

# Shadow Prices for Costs and Benefits in the Regional Development Projects

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## Abstract:

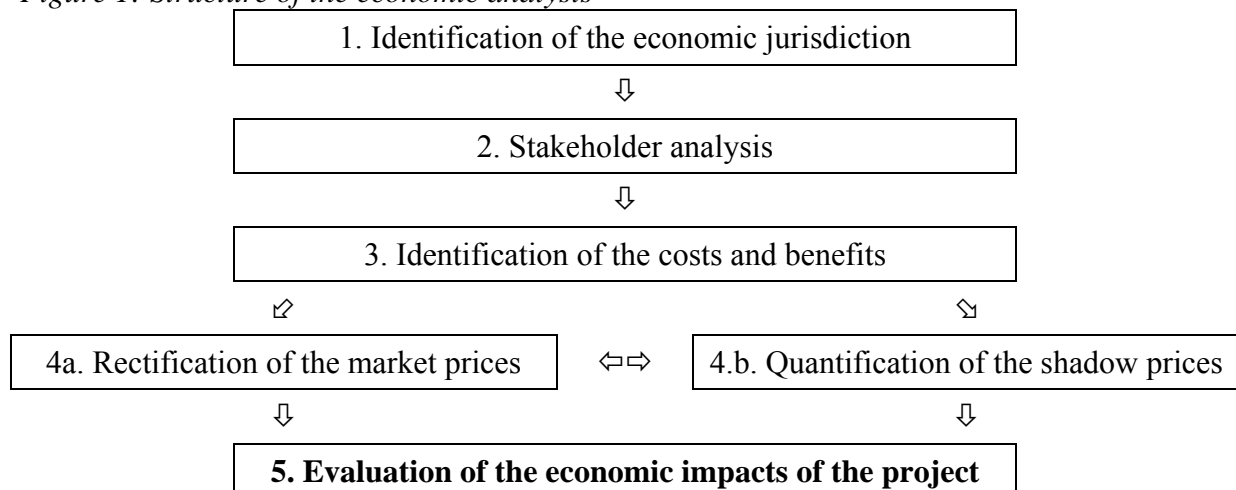
*The paper concerns the setting of the shadow-prices for the costs and benefits of the regional development projects; the cost-benefit analysis is used as the main methodological framework. The article focuses on the most typical item connected with the regional development projects – creation of the new working places (increase of employment). The variables with important impact on quantification of the costs and benefits related to the new working places are analyzed in detail – number of the net jobs created, monthly savings for 1 working place and time period of their calculation.*

**Keywords:** cost-benefit analysis, economic analysis, shadow prices for the jobs created

## Introduction

Nowadays, cost-benefit analysis is a traditional tool for the ex-ante evaluation of the regional development projects. Especially when the public money is concerned, the quantification of the impact on the society is desired. The methodology is described in detail in large number of the theoretical issues (see for example Boardman et al., 2001). Correct application of this methodology can lead to reasonable results, particularly when preparing financial analysis (analysis restricted only on the impacts on the project holder). A more tricky case is the core of the CBA represented by the economic analysis - evaluation and quantification of the impacts on the society as a whole, cost and benefits of the project. Available literature only generally recommends sensitive evaluation of all direct and indirect costs and benefits; universally applicable methodology does not exist or is not known. The basic structure of the economic analysis can be defined as followed: identification of the economic jurisdiction (area) of the project, stakeholder analysis, identification of the cost and benefits, rectification of the market prices and quantification of the shadow prices. The individual issues are resulting into the economic cash-flow of the project - basic input for the economic evaluation (analysis of the projects impact on the society).

Figure 1: Structure of the economic analysis



Economic jurisdiction of the project is defined as the limited area, where the project impacts are being considered. Enclosed area has to be in accordance with the aim of the evaluation, generally the evaluation can be undertaken on the local level (municipality), regional level, national level or ad extremis unlimited evaluation. Project evaluation has to correspond with the socioeconomic conditions of the evaluated area. The evaluation itself concerns only the cost and benefits emerging from and affecting the selected area.

Stakeholder analysis is a decision-making tool for identification and evaluation of all the subjects affected by the project realization, its use has been standardized for example in the project cycle management by the European Commission. Two types of the group of the stakeholders can be distinguished; the primary stakeholders are the subjects directly affected by the results and impacts of the project (both positive and negative ones), the secondary stakeholders are affected only indirectly, but they for example take concern in the use of resources in the region or are interested in the development. The appraisal of the impacts anticipated - identification and quantification of the projects cost and benefits is also performed in accordance with the identification of the main stakeholders

The last and the trickiest one step before the final evaluation is the rectification (adjustment) of the market prices and quantification (appraisal) of the intangible project impacts. Financial analysis is provided in the market prices of the individual inputs and outputs. These prices though not always correspond with their economic value (value of the individual items for the society), mostly because of taxes, custom charges, import or export quotas or monopolies existence. The rectification can be performed for example through the use of the so called factor of conversion defined after the character of the sector (see DG Regio, 2002), but their use during the project evaluation on the regional level is not necessary. The quantification of the intangible impacts on the stakeholders concerned is almost always required; quantification in the monetary items (shadow prices) belongs to the most important principles of the cost-benefit analysis. The realization of the regional development projects is commonly connected with the creation of the new working places, improvement of the economic situation within the region, improvement of the environment or increase of the life quality of the inhabitants.

## **Shadow prices of the cost and benefits of the new working places**

Impacts of the new working places from the realization of the regional development projects are frequently the only ones that are valued in monetary terms and get their shadow price enabling the input into the calculation of the economic cash-flow of the project and resulting in indicators. But the methodology of their valuing (setting the shadow price) is often very contradictory, its choice has an important effect on the results of the evaluation and in some cases can also lead to incorrect conclusions and decisions. Among the most important variables with the influence on the setting of the shadow prices of the new working places belong above all the following aspects:

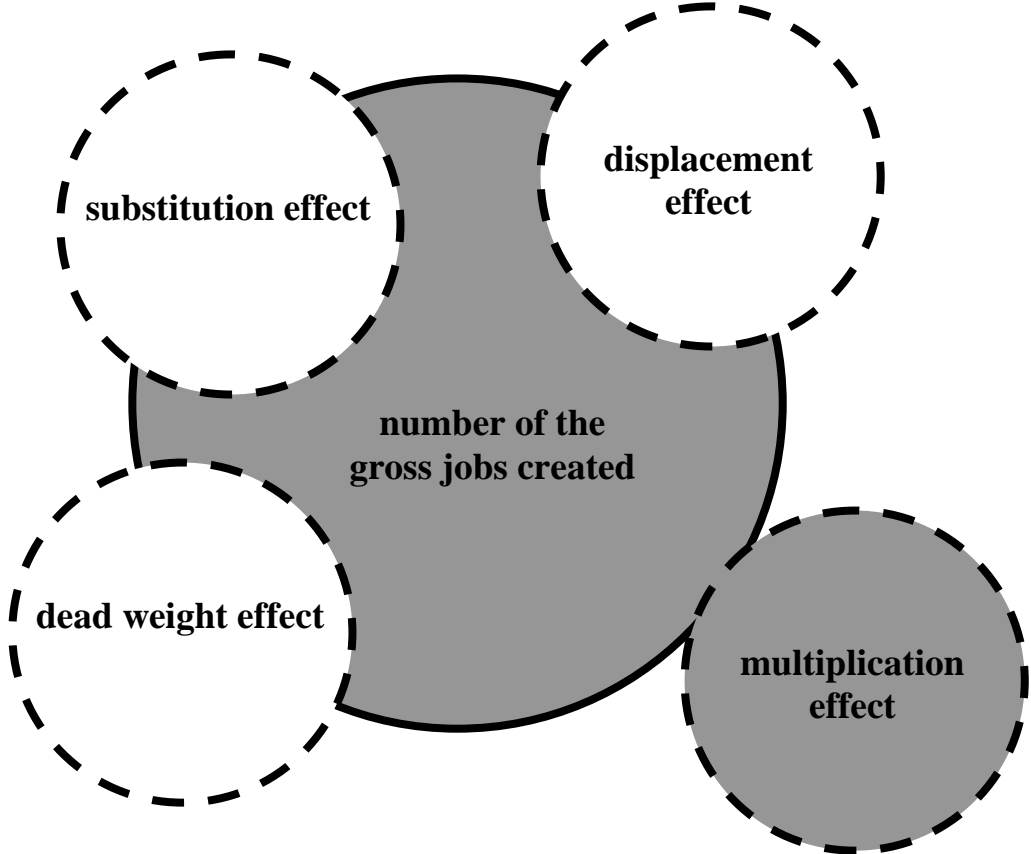
- number of the net jobs created;
- benefits from 1 net working place created;
- time period of the evaluation of the benefits from the net jobs created.

Number of the net jobs created - in the project proposal of the investment activity the number of the new jobs created or jobs necessary for the project sustainability is often indicated. This indicator should be called the gross number of the jobs created (hold down), for the economic evaluation it is necessary to convert this value into the net number of the jobs created.

Substitution effect, displacement effect, dead weight effect or multiplication effect can be mentioned as the most important effects with the influence on the conversion.

Substitution effect is negative; it covers the working places closed down by the project holder because of the realization of the project. A typical example of this is the close down of the manual working places because of the installation of the new full-automatic assembly line. The displacement effect has negative impact as well as the substitution effect. It takes into account close down of the working places elsewhere in the society. This effect is often neglected during the evaluation of the project, mostly by the intended limitation of the economic jurisdiction of the project. The last negative effect is the dead weight effect representing the jobs created by the project holder and described in the project proposal but not created independently on the project realization. Against these three negative effects there is only one positive - the multiplication effect. This effect concerns the new working places created in the economy because of the project realization, for example by the suppliers, in services, etc. The individual effects are graphically described in the scheme below (number of the net jobs created is represented by the grey area). The coefficient of conversion (size of the individual effect) depends on sector characteristic and local conditions of the project realization.

Figure 2: Effects influencing the number of the net jobs created



Source: EC, DG Regio, 1997, modified

Calculation of the benefits from the jobs created is based on the save costs method - it means on costs not spend because of the project realization. The largest recipient of these benefits is

the state, in the Czech Republic represented by the Ministry of Labor and Social Affairs (MPSV). The size of the save costs can be estimated from different points of view. First of them is the passive employment policy (PEP) represented by the social contributions, according to the data of MPSV (2005) it is about 4.500,- CZK / month (1 € = 30 CZK). More expensive is the active employment policy (AEP), the costs are estimated (based on MPSV data) at 19.000,- CZK / month. And the last items are the funds unpaid by the unemployed persons as taxes, social or health securities. These lost benefits of the state are estimated at 10.000,- CZK / month. Hence we get wide range of the benefits of the state as the important stakeholder of the project, it varies from 4.500,- CZK / month to 33.500,- CZK / month for 1 unemployed person, who gets the job. Unique result does not exist (it is dependent on the character of the working place created and former position of the new employee).

The last factor influencing the economic cash-flow connected with the creation of the new working places is the time period of the benefits calculation. The following approaches can be considered: estimated sustainability of the new working place, commitment of holding of the place (typical of the project financed by public funds), the whole time period of the project evaluation or the average time period of the unemployment in the region. Depending on the selected approach also the time period for the calculation of the benefits ranges from 6 months<sup>1</sup> to the 15, 20 or 30 years, which is the whole evaluation period by large infrastructure projects.

## **Sensitivity analysis**

The selected approaches to set the variables have been analyzed with the aim to identify their influence on CBA results. As the input model the financial cash flow of the investment project was used with following parameters: investment 10,0 mil. CZK, operating average net benefits 0,5 mil. CZK, evaluation period 15 years (in range 0-14). The model was based on the standard methodology of the European Commission for preparing CBA of investments projects<sup>2</sup>. As the first variable the impact of the time period of benefits calculation was tested. The remaining variables were on their medium values, which means: the conversion factor between the number of the net and gross<sup>3</sup> jobs created is 1,0; save costs from 1 working place are at the double size of the minimal value, i.e. 9.000,- CZK / months. Other economic costs and benefits were not considered.

The received results show high addiction of the results of the economic analysis on the time period of the benefits calculation. In the low limit (use of the shortest time period calculated, i.e. 1 year) the received results are noticeably negative (with use of discount rate 5 % values achieve -4,0 mil. CZK, i.e. negative impacts of the project on the society). In the case of maximal limit (i.e. consideration of benefits during the whole period of the project evaluation) NPV achieves the value of 5,6 mil. CZK, i.e. positive impacts of the project on society. These two completely different results were achieved by the use of the same inputs and variables; the only difference is the choice of the methodology for definition of the time period of calculation of benefits from the new working places. All results are also displayed in the graph below.

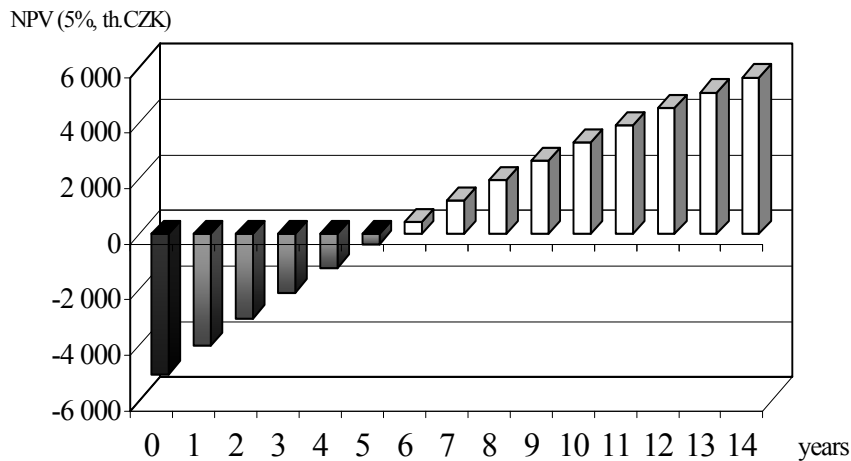
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<sup>1</sup> according to MPSV (2005) average time period of the unemployment in the Czech Republic

<sup>2</sup> European Commission, 1997

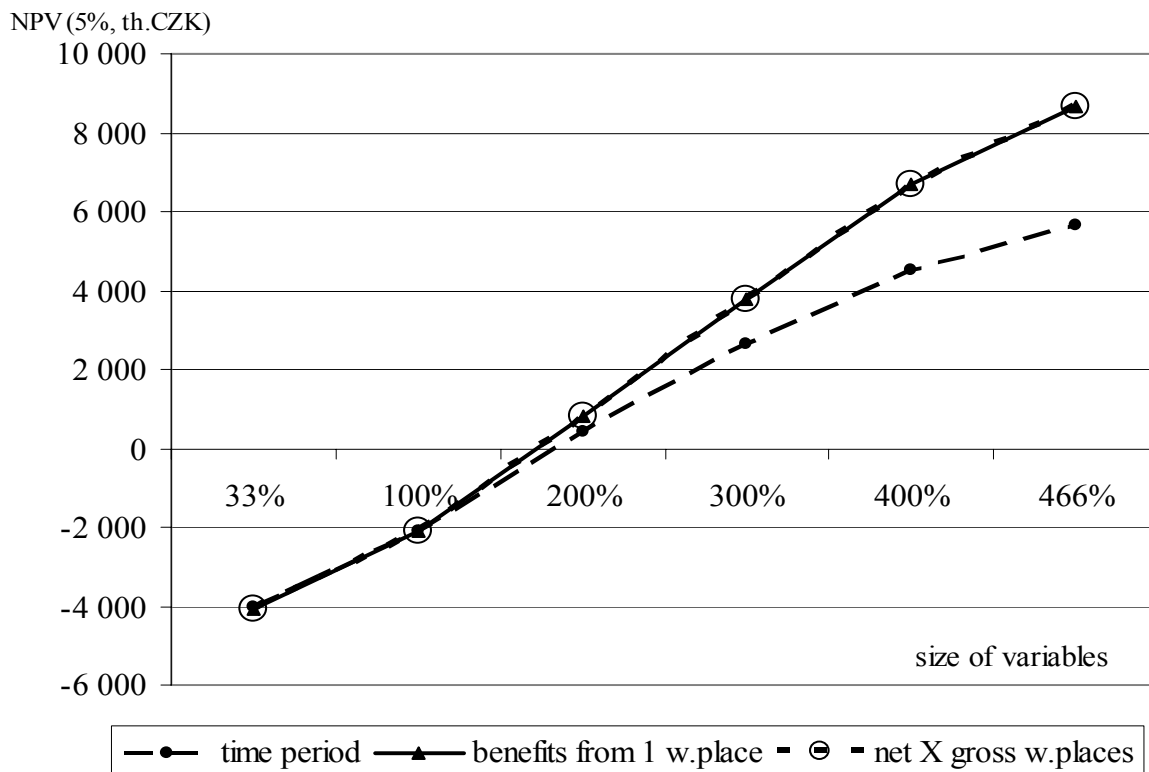
<sup>3</sup> number of the gross jobs created is defined as 1 working place for 1,0 mil. CZK of investment; i.e. 10

Figure 3: Addition of the NPV on the time period of benefits calculation



Similar approach was used when testing the remaining described variables. Individual variables were set in the range 33 - 466 % of their medium value. Influence and sensitivity of the coefficient of conversion is identical to the variable of benefits from 1 working place created; the lower sensitivity of the variable of time period of calculation of benefits is determined by the discount factor (discount factor decrease value of cash-flow emerging later in time).

Figure 4: Addition of NPV on the individual variables



Final results of prepared sensitivity analysis demonstrate high addiction of the economic analysis on size of the use variables, here in all cases (both maximum and minimum limits) was respected the methodology of the European Commission for CBA. The changes in the methodologically acceptable area lead to considerably different results and can significantly influence the decision making process based on CBA.

## **Conclusion**

Economic evaluation of the regional development projects often depends on the methodology used for quantification (setting of the shadow prices) of working places created. To the most important variables influencing this quantification belong coefficient of conversion between number of the net and gross jobs created, value of benefits from 1 working place created and time period of the benefits calculation. Achieved results of the economic analysis can be interpreted only with the connection to the pre-conditions accepted. It is necessary to prepare unified methodology defining individual variables for comparison of the results among competitive projects (in the case of limited resources).

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