

Employment effect

Table 4 – Panel regressions for the employment effect of the SEZ policy, nuts5 level (villages)

Equation	3.b	4.b	5.a and 5.b
Method	PLS	Panel, RE	Two-step Panel, FE
Standard errors	White, CS	Clustered robust	White, CS
Dependent variable:	log Employment	log Employment	log Employment
Intercept	-0.70*** (0.21)	-4.01*** (0.15)	0.01 (0.01)
SEZ	0.08*** (0.01)	0.12*** (0.03)	-0.19*** (0.03)
URBAN	0.17*** (0.05)	0.53*** (0.03)	0.12*** (0.03)
Log Working	0.46*** (0.17)	0.78*** (0.03)	0.93*** (0.05)
Log Dependants	0.09 (0.16)	0.58*** (0.03)	0.40*** (0.04)
Log State	0.29*** (0.03)	0.01(0.01)	0.06*** (0.01)
Log Local	0.33*** (0.05)	-0.07*** (0.01)	-0.01(0.01)
Log Foreign	0.10*** (0.01)	0.04*** (0.01)	0.02*** (0.01)
Log Education	0.37*** (0.05)	0.04*** (0.01)	0.06*** (0.01)
Log Subsidies	-0.39*** (0.05)	-0.06*** (0.01)	-0.02*** (0.01)
Region effects	none	random	fixed
Year effect	none	random	fixed
Number of obs	59,669	59,669	59,669
Nuts5 regions	3,823	3,823	3,823
Years	17	17	17
R ² /LL	0.85	0.77	0.98
ρ	0.89	0.77	0.66

Firm creation

Table 5 – Panel regressions for the firm creation effect of the SEZ policy, nuts5 level (villages)

Equation	3.b	4.b	5.a and 5.b
Method	PLS	Panel, RE	Two-step FE
Standard errors	White, CS	Clustered robust	White, CS
Dependent variable:	log Firms	log Firms	log Firms
Intercept	-2.68*** (0.11)	-2.25*** (0.10)	-0.09*** (0.01)
SEZ	-0.04*** (0.00)	-0.06*** (0.02)	0.24*** (0.03)
URBAN	0.15*** (0.01)	0.22*** (0.03)	0.82*** (0.03)
Log Working	2.10*** (0.13)	1.83*** (0.02)	0.64*** (0.10)
Log Dependants	-1.23*** (0.13)	-1.02*** (0.02)	0.07* (0.04)
Log State	0.22*** (0.01)	0.19*** (0.01)	0.02** (0.01)
Log Education	0.06 (0.06)	-0.05*** (0.01)	0.00 (0.01)
Log Subsidies	-0.06 (0.07)	0.07*** (0.01)	0.00 (0.00)
Region effects	none	random	fixed
Year effect	none	random	fixed
Number of obs	61,985	61,985	61,985
Nuts5 regions	3,823	3,823	3,823
Years	17	17	17
R ² /LL	0.91	0.89	0.99
ρ	0.91	0.78	0.66

Foreign firm creation

Table 6 – Panel regressions for the foreign firm creation effect of the SEZ policy, nuts5 level (villages)

Equation	3.b	4.b	5.a and 5.b
Method	PLS	Panel RE	Two-step FE
Standard errors	White, CS	Clustered robust	White, CS
Dependent variable:	log Foreign	log Foreign	log Foreign
Intercept	-6.49*** (0.18)	-5.72*** (0.26)	-0.10*** (0.01)
SEZ	0.16*** (0.01)	0.11** (0.06)	0.41*** (0.06)
URBAN	0.27*** (0.02)	0.40*** (0.07)	0.95*** (0.06)
Log Working	2.78*** (0.08)	1.57*** (0.04)	0.17** (0.08)
Log Dependants	-2.04*** (0.09)	-0.89*** (0.03)	0.54*** (0.09)
Log State	0.10*** (0.01)	0.19*** (0.01)	0.06*** (0.01)
Log Education	0.33** (0.14)	-0.02*** (0.01)	-0.04 (0.04)
Log Subsidies	-0.34** (0.14)	0.03*** (0.01)	0.01 (0.03)
Region effects	none	random	fixed
Year effect	none	random	fixed
Number of obs	62,005	62,005	62,005
Nuts5 regions	3,823	3,823	3,823
Years	17	17	17
R ² /LL	0.61	0.55	0.96
p	0.97	0.87	0.73

Investment effect

Table 7 – Panel regressions for the investment effect of the SEZ policy, nuts4 level (communes)

Equation	3.b	4.b	5.a and 5.b
Method	PLS	Panel RE	Two-step FE
Standard errors	White, CS	Clustered robust	White, CS
Dependent variable:	log Invest	log Invest	log Invest
Intercept	-14.91*** (1.06)	-19.20*** (0.85)	-0.00 (0.05)
SEZ	0.12*** (0.02)	0.07 (0.05)	0.01 (0.07)
URBAN	-0.05 (0.05)	-0.34*** (0.08)	-0.21** (0.10)
Log Working	1.67*** (0.26)	1.66*** (0.34)	1.63*** (0.29)
Log Dependants	-1.49*** (0.24)	-2.14*** (0.25)	0.43 (0.50)
Log State	-0.06*** (0.02)	-0.03 (0.06)	0.11 (0.07)
Log Local	0.36*** (0.03)	0.44*** (0.13)	-0.01 (0.20)
Log Foreign	0.04*** (0.01)	0.15*** (0.04)	0.13 (0.11)
Log Education	1.70*** (0.12)	1.12*** (0.08)	-0.04 (0.06)
Log Subsidies	-0.96*** (0.06)	0.18* (0.11)	0.12 (0.11)
Region effects	none	random	fixed
Year effect	none	random	fixed
Number of obs	2,654	2,654	2,654
Nuts4 regions	380	380	380
Years	7	7	7
R ² /LL	0.77	0.75	0.92
ρ	0.69	0.56	0.14

Income (wage) effect

Table 8 – Panel regressions for the income effect of the SEZ policy, nuts4 level (communes)

Equation	3.b	4.b	5.a and 5.b
Method	PLS	Panel RE	Two-step FE
Standard errors	White, CS	Clustered robust	White, CS
Dependent variable:	Wages	Wages	Wages
Intercept	67.86*** (11.10)	28.78 (18.63)	-35.02 (77.62)
SEZ	-1.06*** (0.19)	-1.24 (1.15)	-1.26 (1.11)
URBAN	10.35*** (0.88)	8.84*** (1.99)	7.79*** (1.46)
Log Working	4.13 (4.33)	-1.90 (3.29)	3.24 (5.32)
Log Dependants	6.73*** (2.43)	8.32*** (2.38)	3.57 (2.83)
Log State	-0.69** (0.33)	-1.20* (0.64)	-0.66 (0.41)
Log Local	-1.22 ** (0.55)	0.64 (1.57)	-2.60*** (0.96)
Log Foreign	0.01 (0.15)	1.50*** (0.58)	0.97*** (0.32)
Log Education	19.90*** (2.86)	-0.94 (1.33)	1.88*** (3.07)
Log Subsidies	-24.73*** (1.51)	0.14 (1.47)	2.03 (1.41)
Region effects	none	random	fixed
Year effect	none	random	fixed
Number of obs	3,412	3,412	3,412
Nuts4 regions	380	380	380
Years	9	9	9
R ² /LL	0.36	0.26	0.96
p	0.95	0.92	0.48

Emission effect

Table 9 – Panel regressions for the emission effect of the SEZ policy, nuts5 level (villages)

Equation	3.b	4.b	5.a and 5.b
Method	PLS	Panel RE	Two-step FE
Standard errors	White, CS	Clustered robust	White, CS
Dependent variable:	log Emissions	log Emissions	log Emissions
Intercept	-8.08*** (0.50)	-10.11*** (0.41)	-0.18*** (0.03)
SEZ	0.39*** (0.02)	0.59*** (0.12)	0.42*** (0.10)
URBAN	1.27*** (0.06)	1.79*** (0.13)	1.68*** (0.10)
Log Working	1.93*** (0.27)	0.48*** (0.10)	0.96*** (0.14)
Log Dependants	-0.84*** (0.24)	0.96*** (0.09)	-0.18*** (0.06)
Log State	0.56*** (0.05)	-0.14*** (0.03)	-0.14*** (0.03)
Log Local	-0.32*** (0.03)	0.03 (0.02)	0.14*** (0.04)
Log Foreign	-0.02** (0.01)	-0.11*** (0.02)	-0.12*** (0.02)
Log Education	0.52*** (0.11)	0.02 (0.02)	0.09*** (0.03)
Log Subsidies	-0.55*** (0.10)	-0.06*** (0.02)	-0.01 (0.02)
Region effects	none	random	fixed
Year effect	none	random	fixed
Number of obs	36,349	36,349	36,349
Nuts5 regions	3,751	3,751	3,751
Years	10	10	10
R ² /LL	0.47	0.41	0.93
ρ	0.92	0.84	0.63

Green investment effect

Table 10 – Panel regressions for the green investment effect of the SEZ policy, nuts5 level (villages)

Equation	3.b	4.b	5.a and 5.b
Method	PLS	Panel GLS	Two-step FE
Standard errors	White, CS	Clustered robust	White, CS
Dependent variable:	log Greeninvest	log Greeninvest	log Greeninvest
Intercept	-7.53*** (0.47)	-7.29*** (0.54)	-0.02 (0.04)
SEZ	0.17*** (0.04)	0.29*** (0.10)	0.20 (0.13)
URBAN	-0.04 (0.05)	0.35*** (0.11)	-0.09 (0.13)
Log Working	2.39*** (0.58)	0.77*** (0.27)	-0.23 (0.43)
Log Dependants	-1.67*** (0.53)	0.24 (0.23)	1.66*** (0.54)
Log State	0.06* (0.03)	-0.03 (0.05)	-0.20*** (0.05)
Log Local	0.77*** (0.09)	0.55*** (0.09)	0.06 (0.12)
Log Foreign	-0.07 (0.04)	0.05 (0.05)	0.13** (0.05)
Log Education	1.14*** (0.18)	0.62*** (0.12)	0.01 (0.09)
Log Subsidies	-1.12*** (0.18)	-0.61 (0.12)	0.12** (0.05)
Region effects	none	random	fixed
Year effect	none	random	fixed
Number of obs	36,500	36,500	36,500
Nuts5 regions	3,758	3,758	3,758
Years	10	10	10
R ² /LL	0.28	0.27	0.55
ρ	0.43	0.29	0.13

Summary of findings

- Employment effect (negative)
- Business creation (positive)
 - Firm creation (positive)
 - Foreign firm creation (FDI) (positive)
 - New investment (absent)
- Wage effect (absent)
- Environment (negative overall)
 - Emissions (positive)
 - Green investment (absent)

Conclusions

- Overall it is concluded that the policy has mainly been effective in meeting short-term objectives
- Longer term objectives related with development, competitiveness, upgrading and sustainability have not been met
- A policy of tax exemptions cannot stand alone, other follow up measures are necessary, if not downside effect will be:
 - Phasing out effect
 - Downgrading
 - No development achieved, meanwhile rest of country has advanced, in fact opposite!
 - Need to consider: Type of incentives=behavioural models?

Questions?