The effectiveness of regional policy in Poland in 2001-2003 in the light of PARADISE method evaluation

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This paper addresses the issues of evaluation of regional development policy effectiveness in Poland. It consists of four parts. In the first section contemporary regional policy in Poland is described and the operational definition of regional policy (called in the article: the definition in the “narrow sense”) is given. Regional policy in that sense is the subject of further analysis. The second fraction focuses on the key issues of the evaluation of regional policy, inter alia the concept of its effectiveness. The third part presents the classification of regional policy effectiveness evaluations methods. Some methods used in European practice are presented. In the last section the detailed description of the PARADISE model is given and an attempt to introduce this method in Polish conditions is made.

1. Contemporary regional development policy in Poland

Regional policy1 in its present shape has its roots in the administrative reform in 1999. The reform created 16 self-governing voivodships and made regional self-government authorities a true partner for the decision centre (the government) as far as decisions concerning regional development are concerned. The change of approach to regional policy was aimed at more effective and successful realization of tasks facing the regional development policy. The status and importance of regional policy was increased by the perspective of Polish access to the European Union structures (EU). The great importance of regional policy in the EU can be reflected in the share of EU budget allocated for this purpose. This share amounts to 30% of the whole EU budget. Poland, as a beneficiary of EU regional policy, took action to create proper conditions to absorb the support funds (European Commission 1999a). One of the elements of these adjustments was the creation of a new model of regional policy in Poland.

One of the basic problems of analyzing the regional development in Poland is its operational definition. Generally speaking, the term regional policy is defined as conscious and deliberate activity of public authority representatives aiming at regional development, namely having as its objective the optimal utilization of regions’ resources to provide steady development of these regions (review of definitions, see: Vanhove N. 1999, pp. 57-63). The new administrative division of the country allows us to differentiate two complementary subsystems of regional policy (Kudłacz T. 1999, pp. 80-121; G. Gorzelak 2001, pp. 177-189):

- inter-regional policy - led by central institutions of public authorities, where the decision making criterion is the region or a system of regions
- intra-regional policy – led by regional institutions of authority (regional self-government), to realize its own aims, on the basis of its own means and at its own responsibility

The above definition of regional development policy (let’s call it a “broad” definition) will be specified to enable its evaluation. In order to do so, we should shortly characterize regional policy in the analyzed period.

The legal foundations for regional development policy were introduced in 2000 by the act on regional development support rules, defining the rules and forms of regional development support and principles of cooperation of the Council of Ministers and government administration representatives with self-government (Act of May 12, 2000 on the regional development support rules)2.

The vision of contemporary regional policy in Poland was presented in the National Strategy of the Regional Development 2001-2006 – NSRD (Resolution of the Council of Minister on National Strategy of the Regional Development 2001-2006). NSRD constitutes part of social and economic strategy of Poland, and is responsible for accomplishing the development aims concerning the area of Poland. The NSRD records make a foundation

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1 In this paper the term is used interchangeably with the term regional development policy.
2 After Poland access to the EU, the act was replaced by the act of April 20, 2004 on National Development Plan, Dz. U., 2004, No 116, position. 1206.
for programming regional development on the operational level and for launching enterprises and projects supporting regional development. NSRD strategic aim is to create conditions increasing regions’ competitiveness and counteracting the marginalization of certain regions in a way that favors the long-term economic development of the country, its economic, social and territorial integrity and the integration with the EU. This strategic aim will be accomplished through state activities focused on the following priorities:

- A. Extension and modernization of infrastructure helping to increase the competitiveness of regions,
- B. Restructuring of the economic basis of regions and creating conditions for its diversification,
- C. Development of human resources,
- D. Supporting the areas needing activation and threatened by marginalization,
- E. Development of cooperation among regions.

The embodiment of NSRD was the introduction of the Support Program for years 2001-2003 (Directive of the Council of Minister of 28.12.2000 on the adoption of the Support Program 2001-2003)\(^1\). The support program for years 2001-2003 defined the scope, procedure and conditions of state support of voivodship programs (see e.g.: Malopolska Region Parliament 2000). In accordance with NSRD it defined its general aim as supporting social and economic development of the country and its particular areas in order to increase their competitiveness, improve living standards, and increase social, economic and spatial integrity in internal relations as well as in relations with countries and regions of the European Community. The actions resulting from voivodship programs focused on accomplishment of aims specifying the NSRD priorities. The proposed division of means according to priorities A-E presented above was as follows: 50%, 15%, 12%, 18%, 5%. In spite of the fact that the support program allowed the regions to allocate the means differently, the above proportions were preserved (Ministry of Economy and Labour 2004, p. 10). This can be seen as a sign of general agreement between the government and self-governments as to regional policy priorities in Poland.

The way of allocating the means among particular regions was defined as follows:

- 80% of the means is allocated among all regions proportionately to the number of their inhabitants,
- 10% is allocated proportionally to the number of inhabitants among the regions whose GDP per capita is below 80% of average GDP,
- 10% of the means is allocated proportionally to the number of inhabitants in poviat where the unemployment level for the last three years has exceeded 150% of the national unemployment rate.

Voivodship contracts were signed on 19.06.2001 for years 2001-2002. In 2002, the realization period was prolonged until 2003. The contracts define the scope, procedure and conditions of task implementation resulting from the voivodship programs, assisted by governments and tasks supervised by proper ministers, assisted by self-governments and other entitled subjects. The voivodship contract is an agreement signed by the Council of Ministers (represented by the Minister responsible for regional development) and the region self-government represented by the Region’s President.

In its broad meaning, the regional policy also comprises the regional part of state aid in the country. State aid is defined as offering financial benefits to a given entrepreneur within his economic activities. Offering benefits is seen as help if it is directly from national public means or from such means given to other subjects and if it decreases or can decrease such means and violates or can violate the competition through privileging some entrepreneurs or the production of specific goods. In case of regional state aid, a region (territorial unit) in which the enterprise operates is taken into account. The scope of regional aid was regulated by the act on conditions of permissibility and supervision of state aid and related directive of the Council of Ministers on permissibility of regional aid for entrepreneurs (act of 27.07.2002 on conditions of permissibility and supervision of state aid for entrepreneurs)\(^2\).

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\(^1\) Initially the support program was provided for years 2001-2002, then it was prolonged for 2003, consequently the means in the preliminary for 2002 had to be divided into two years. In 2004 a new program was adopted by the Directive of the Council of Minister of 16.03.2004 on adopting a support program for 2004, Dz. U. 2004, No 56, position 542.

\(^2\) In the analyzed period there were two acts, one of 30.06.2000 on conditions of permissibility and supervision of state aid for entrepreneurs, Dz. U. 2000, No 60, position 704 with subsequent changes and the act of 27.07.2002 on conditions of permissibility and supervision of state aid for entrepreneurs, Dz. U. 2002, No 141, position 1177 with subsequent changes. Since the EU access, state aid is regulated by the act of 30.04.2004 on procedure concerning state aid, Dz. U. No 123, position 1291.
The above short outline of policy for 2001-2003 allows us to define three main instruments used by the broadly defined regional policy, namely:

- regional contracts,
- co-financing from Support Program means the tasks carried out from pre-access funds,
- regional state aid.

The amount of expenses on particular elements is presented in table 1. Over half of all means is comprised of joint (government and self-government) expenses related to regional contracts. These are the expenses actually born (they differ from planned means; the use of public means for 2001-2003 is estimated at 90.43%). The data concerning co-financing are planned figures (due to lack of data on their accomplishment). In case of regional state aid one should remember that the engaged means are not only public expenditure, but they also decrease the state revenue.

### Table 1. Financial means related to regional development policy in 2001-2003 (in PLN)

<table>
<thead>
<tr>
<th>Years</th>
<th>Means for co-financing pre-access support included in the Support Program</th>
<th>Regional state aid</th>
<th>Government and self-government means for contracts</th>
<th>Together</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1 222 575 641</td>
<td>385 071 969</td>
<td>2 630 941 236,1</td>
<td>4 238 588 846</td>
</tr>
<tr>
<td>2002</td>
<td>1 165 200 000</td>
<td>469 636 795</td>
<td>1 851 023 295</td>
<td>3 485 860 090</td>
</tr>
<tr>
<td>2003</td>
<td>1 159 617 962</td>
<td>835 868 500</td>
<td>1 403 550 263</td>
<td>3 399 036 726</td>
</tr>
<tr>
<td>Total</td>
<td>3 547 393 603</td>
<td>1 690 577 264</td>
<td>5 885 514 794</td>
<td>11 123 485 661</td>
</tr>
</tbody>
</table>

Source: own analysis (on the basis of data from Office for Competition and Consumer Protection and Ministry of Economy and Labour 2004).

In this paper the definition of regional policy was limited to the public expenditure related to contracts. Such narrow definition of policy can be justified in two ways. Firstly, regional state aid is in conflict with regional policy principles defined by NSRD, especially with the principle of programming⁷. Moreover, the Office for Competition and Consumer Protection (OCCP) notices very weak reporting on state aid by territorial self-government units (OCCP 2003). This questions the credibility of data in territorial perspective concerning regional state aid. Secondly, the means for co-financing pre-access support naturally depended on external factors (foreign ones). Till the end of 2004, there were no reports on allocating and utilizing these means, therefore it is difficult to evaluate the impact of the decision to co-finance the pre-access programs on particular regions and systems of regions.

### 2. Evaluation of regional development policy

The foundations for evaluation of the activities of a country should be searched in praxeology – a general theory of efficient activity. The evaluation of activities will be seen on the grounds of praxeology as some practical features of activities ascribed to them from the point of view of their efficiency (Kotarbiński T. 2000, p.74). Efficiency may have three different meanings:

- Universality, general term of each practical (praxeological) features of activity, for example thoroughness, effectiveness, usefulness.
- Synthetic, all the features, the more effective you are, the more you fulfill particular feature.
- Manipulative, defined by term skillfulness (even for non-physical activities).

The main area of interest of this article is the efficiency of public authorities activities directed at regional development in its universal meaning. The features of efficient activities can be grouped according to the object of activities as well as to the activities themselves (Kotarbiński T. 2000, pp. 74-93). Among features of the activity effectiveness and efficiency seems to be most important⁸. The action of public authorities can be called

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⁵ Less important instruments were neglected (at least judging by the amount of financial means engaged) such as advisory, information and pilot programs or preventing natural disasters. Special economic zones are sometimes treated as regional policy instruments, but in the paper they are neglected because since 1997 such zones were not created.

⁶ All data on regional policy used in this paper are expressed in prices from 2002; to change the nominal to real value, a deflator of GDP for Poland was used.

⁷ The principles of programming, concentration, subsidiarity, partnership and additionality were described in NSRD; only in case of principle of concentrating means, NSRD mentions regional state aid and postulates maximum limit of means for such aid (this limit is allocated to sub-regions).

⁸ By such delimitation efficiency is understood narrower then the efficiency of public authorities in universal meaning. That „imprecision” results from weaknesses in translation of polish terms: “sprawność” (efficiency in universal meaning) and “efektywność” (efficiency in narrower sense).
effective when it leads to the desire aim. The action may be effective or ineffective, that is counter-effective or neutral to a given aim. The efficiency is defined as productiveness or economy. The action is more productive if we produce the bigger total product (its value, to be precise) with given investment. Economy is understood as minimizing the investment with the same product. Both features are gradable, which means that the action can be more or less effective and more or less efficient.

The European Commission made special contribution into the development of evaluation. The evaluation of policy in the European Commission methodology equals the praxeological definition: by evaluation of the policy, program or project we understand the value of policy, program or project with reference to criteria defined earlier and on the basis of particular information. The evaluation of regional development policy is carried out on the basis of the process of implementing the policy (see Figure 1).

The key issues of policy process evaluation should answer the following questions:

- Relevance: To what extent are the programme's objectives relevant in relation to the evolving needs and priorities at national and EU level?
- Efficiency: How were the resources (inputs) turned into outputs (direct effects), results or impacts (wider effects on direct and indirect beneficiary)?
- Effectiveness: How far has the programme contributed to achieving its specific and global objectives?
- Utility: Did the programme have an impact on the target groups or populations in relation to their needs?
- Sustainability: To what extent can the changes (or benefits) be expected to last after the programme has been completed?

In examining this policy process, the tasks of evaluation can be grouped under two broad roles:

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*Pay special attention to the Commission program MEANS (Methodes d’Evaluation des Actions de Nature Structurale), see also special guide accessible on site: [http://www.evaled.info](http://www.evaled.info).*
• **Formative** role addresses the efficiency of policy, analyzing how policy converts its various inputs into activities and outputs within the parameter targets set by its designers. This aspect of evaluation is focused on the mechanisms in place for delivering policy and its conclusions are mainly used to improve the administration of policy.

• **Summative** function of evaluation is concerned with the effectiveness of policy actions, measuring whether they have had a significant effect on its target groups (through its results) and on the wider economy (through its impacts). The product of this aspect of evaluation comments fundamentally on the goals and methods of policy rather than its operation, and as a result, can lead to revisions of a programme or measure or in some cases, its replacement with a more effective approach.

As the concept of effectiveness shows, it is required to define clear objectives for regional policy. Regional competitiveness is presently considered as a main priority for modern regional development policy (see e.g. Bachtler J., Yuill D. 2001). In present paper regional competitiveness is understood as a region’s ability to create relatively high income and employment (European Commission 1999b, p. 75). There is a wide range of measures of regional competitiveness (see e.g. European Commission 2003). In the paper it is assumed that private investment is a good indicator for regional competitiveness (see section about PARADISE model).

3. **Methods of regional policy effectiveness assessment**

The method, which is considered to be the most complete one, is the cost-benefit analysis (Acocella N. 2002, p. 326; Swales K. 1997). This method is rooted in welfare economics (McVittie E., Swales J.K. 2003). Firstly, possible cost and benefits concerning regional policy are identified. The identification of possible items of a cost-benefit analysis is followed by quantification. To make decision about implementing a given regional policy instrument the net present value (NPV) is calculated. In case of comparing different instrument of regional policy relative net present value (NPV_r) can be used.

\[
NPV = B - C, \\
NPV_r = \frac{B - C}{C},
\]

where:

B - discounted benefits,
C - discounted costs.

Another criterion to make decision about introducing or not regional policy instrument is the calculation of internal rate of return (IRR). IRR is the discount rate r which makes the net present value of the stream of benefits equal to the net present value of the stream of costs.

<table>
<thead>
<tr>
<th>Table 2. Principal social benefits and costs of regional policy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits</strong></td>
</tr>
<tr>
<td>1. Additional output and income arising from increased</td>
</tr>
<tr>
<td>economic activity</td>
</tr>
<tr>
<td>2. Reduced infrastructure costs and costs of public service</td>
</tr>
<tr>
<td>provision as a result of reduced migration assisted areas to</td>
</tr>
<tr>
<td>non-assisted areas</td>
</tr>
<tr>
<td>3. Avoided costs of migration for individuals who</td>
</tr>
<tr>
<td>otherwise have been forced to leave the assisted areas</td>
</tr>
<tr>
<td>4. Reduced urban externality costs (e.g. pollution,</td>
</tr>
<tr>
<td>congestion) arising from a less concentrated spatial</td>
</tr>
<tr>
<td>patterns of economic activity</td>
</tr>
<tr>
<td>5. Equity or redistribution benefits of regional policy</td>
</tr>
<tr>
<td>6. Non-economic benefits (political, social, environmental)</td>
</tr>
</tbody>
</table>


It is very difficult to make a cost-benefit analysis of regional policy measures. Firstly, the identification of all effects is hardly possible. Table 2 is an example of such effects. Secondly, it must be admitted that some non-economic costs and benefits and some intangibles cannot be measured. Even apart from that, the data required are in most cases not available for a sufficiently long period. Moreover, the “with and without” principle has to be applied to each item. It implies a distinction between diverted, autonomous, and subsidy-created investment.
Beside the cost-benefit analysis, there are other methods of evaluating an effectiveness of regional policy. Most of them are combined with Structural Funds evaluation. The MEANS Programme suggests two overarching methodological approaches to the evaluation of impact (particularly on employment) of the regional policy (MEANS 1999, p. 24):

- Bottom-up approach,
- Top-down approach.

Bottom-up approach is a method which calculates aggregate effects by summing the measured impact on aided and unaided individuals or firms. The distinction between gross and net effect is important in this method. The direct outputs (gross effects, e.g. gross jobs) of the programme are indentified by some microeconomic analysis (e.g. survey method). This directly outputs are then transformed so that it can be treated as an exogenous disturbance in a model of the region to calculate net impacts (steps between outputs, results and impacts, see Figure 1). In the measurement of net employment impact, it is argued that the move from gross jobs to net jobs requires the identification and quantification of additionality, deadweight, substitution and displacement effects. Where evaluations attempt to calculate net employment effects (as well as gross effects) these also generally incorporate multiplier effects too.

Additionality and substitution measure the extent to which the programme effects the behaviour of the direct beneficiaries. Deadweight quantifies the extent to which aid is above the minimum that would have been necessary to achieve that change in behaviour.

Polish Ministry of Economy and Labour makes an attempt to evaluate voivodship contracts in years 2001-2003 in the way like bottom-up approach. The description of the Support Programme’ priorities A-E execution is followed by the conclusion about generally good performance of voivodship contracts. That conclusion is at least doubtful, because the Ministry did not assess effects mentioned above.

Top-down evaluations do not go through the process of tracking the effects of individual projects, aggregating to get the programme outputs and then calculating impacts by multiplier and displacement adjustments. Rather, these methods attempt to identify impacts at a more aggregative level.

One broad method is to construct a counterfactual position. This means identifying the level of activity that would have occurred in the area without the given regional policy instrument. The difference between actual and the counterfactual is then attributed to the impact of policy. There are two ways of constructing the counterfactual: choose a comparator, non-aided region that is identical in all important respects to the region in receipt of assistance; and model the behaviour of the region before the region received an assistance and then run the model forward into the period where funding operates.

A second type of top-down method seeks to formally model the policy effects themselves. This implies that the section of the evaluation path identified as being in the domain of the programme (from objectives to outputs) is formally modelled. However, the focus is almost certainly the impacts of the programme so that separate additionality, displacement and multiplier figures will not be calculated or required. The explicit modelling of policy effects is conceptually more satisfactory than the corresponding counterfactual approach.

A final top-down approach is one that deals with policy effects through direct econometric estimation. This could be in the form of a single equation or a system of equations. From a methodological view, economists normally favour formal econometric approaches that test the statistical significance of the impact of independent variables on dependent variables. In this case, the key independent variables are the policy variables and the dependent variable would be a measure of policy impact. If data are available, this approach should calculate the impact of policy with the greatest degree of accuracy.

Although that short characteristic of top-down and bottom-up approaches suggests a gap between these methods, it is important, that these approaches should be seen as complementary, not competitive.

This paper focuses on one of the top-down approaches. European practice shows that there are several models in use (Bachtler J. 2000, pp. 107-130), e.g.:

- Modified shift-share analysis,
- Dynamic input-output tables,
- HERMIN model,
In the traditional shift-share analysis two components of change in the measure that we are interested in (e.g. employment, income), can be identified (Vanhove N. 1999, p. 117-122):

- “Share” component,
- “Shift” component (or “net shift”), further divided into “structural” (“industry mix”) and “differential” (“regional”) components.

The “share” component measures by how much the measure we take in a local area increased (changed) because of growth in the national economy during the period of analysis. It informs of the change in taken measure in a given region that would take place if the region’s measure had grown at the same rate as the national one. This is the norm for the region from which deviation can be measured. The “shift” component represents any deviations in a taken regional measure from the national share. It is positive in prosperous regions and negative in depressed regions. The “structural” component measures the portion of regional growth that is due to an abundance of either quick or slow growing sectors. Regional component is the difference between the actual change in a taken measure and the sum of the “share” and “structural” component. It is considered as an indicator for regional competitiveness (if positive) or lack of regional competitiveness (if negative). Those conclusions can be drawn both for any sector or regional economy as whole.

In order to receive information about the policy impact on the competitiveness of a region (or a sector in a given region) the following steps are taken (Moore B., Rhodes J. 1973, see also usage in combination with other methods in : Dinc M., Haynes K. E., Tarimcilar M. 2003):

- The study period is divided into a policy–off and policy–on period,
- A linear trend for regional component is fitted for policy-off period and extrapolated forward into the policy-on period,
- The difference between the actual regional component and the extrapolated regional component is then taken as an estimate of the effect of regional policy.

The main advantage of this method is its methodological simplicity, which means that it does not require high resources and is relatively not time - consuming. The main point of criticism against this shift-share procedure is that no explanatory factors are taken into account, so that we cannot be sure if the observed differences are due to regional policy or autonomous factors, for example the labour reserve.

Input – Output (I-O) analysis makes it possible to show complicated interdependencies in different kinds of systems (Isard W. 1998, p. 41 and further). I-O models are often used in regional economies analyzing. Dynamic Input-Output analysis was used to evaluate the impact of Structural Funds on the economies of Greece, Spain, Ireland and Portugal. There are two elements of this approach: first a method for updating Input-Output tables is developed and then the relevant national I-O tables to simulate the impacts of Structural Fund expenditure in both ex ante and ex post evaluation exercises are used.

I-O analysis can be used to quantify the impact of the Structural Funds on the following economic variables:

- the rate of growth;
- other economic aggregates and the industrial structure;
- employment;
- capital stock.

The I-O system is used to identify the following three separate effects:

- the demand impacts generated by the construction of the infrastructure financed by the Structural Funds;
- the wages and salaries supported by the Structural Fund; and
- the additional induced investment generated as a result of the expansion in local activity.

The main strengths of this approach are: a clear analytical framework (it is based on a formal modelling approach), stressing sectoral disaggregation, incorporating the interaction between economic sectors and elements of final demand, the use of existing I-O tables could be relatively low cost. The major weakness is the fact that it does not take into consideration the supply-side of economy, what has two key implications. First, the supply-side stimuli that the Structural Funds aim to produce have to be converted into the demand side stimuli to be captured by I-O. This has to be done in an ad hoc way. Second, there are no supply constraints built into the
model as it normally operates. The lack of the I-O tables for existing programme areas (so that evaluation at that level is more problematic) is another weakness.

The Hermin models were constructed for the assessment of the effects of the structural funds and Cohesion Fund on the economies of the four poorest countries: Greece, Spain, Ireland and Portugal, and also East Germany. Its origins lay in the complex multi-sectoral HERMES model that was developed by the European commission from the late 1970s to identify and quantify the impacts of the oil price shocks on the individual economies of European Community.

This model was also applied in Poland in order to identify the impact of the National Development Plan 2004 – 2006 (NDP) on the whole Polish economy (Bradley J., Zaleski J. 2002). HERMIN model is a multi-equation model of the economy, which describes both sides, supply and demand, of the economy. The NDP consists of the major public investment programmes aimed at improving the quality of physical infrastructure, human resources, as well as providing direct grant aid to the three main productive sectors (manufacturing, market services and agriculture).

There are three possible sources of funding for each of these economic categories:
- EU transfers in the form of subventions to the public authorities, as set out in the NDP treaties,
- Domestic public sector co-financing, as set out in the NDP treaties,
- Domestic private sector co-financing, as set out in the NDP treaties.

The HERMIN model for Poland simulates and compares the performance of the Polish economy “with – NDP” and “without NDP”. The experiment was led in three versions: the first including EU, local public and private co-finance, the second including only EU finance and local public co-finance and the third including only EU finance. Generally speaking, the simulation shows the positive impact on Gross Domestic Product (GDP) and unemployment rate. Especially good results were obtained in the first version.

The main strengths of the HERMIN approach are:
- It generates an explicit model of the recipient economy. This model is open to scrutiny and based on prior theoretical reasoning so that the causal mechanisms are transparent.
- It captures economy-wide impacts.
- It incorporates supply-side effects, such as competitiveness and labour market effects.
- Once the model has been set up, additional simulation is inexpensive, particularly as against extensive face-to-face interviews.

The main weaknesses of the Hermin approach are:
- Formal economic modelling involves a high set-up cost.
- The data requirements are high.

The PARADISE approach is explained in the next section.

4. The PARADISE model. An attempt to assess regional policy impact in Poland
The PARADISE model (Policy Assessment of Regional Achievements and Development Induced by Stimuli of ERDF) was used in 1990s to estimate the impact of the European Regional Development Fund (Blaas E. and Nijkamp P. 1995). The aim was to generate an evaluation method, which can be applied in a consistent manner across regions in all the EU countries.

The evaluation of the policy effectiveness consists of two steps:
- frequency analysis,
- simple explanatory model, which uses multiple regression approach.

Frequency analysis is based on a cross-sectional comparison of the relative performance of various region in a country in terms of two or more strategic policy-relevant variables in a given year. Imagine that the relevant
impact variable is A, and the policy (or control) variable is B and that we have observations on these variables across all regions. These variables are standardized for regional size (for example, per head of population). The average values of A and B across the whole population under consideration are $A^*$ and $B^*$. Each region is then classified as having an above or below average value for A and B. This places the region in one of the four categories in the table below. If a positive relationship between the policy and impact variable is expected, we expect the bulk of the observations across regions to lie in the quadrants I and IV. However, the direction of causality cannot be derived directly from that table in a static setting. Moreover, no conclusion about the strength of the correlation between the variables can be drawn.

Table 3. A cross-classified Frequency Table for Regional Policy Evaluation

<table>
<thead>
<tr>
<th>$A_r$</th>
<th>$B_r$</th>
<th>$B_r &lt; B^*$</th>
<th>$B_r &gt; B^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A_r &gt; A^*$</td>
<td>I</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>$A_r &lt; A^*$</td>
<td>III</td>
<td>IV</td>
<td></td>
</tr>
</tbody>
</table>


This impact method is easy to handle and presents directly interpretable picture of a possible influence of one or more explanatory (or control) variables on a dependent regional response variable. In order to assess the impact of ERDF, the private investment ($I_{pr}$) is taken as a dependent variable. ERDF Commitments ($I_{cr}$), public investment minus ERDF Commitments ($I_{(o-c)r}$) and changes in gross value added ($\Delta GVA$) are considered as explanatory variables. The theoretical backgrounds of the model are explained as follows. In general most firms tend to respond to public stimuli by increasing their investments, which in turn may generate additional employment and hence regional growth. Furthermore, firms may be looking ahead (i.e., they invest more if they expect a rise in value added) or looking back (i.e., they invest more if a rise in value added has actually taken place). This approach postulates that private investments provide the best first response variables of public policy. They can also serve as an indirect first-order indicator for the economic development in a region. In PARADISE model the ERDF Commitments are subtracted from the level of public investments so as to allow separate identification of ERDF impacts.

The simple explanatory model tests the existence of casual quantitative relationship between the economic development of a region (represented by private investments) and possible explanatory background variables for this development. The ERDF Commitments in this model are then regarded as one such explanatory variable.

Following casual model is a frame of reference:

$$I_{pr} = \alpha_0 + \alpha_1 I_{cr} + \alpha_2 I_{(o-c)r} + \alpha_3 \Delta GVA_r$$

where:

$\alpha_0$ reaction coefficient ($i= 1, 2, 3$);

$\alpha_0$ intercept.

Then this equation is represented in terms of three complementary types of investment equations:

- **Active response model**, where it is postulated that private investments depend inter alia on the economic situation that entrepreneurs expect in the near future. Explanatory variables are: public investments minus ERDF Commitments and ERDF Commitments in the same time t, and the change in gross value added with an expected forward time lag (for the time t, t+1, t+2, etc.).

- **Conventional investment model**, where the investments in the private sector in time t depend only on public investments minus ERDF Commitments and ERDF Commitments, both with the negative time lag (for the time t, t-1, t-2, etc.).

- **Passive response model**, which means that private investments in time t depend among others on the economic situation in the past few years. Explanatory variables in this variant are: public investments minus ERDF Commitments and ERDF Commitments in the same time t, and the change in gross value added with and without the negative time lag (for the time t, t-1, t-2, etc.).

Additionally to these three investment equations a further analysis of regional employment impact is made by investigating the labour–investment ratio:
For Dutch regions a lot of experimentation was done regarding appropriate time lags, absolute date and moving averages, etc (Blaas E. and Nijkamp P. 1995). By testing the significance of reaction coefficients of explanatory variables the best results were achieved for the application of the moving averages. Generally, the Netherlands’ study shows that the ERDF expenditures in the past have certainly influenced the private investment in the regions considered (most of reaction coefficients were significant). The value of reaction coefficients of the ERDF Commitments allow to gauge the extent of impact. The rest of the explanatory variables shows that public investments have very significant effects on private investments, though a change in gross value added performs poorly in investment equations. The division of regions into four groups exhibited that private investments in some groups are more strongly influenced by ERDF expenditures than in the other groups. The explanation of this phenomenon can not be given using PARADISE approach, conducting more detailed case study research at the regional level would be necessary.

The main barrier to implementing top-down approach for regional policy effectiveness evaluation in Poland is the lack of appropriate data at the regional level. Regarding the new administrative division they are available since the year 1995. Problems concern also the update of data (for example two years lag in aggregate production and income measures). Despite obstacles mentioned above, an attempt to use this method for the assessment of regional policy (in its narrow sense) effectiveness is made.

It is assumed that private investments can be taken as a measure of regional competitiveness, because the objective of regional competitiveness is regional development (regarded as creating relatively high income and employment). Private investments increase the capital stock in region (consequently potential output of a region)\(^{12}\). The significant correlation between GVA per capita (commonly used measure of regional competitiveness, see: European Commission 2003, pp. 2-36) and private investments per capita confirms that private investments are appropriate regional competitiveness indicator (see table 4). The \(p\) value in table 4 is interpreted as a probability of error that is involved in accepting our observed results as valid (in many areas of research the \(p\) value of 0.05 is customarily treated as a “borderline acceptable error level”). Regional competitiveness is also connected with employment level hence using the labour-investment ratio is appropriate.

### Table 4. Correlation coefficient between private investments per capita and GVA per capita (1999-2003)

<table>
<thead>
<tr>
<th>Year</th>
<th>Coefficient</th>
<th>(p) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>0.9130</td>
<td>0.000</td>
</tr>
<tr>
<td>2000</td>
<td>0.9092</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>0.9207</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
<td>0.9237</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: own analysis

The value of the private investments in a region (\(I_{pr}\)) is the dependent variable in the model. Public investments minus voivodship contracts in a region (\(I_{v}\)), voivodship contracts measures (\(I_{w}\))\(^{13}\) and the changes in gross value added in a region (\(\Delta GVA\)) are considered as explanatory variables. All variables are weighted by population of a region. If the significance of the value of the reaction coefficient of the voivodship contracts commitments exists it would be concluded that the regional policy in the narrow sense in Poland is effective. In the reverse situation (on the contrary) conclusions about the effectiveness of the regional policy would not be justified. Additionally, if there is a significant (positive) influence of private investments on the employment the conclusions are strengthened.

The following model is used as a frame of reference:

\[
I_{pr} = \alpha_0 + \alpha_1 I_{v} + \alpha_2 I_{w} + \alpha_3 \Delta GVA_r
\]

where:

\(\alpha_i\) reaction coefficient (\(i = 1, 2, 3\));

\(\alpha_0\) intercept;

\(\Delta GVA\) changes in gross value added.

\(^{12}\) Net investments should be taken into calculation but the lack of appropriate data force the author to use gross investment data.

\(^{13}\) Due to limited data it was assumed that all voivodship contracts commitments are investment kind.
The analysis is broadened by using two complementary models, which describe the possible behaviour of entrepreneurs in the case of explanatory variables:

- **Conventional investment model**, which analyses the influence of the public investments minus voivodship contract expenditures and voivodship contract expenditures on the private investments. The time lags are taken into consideration.

\[
I_{pr} = \alpha_0 + \alpha_1 I_{br}^{\delta} + \alpha_2 I_{kr}^{\delta},
\]

where:
- \( I_{pr} \) — private investments in region \( r \);
- \( I_{br} \) — public investments minus voivodship contract in region \( r \);
- \( I_{kr} \) — voivodship contract expenditures in region \( r \);
- \( \alpha_0 \) — constant coefficient;
- \( \alpha_1 \) — coefficient of public investments minus voivodship contract expenditures;
- \( \alpha_2 \) — coefficient of voivodship contract expenditures;
- \( \delta \) — time lag (\( \delta = 0,1,2 \)).

- **Passive response model**, where private investments in time \( t \) depend on the public investments (total minus contracts and contracts) in the same time \( t \) and on the economic situation in the past (the change in the gross value added in region \( r \)).

\[
I_{pr} = \alpha_0 + \alpha_1 I_{br} + \alpha_2 I_{kr} + \alpha_3 \Delta GVA_r^{\delta},
\]

The limited data makes it impossible to analyze policy impact with more than two years time lag. The same kind of problem appeared when the attempt of active response model construction was made. Gathering data for a greater number of years would enable to use not only the absolute data but also moving averages in the analysis.

The dependence between employment (this variable is not weighted by population) and private investments is represented by following model:

\[
L_r = \alpha_0 + \alpha_1 I_{pr}^{\delta},
\]

where:
- \( L_r \) — total employment in region \( r \);
- \( \alpha_0 \) — constant coefficient;
- \( \alpha_1 \) — coefficient of private investments.

Frequency analysis suggests the existence of positive correlation between the private investments and explanatory variables (see table 5). Table 5 should be read in the following way. The dependence between the private investments \( (I_{pr}) \) and public investments with voivodship contracts subtracted \( (I_{br}) \) in year 2001 (time lag 0) is considered. Three voivodships had the higher value of both \( I_{pr} \) and \( I_{br} \) than the national average (that cell is called quadrant I, compare: table 3). None of voivodships showed the \( I_{pr} \) higher than national average and \( I_{br} \) below the national average simultaneously (quadrant II). Three voivodships were characterized by the value of \( I_{pr} \) below the national average and \( I_{br} \) above (quadrant III). The rest of voivodships (10) were put in quadrant IV. The other dependences should be interpreted in the analogous way. If the number of voivodships in quadrants I and IV is higher than the half of all voivodships, the positive correlation between the variables can be concluded. Regarding \( I_{br} \), 75% of the results is placed in these quadrants, for \( I_{kr} \) and \( \Delta GVA_r \) the numbers are accordingly 72% and 54%.
Table 5. Frequency table for the years 2001 - 2003

<table>
<thead>
<tr>
<th>Time lag</th>
<th>Iₚₑ&gt;1ₗᵣ</th>
<th>Iₚₑ&lt;1ₗᵣ</th>
<th>Iₚₑ²&lt;1ₗᵣ</th>
<th>∆GVAₗᵣ&gt;∆GVAᵣ</th>
<th>∆GVAₗᵣ&lt;∆GVAᵣ</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>10</td>
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<td>-</td>
</tr>
<tr>
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<tr>
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<td>2003</td>
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<td></td>
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<td>1</td>
<td>2</td>
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<td>8</td>
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<tr>
<td></td>
<td>29</td>
<td>88</td>
<td>19</td>
<td>60</td>
<td>52</td>
</tr>
</tbody>
</table>

Iₚₑ - private investments in region r; Iₗᵣ - public investments minus voivodship contract in region r; Iᵥᵣ - voivodship contract expenditures in region r; ∆GVAᵣ - change in gross value added in region r; * describes the national average of a given value, dots mean the lack of data from given period. Source: own analysis.

The results of regressions analysis are presented in table 6. Investments and employment models are well fitted (adjusted R² above 0.5 in most cases). In order to facilitate the understanding of the results, the conventional model, explaining the influence of the public investments minus voivodship contract expenditures (Iₗᵣ) and voivodship contract expenditures (Iᵥᵣ) on private investments (Iₚₑ) in year 2001, would be analyzed. Iₗᵣ has significant influence on the private investments in each possible time lag (in each field +). Iᵥᵣ had significant influence on Iₚₑ with time lag 0 (i.e. from the same year). Sign “∆” in the other fields means that contracts in years 2000 and 1999 (time lag 1 and 2) did not exist.

A look at the separate variables shows that public investments give the best results (almost all parameters are significant). The changes of GVA have no significant influence on dependent value (the significant influence is observed only in one case).

Voivodship contract investments in 6 cases out of 14 have significant influence on the private investments. It can be noticed that the contracts from 2001 year have always significant influence on investments (in 6 cases out of 6). So it suggests that regional policy in this year had effective influence on the regional competitiveness (measured by private investments). The contracts from other years did not show significant influence on the private investments (the effectiveness of regional policy is doubtful).

Table 6. Results of regression analysis for Poland

<table>
<thead>
<tr>
<th>Equation</th>
<th>Iₚₑ = α₀ + α₁Iₗᵣ⁻ + α₂Iᵥᵣ⁻</th>
<th>Iₚₑ = α₀ + α₁Iₗᵣ + α₂Iᵥᵣ + α₃ΔGVAᵣ⁻</th>
<th>Iᵣ = α₀ + α₁Iₚₑ⁻</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Iₗᵣ</td>
<td>Iᵥᵣ</td>
<td>Iₗᵣ</td>
</tr>
<tr>
<td>Time lag</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>+</td>
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<tr>
<td>2002</td>
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<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

* =significant explanation with: 0.5< adjusted R²<1; * =significant explanation with: 0.4< adjusted R²<0.5; Δ= absence of variable in given period; 0 = coefficient not significant. A dot means that there is lack of data necessary for regression from given period. The significance of all coefficients is based on confidence level > 95%.

Source: own analysis.
The main advantage of PARADISE model is the fact that the statistical testing of the relationship between an independent policy variable and a dependent impact variable is in principle a powerful tool and this is a general methodological approach most strongly favoured in economics. This method is relatively less time consuming and less expensive in comparison to other models (e.g. HERMIN model). The quality of the model would be probably higher if data with greater time period could be obtained and when net investments data instead of gross investment used. In order to improve the quality of regional policy effectiveness evaluation complementary techniques should be used. Revealing the effectiveness of regional policy in Poland could be the starting point for the analysis of other issues of policy evaluation, e.g. regional policy efficiency.
References

Some documents’ title are translated into English, but whole texts are in most cases available only in Polish. In this paper not published data from Office for Competition and Consumer Protection were used.


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