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Assessment of Large-Scale Projects Based on CBA

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Abstract

CBA is a very important and strong tool for economic effectiveness evaluation of public investment projects. The outputs (NPV, IRR and BCR) are dependent on correctly set input data. As has been proved recently, an inaccuracy in forecast occurs very often. This paper deals with analysis of particular benefits, which help to create the total benefit for evaluation of road infrastructure projects and megaprojects based on CBA according to the Czech methodology. Moreover, it considers the overall inaccuracy of the project regarding the partial inaccuracies and their shares.

Monte Carlo simulation has been applied in order to determine the share of particular benefits and the closest similar probability distribution of these shares to the total benefit of the project. Research results have confirmed that the largest share and the most severe inaccuracy in the total benefit is represented by savings in travel time costs. They have revealed that the share of this benefit has the logistic probability distribution with mean of about 77% and 20.72% of standard deviation. The inaccuracies of the particular benefits have been studied in international research. As a result, very large differences were found. That means that there is still a large space for exploration.

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1. Introduction

The large-scale transport infrastructure projects and megaprojects are typical public projects which are financed from public financial resources. According to the fact that public financial resources are scarce, the relevant decision-making technique tries to find out which methods are able to calculate and determine economic efficiency of these projects more accurately. For the choice of the most effective projects the basic methodological foundation is the CBA (cost-benefit analysis). This method is based on the creation of NCF as the difference between zero (the infrastructure without project) and investment (the infrastructure with project) variant of project. NCF of both variants consists of total agency costs and total benefits of the project. The total benefit is the sum of particular benefits which are in the Czech Republic created on the basis of the Instruction of Road and Motorway Directorate of the Czech Republic¹. The analysis has been performed on the sample of 27 Czech large-scale transport infrastructure projects processed during 2013-2015 period and other international scientific resources.

All of these benefits consist of many particular variables, which are related to the technical data gained from the traffic models and their unit prices. As every model which consists of so many variables predicted is followed by an inaccuracy, this phenomenon occurs in this case as well. Not only optimism bias, but also other factors play their role. As a result, every partial benefit produces its volume of imprecision and altogether they cause total difference from the ex-post values.

The aim of this paper is to perform detailed analysis of the shares of partial benefits discussed above in project total benefit and then to use these values as weights for estimation of the possible total inaccuracy of the ex-ante appraisal of the transport infrastructure project.

The paper is structured as follows: firstly, review of the literature dealing with the issue of transport infrastructure projects, their impacts and effectiveness is presented. Then, methodology employed in the research is explained. Consequently, results are presented, discussed and compared with other studies where applicable. Finally, the main findings and the outline of future research directions are provided.

2. Literature Review

The evaluation of transport projects has a long history, but there is no universal method that is collectively agreed upon. There are many differences between countries regarding the scope and method of evaluation on actual decision-making². The time and international comparison showed which methods are suitable and what weak points they have. In the course of years, CBA is not the only tool used for the ex-ante evaluation of transport infrastructure projects, but it is one of the most common methods to be used together with MCA (Multi-criteria analysis) in the European Union countries³ as well as in countries outside the Europe such as the USA or Japan, to name a few. Methods differ in each country due to their development of the theory and application but they have a lot in common⁴.

An increasing number of studies have demonstrated that the economic evaluation of transport infrastructure projects via CBA has the largest explanatory power^{5,6,7,8,9,10}. As can be seen in Fig. 1, for road projects, the CBA is not the only method of appraisal, but definitely the most widely spread one, in some cases combined with MCA or other quantitative methods^{12,13}. Countries concerned in Fig. 1 are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Netherlands, Sweden, Switzerland, the UK, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, Slovenia, Cyprus, Greece, Italy, Malta, Portugal and Spain.

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