www.dagliano.unimi.it

CENTRO STUDI LUCA D'AGLIANO

DEVELOPMENT STUDIES WORKING PAPERS

N. 181

December 2003

Cost-benefit Analysis of Infrastructure Projects in an Enlarged European Union: an Incentive-Oriented Approach

*Massimo Florio**
*Silvia Vignetti***

*University of Milan
**CSIL-Centro Studi Industria Leggera

Cost-benefit analysis of infrastructure projects in an enlarged European Union: an incentive-oriented approach

Massimo Florio
Dipartimento di Economia Politica e Aziendale
Università degli Studi di Milano
Via Mercalli 23
20122 Milano
Massimo.Florio@unimi.it

Silvia Vignetti
CSIL-Centro Studi Industria Leggera
Corso Monforte 15
20122 Milano
vignetti@csilmilano.it

May 2003
Draft-comments are welcome

Keywords: Cost-benefit analysis, Project Evaluation, Structural Funds, European Regional Policy
JEL Numbers: D61, H43, R58

ABSTRACT

The purpose of the paper is to analyse some results of cost-benefit analysis in a sample of ISPA (*Structural Instrument for pre-accession countries*) projects. The focus is particularly on the variability of financial and economic rates of return and how to integrate this information in the EU co-financing mechanism. We investigate, through the analysis of variance of co-financing rate, to which extent variability of rates is due to structural characteristics (sectors, countries) or to the existence of a residual variance due both to specificity of the project and discretional element of the appraisal method, which may constitute an information noise. We find that the variance of co-financing rate across countries is poorly explained by different composition of sectors of investment. This suggests the need to reinforce a more consistent approach to evaluation and co-financing. We suggest some possible solutions.

ACKNOWLEDGEMENTS

Paper presented at the Fifth European Conference On Evaluation of The Structural Funds - Budapest, 26/27 June 2003. The authors are particularly grateful for lively discussions with A.Bougas, A. Mairate, J.C. Blain, Evaluation Unit, DG Regional Policy, European Commission. However any view expressed here is the sole responsibility of the authors and do not involve the EC or any other third party. A previous related paper has been presented at the conference 'Evaluation and EU Regional Policy: New Questions and New Challenges', Aix-en-Provence, France 31st May and 1st June 2002.

Cost-benefit analysis of infrastructure projects in an enlarged European Union: an incentive-oriented approach

INTRODUCTION

With the new programming period 2000-2006 for EU Structural Funds, evaluation becomes an integral part of the planning activity. New methodological approaches and innovative ways of improving evaluation strategies for regional policy has been developed and need to be discussed and tested.

The purpose of the paper is to analyse some results of financial and economic analysis in a sample of ISPA (*Structural Instrument for pre-accession countries*) projects. The focus is on the variability of financial and economic rates of return and how to integrate this information in the EU co-financing mechanism. The main aim is to investigate, through statistical distribution of co-financing rate, to which extent variability of rates is due to structural characteristics (sectors, countries) or to the existence of a residual variance due both to specificity of the project and discretional element of the appraisal method, which may constitute an information noise. The basic idea, derived from a previous paper presented in Edinburgh Evaluation Conference[1], is to consider project rates of return as signals for decision making, determined by unknown variables, including true structural parameters and measurement errors. We apply this idea to ISPA projects and show how to use our approach for a better incentive structure of co-financing.

The paper developes an approach based on an empirical analysis of a database of about 240 projects. This empirical approach is based on a statistical analysis of expected project returns, and observation of average values and variance of the distribution of co-financing rate.

The main result of the paper shows that the variation among co-financing rate is probably excessive and not justified by variations of expected returns among sectors or EU countries or ISPA countries. Some recommendations about improvements in the co-financing decision will be given.

The paper has the following structure. First we briefly cite the context of EU Regional Policy through the Structural Funds and the debate on its impact. Second, we mention some issues in cost benefit analysis in this framework. Third, we present the specific aims and regulations of ISPA projects, and the co-financing mechanism. Fourth, we present our database on ISPA projects approved in 2000-2002. Fifth, we test our data by simple statistical techinques in order to see the possible origins of observed variance in some ex ante evaluation results. The paper is concluded by suggestions for improvements of the Commission approach to project appraisal and co-financing.

1. BACKGROUND

The “Agenda 2000” of the European Union commits substantial financial resources to Regional Policy for the programming period 2000-2006. Structural convergence is an ambitious objective and it depends, at least

[1] M. Florio, *An International comparison of the financial and economic rate o return of development projects*, Fourth Conference on evaluation of the Structural Funds, Edinburgh, 18-19 September 2000.

partially, upon effectiveness and efficiency in the use of instruments available in the new programming period: Structural Funds, Cohesion Fund and, in the perspective of enlargement, ISPA, among others.

The current debate concentrates on the long-term sustainability of the Structural Policy of the European Union and its effectiveness with regards also to the enlargement process. Different opinions on more or less radical reforms of European interventions have been expressed on these issues[2]. Academic literature not always agrees with the optimistic Commission expectations: for the Commission's approach see European Commission (2003). For a critical view see for example Boldrin and Canova (2003).

Among the main points raised by this debate about EU regional policy, there is the need to improve evaluation and projects selection. The new Regulations have tried to strengthen this perspective. In this paper we focus on cost-benefit analysis (CBA).

CBA is explicitly required by new Structural Funds Regulation (Reg. 1260/99), Cohesion Fund (Reg. 1264/99) and ISPA (Reg. 1267/99), for projects with a budget, respectively, of more than 50 Meuro, 10 Meuro and 5 Meuro. Regulations state that Member States have the responsibility for prior appraisal, while the Commission must verify that information provided in the appraisal are exhaustive so to allow project selection and determination of the co-financing rate. This responsibility requires the Commission to develop specific technical skills in cost-benefit analysis. Moreover it is necessary that project proposer know the criteria on the basis of which significant decisions will be taken by the Commission. Project proposers should know which are the strategic information, focus on them, and improve the project's chance of success.

Recently the European Commission, DG Regional Policy, has started a review of some aspects of project appraisal in the context of EU Regional Policy. We have been involved in the process, and this paper reflects our own experience and personal thinking on it. A new guide for project appraisal has been prepared, see European Commission (2001)[3].

A specific task of the review was to identify a standard methodology to be applied to the appraisal processes among different Funds, Geographical units, other Commission services, sectors of intervention, member states and accession candidates. The main task was to provide a simple set of rules in order to ensure some homogeneity and consistency in project selection process (about methodological issues in the use of Structural Funds). In fact, from the analysis of a sample of projects proposed in this last programming period a strong heterogeneity in the appraisal methodology by the Member States agencies had been noticed (see the discussion in Florio, 1997 and Florio, 2002).

This paper wishes to clarify some aspects of the debate on project appraisal in the context of EU Regional Policy, with special reference to co-financing decisions.

---

[2] On the effects of EU Regional Policy on the its convergence outcome, see in particular Armstrong (1996), Begg (1999), Bradley (1995), Fayolle and Lecuyer (2000), Lolos (2001), Pereira (1997). On impacts of EU Regional policy and effects of Structural Funds reforms on accession countries see Fayolle (1998), Nicolaides (1999), Swinnen (2001), Welfens (1999).
Empirical evidence, moreover, would suggest contrasting conclusions: together with clear cases of success, like Ireland (see, for example, Barry, 1999, Barry, Bradley, and Hannan, 2001 and Payne, Mokken and Stokman 1997), there are less positive experiences, like the Mezzogiorno in Italy. For other country or region case studies see e.g. Bristow, Blewitt, (2001) for Wales, Dauce (1998) for Bourgogne, Lolos and Zonzilos (1994) for Greece.

[3] Previous editions were Guide to cost-benefit analysis of major projects in the context of EC Regional Policy, 1994 and 1997.

2. COST BENEFIT ANALYSIS (CBA) ISSUES

Investment projects co-financed by the Structural Fund (SF), the Cohesion Fund (CF) and ISPA are among the implementation tools for EU regional policies. According to EU Regulations infrastructural and productive investments may be financed by one or more of the Community's financial tools: mainly grants (SF, CF, but also repayable aid for the ISPA), loans and other financial tools (European Investment Bank, Investment Fund). According to the SF reg. 1260/1999, art. 26, CF Reg. 1265/1999, art. 1 and ISPA Reg. 1267/1999, Annex II (C), the Commission is responsible for the prior appraisal of major projects on the basis of information given by the proposer.

Community regulations indicate which information must be contained in the application form for the purposes of an effective evaluation on the part of the Commission. Article 26 of reg. 1260/99, for co-financing of major projects, asks for:

- a cost-benefit analysis,
- a risk analysis,
- an evaluation of the environmental impact (and the application of the Polluter Pays Principle),
- the assessment of impact on equal opportunities and on employment.

Regulation for the Cohesion fund and the ISPA, in addition to stating that the proposals for co-financing must contain a cost-benefit analysis, a risk analysis and a detailed indication of the alternatives rejected, also provide some indications of the criteria to be applied in order to ensure the quality of the evaluation: in the case of environmental projects a cost-benefit analysis supplemented by other evaluation methods, possibly of a quantitative nature such as a multicriteria analysis and the consideration of the Polluter Pays Principle (see art. 10 (5), Reg. 1164/94 and the Council's amendments). Other information that should be provided in the request for financing from the CF are: an evaluation of the direct and indirect effects on employment; an indication of the contribution of the project to European policies related to the environment and to trans-European transport networks; a "financial plan that includes, wherever possible, information about the economic viability of the project" (see art. 10 (4), reg. 1164/94).

Given the heterogeneity of projects presented by member states to the EC for the co-financing both in terms of budget, sectors and countries, final results of cost-benefits analysis can strongly vary for different criteria and methods of analysis. This can affect consistency of co-financing decisions and projects comparability. CBA, in fact, on the basis of the calculation of some summary performance indicators, allows the comparison of interventions performances in different sectors, countries, and institutions. But, in order to achieve consistent and comparable results from this exercise, which could be very useful in order to stress strengths or weaknesses in the programming process, a common methodological basis is needed. CBA *per se* may be more or less ingenuous and in-depth, but without coherent rules it cannot deliver a smooth and fair decision process. We list below some of the issues that may contribute to lack of consistency in project appraisal.

Tab 1. shows the results of a previous survey on projects of the 1994-1999, along a number of typical items of CBA. The analysis was done by a team of independent experts (lead by M. Florio) on a sample of projects (ERDF and Cohesion Fund) of the previous programming period (200 projects in 1989-93, other 200 in 1994-1999) and it stressed some crucial issues. The table reveals that in the previous project vintages there

was large room for improvement in the quality of CBA and that there were also substantial differences between the European Regional Development Fund and Cohesion Fund project, reflecting different institutional features of these instruments.

Tab. 1. Overall assessment of CBA quality. Percentage on the total number of evaluated projects. Scores.

Analysis	Cohesion Fund 1993-1996			ERDF 1994-1999		
	Scores (*)					
	1	2	3	1	2	3
Financial planning	7.5	1.1	91.4	21.5	7.5	71.0
Financial rate of return	15.1	0.0	84.9	23.4	16.8	59.8
Forecast of changes of relative prices	14.0	29.0	57.0	8.4	26.2	65.4
Overall methodology for financial analysis	6.5	7.5	86.0	19.6	24.3	56.1
Economic rate of return	67.7	16.1	16.1	36.4	4.7	58.9
Estimates of the shadow prices	16.1	58.1	25.8	17.8	18.7	63.5
Evaluation of externalities	11.8	54.8	33.4	1.9	33.6	64.5
Overall methodology for CBA	20.4	53.8	25.8	4.7	35.5	59.8
Sensitivity analysis	15.1	40.9	44.0	14.0	18.7	67.3
Risk analysis	0.0	0.0	100.0	0.0	0.0	100.0
Analysis	Total sample 2nd generation			Total sample 1st generation		
	Scores (*)					
	1	2	3	1	2	3
Financial planning	15.0	4.5	80.5	45.5	19.5	35.0
Financial rate of return	19.5	9.0	71.5	10.0	15.5	74.5
Forecast of changes of relative prices	11.0	27.5	61.5	1.5	8.5	90.0
Overall methodology for financial analysis	13.5	16.5	70.0	5.5	13.0	81.5
Economic rate of return	51.0	10.0	39.0	34.5	13.5	52.0
Estimates of the shadow prices	17.0	37.0	46.0	17.0	29.0	54.0
Evaluation of externalities	6.5	43.5	50.0	4.5	7.5	88.0
Overall methodology for CBA	12.0	44.0	44.0	21.5	24.0	54.5
Sensitivity analysis	14.5	29.0	56.5	9.5	28.5	62.0
Risk analysis	0.0	0.0	100.0	6.0	2.0	92.0

(*) 1=Existing and adequate;

2=Existing but not completely adequate;

3=Not existing or inadequate;

Source: M. Florio, "An international Comparison of the Financial and Economic Rate of Return of Development Projects", DEPA Working Paper, 99.06-dicembre.

In other previous project surveys we have focussed on the comparison of the rates of return in the different sectors and institutions (EBRD - European Bank for Reconstruction and Development; World Bank, and other EU projects), see Florio 1999. We find substantial room for improvement of consistency in these international organizations as well.

Performance indicators collected for a large sample of project can be analysed with the aim to:

- obtain a set of benchmarks for comparability across countries and sectors;
- identify the main differences in methodology and approach in order to fix a set of CBA rules;
- improve the quality of proposals among sectors and countries, and make the selection process and the determination of co-financing rate more transparent.

These previous surveys and our own new findings, stress that the new 2000-2006 project vintage shows clear improvement in the quality of analysis as compared with the previous exercises. However, there still are some key issues in project analysis that need to be addressed. These include:

a) time horizon;

b) residual value at end year;

c) determination of the total cost of investment (depreciation, "replacement cost" reserves, "contingency" reserves);

d) financial discount rate;

e) social discount rate;

f) calculation of performance indicators;

g) determination of the co-financing rate.

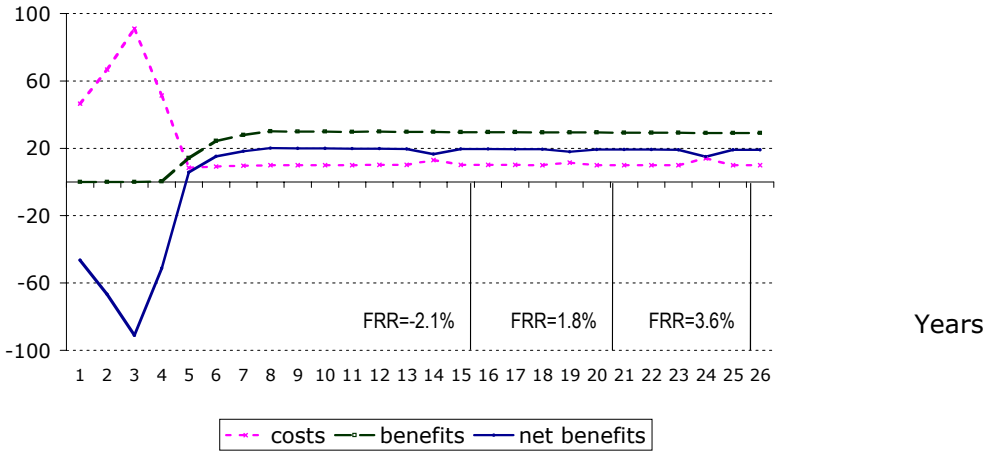
We turn now to briefly discuss these key issues in cost-benefit analysis of infrastructure projects.

a). Time horizon

Time horizon is the maximum number of years for which forecasts are provided. The number of year usually reflects the lifetime of the investment and project cycle. After that period of time project activity is (usually only fictitiously) expected to stop and the investment sold out. However, time horizon of an investment could be virtually indefinite. It is just a matter of convenience to forecast a final year when assets and liabilities are simultaneously liquidated.

In practice, there are often excessive variations in the determination of the time horizon across similar projects[4]. The choice of time horizon can seriously affect the results of the appraisal process (See Graph 1 where we show an example, for a specific project, of different time horizons and calculation of the rate of return).

Graph. 1. Different time horizon for the calculation of the financial rate of return (thousand of Euro)



[4] Lifetime of investments is duly considered in the Funds Guidelines. For the CF the Guidelines say: "The lifetime varies according to the nature of the investments: it is longer for civil engineering works (30-40 years) than for technical installations (10-15 years). In the case of a mixed investment comprising civil engineering works and installations, the lifetime of the investment may be fixed on the basis of the lifetime of the principal infrastructure (in this case investment in the renewal of infrastructure with a shorter lifetime must be included in the analysis). The lifetime may also be determined by considerations of a legal or administrative nature: for example the duration of the concession where a concession has been granted".

For the ISPA Fund the Guidelines say: "infrastructure projects are generally appraised over a period of 20-30 years, which represents a rough estimate of their economic life span. Although the physical assets may last significantly longer than this – e.g. a bridge may last for 100 years - it is not generally worthwhile trying to forecast over longer periods. In the case of assets with a very long life, a residual value may be added at the end of the appraisal period to reflect their potential resale value or continuing use value".

The problem could be solved as follows:
- by asking the proposer to include always their best estimate of the residual value at final year (see below);
- by suggesting a standard time horizon.

Theoretically residual value should be expressed as the discounted sum of future forecasted flows over time horizon to infinity. This is often unpredictable. Usually for public work or industrial activity usually it is used the average physical lifetime value of stock of fixed capital (buildings, machinery, equipment).

For the standard time horizon there are in turn two possibilities:
- either to ask the significant tables to be computed for a fixed number of years;
- or to allow for some flexibility according to the kind of project, in order to consider the different life of service of the main assets, so the standard grid for time horizon should be differentiated by sectors, and based on some accepted international practice: for example the one suggested in the new Guide.

The new Guide proposes a sectoral grid. Project proposers are expected to follow the proposed time horizon, or to give evidence for a different choice. Nevertheless the Member States could indicate which are their standard practices and establish standard criteria for the projects of the same nature for national purposes.

b) Residual value at end year

Among revenue items at the last year considered by CBA there is the residual value of the project. Residual value should be understood as the market value for the fixed assets (or liquidation value of assets in the case they are sold out at end year) and includes the appraisal of the net revenues the project can generate beyond time horizon, before any substantial revamping or replacement of the old investment.

Omitting this value, as sometimes happens, is a serious mistake that may artificially depress the project returns. Infact the present value of net revenues with this value would be higher than the rate without the value. Even if the project would not be really liquidated at end year, project analysis considers as the end of the project cycle coincides with the liquidation of residual investments.

The residual value at end year must be included as follows:
- the residual market value for fixed assets, as if they should be sold out at the end year of time horizon (including the stream of future net income generated by the project);
- the residual value for any other current assets or liability.

In other words, the residual value is the liquidation value of the project and not its perpetual value[5]. The discounted value of every net future revenue after the time horizon should be included in the residual value.

c) Determination of the total cost of the project

The cost of a project is given by the sum of investment and operating costs. The total cost of the project is used by the Commission services to calculate the co-financing rate (see below) which is applied to eligible costs of investment.

The difference between eligible costs (on the amount of which the co-financing rate is calculated) and the total costs are:

[5] The CF Guidelines rightly say: "If it is considered that an investment has a residual value at the end of the selected period, this value must be taken into account, provided that it represents revenue for the owner (from the sale of the asset or its use during a period following the period used for the financial analysis)".

- land purchase expenditure;
- payment of VAT;
- expenses borne before the application presentation;
- related work or connected expenses.

The international methodology for financial analysis of projects is made on a discounted cash flow basis (DCF). According to this approach all items that do not give rise to an effective monetary expenditure must be excluded, even if they are items normally included in company accounting (Balance Sheet and Profit and Loss Account). In particular the following item sometimes found in project proposed for EU co-financing are not consistent with the DCF methods:

- depreciation;
- reserves for future replacement costs;
- contingency reserves.

Depreciation cannot be included in cost items[6], otherwise the investment costs of physical assets is double counted, once at the beginning of activity when investments are paid and a second time during the period of project life cycle. Investment costs are included as outflows only when they are really paid, that means when there is a monetary outflow. In this case co-financing rate would be artificially augmented.

Occasionally some replacement costs appears in some projects. Replacement cost is the cost paid for the replacement of some physical assets after its life cycle. This cost usually is financed by writing in the accounts the constitution of a reserve year after year until the real cost is paid. If the reserve appears among outflows this is an unduly anticipation of future costs and in the logic of discounting this lowers enormously the projects returns. Only an actual forecasted flow for a future replacement, for example for short-life equipment, should be considered in the outflows.

Contingencies reserves are constituted as a guarantee for eventual future risk. From a sample of project examined these costs vary from 0% to 20% of the total cost of investments, with an average value of 6%.

For the same reasons of replacement costs, contingency reserves, as unexpected events, are best treated in risk analysis: as they are not cash outflows, they have not to be included as cost items[7].

d) Financial discount rate

The discounting process allows to sum financial flows occurring at different years. It is used to give a present value to future ones and to calculate the net present value of the sum of the balance of cash flows. A problem we have observed is that quite often project proposals lack an appropriate distinction between financial and economic discount rate.

The rate at which future financial values are discounted to the present is usually roughly equal to the opportunity cost of capital. It should reflect the preference for the present compared to future financial flows.

In this view it could be consistent to have different financial discount rate in different countries, reflecting different opportunity cost of capital in different financial markets. Infact the sample of projects examined shows a range of discount rates, from a minimum value of 3% to a maximum of 11%, with an average value

[6] About depreciation the CF Guidelines, annex D, point 2.1. says clearly: "depreciation need not to be taken into account".

[7] However this point is rather controversial, because in practice project proposers were allowed to include replacement costs and contingency reserves in their cost forecasts.

of 5%. Nevertheless this could affect the calculation of the net present value (NPV, which is one of the most crucial performance indicator).

In order to achieve consistency there are two pathways:

- the standard practice worldwide is to take the return on Government bonds as a minimum benchmark. For investment in public sector it would be safe to use the real interest rate on public bonds of maturity equivalent to the project horizon. This solution will lead to different financial discount rate for each country, but based on the same calculation rule.
- An alternative solution would be to consider the real interest rate of a prime lender, e.g. EIB 'European Investment Bank' bond denominated in Euro, of equivalent maturity of the project horizon. In this case opportunity cost of capital is assumed to be the same in the public sector in the European Union.

The final solution was based on a mix of the two mentioned approaches. The CF Guide says: "in practice and under the current conditions this rate ranges from 6% to 8% at real prices".

In the new Guide a standard 6% has been suggested as standard financial discount rate.

e) Social discount rate

Social discount rate is used for discounting in the economic analysis. It reflects the view on how future social benefits and costs should be valued when compared with present ones. For this reason theoretically a social discount rate determined country by country should better reflect this view.

As for the financial discount rate also for the social discount rate there are three alternatives:

- to use the real financial rate of return, supposing that the marginal public investment should have the same return as the private one;
- to use a formula based on the long term growth rate of the economy ;
- to use a standard conventional cut-off rate (World Bank and EBRD use a quite high real 10% required rate of return).

For social discount rate it is even more difficult to fix a standard benchmark across Europe, and this is not the place to discuss in detail this point. However a 5-6% rate, seems to be, under present circumstances, a reasonable compromise among the three approaches (taking 3-10% as extreme boundaries of a likely range). However, in specific cases, the project proposer may wish to justify a different value.

f) Calculation of performance indicators

The financial internal rate of return is the value that zeros out the financial net present value of the investment, and could be considered as the maximum value the interest rate could assume without making the investment a net loss compared to an alternative use of capital. Under a specific value of FRR taken as a benchmark, the investment should be considered not suitable.

The financial internal rate of return is in practice the solution for FRR in the equation below:

$$NPV\ (S) = \Sigma\ S_t / (1+FRR)^t = 0$$

The FRR should be calculated both for the investment and for the own capital.

The financial investment return (FRR/C) is the capacity of operating net revenues to sustain the investment costs regardless the way in which they are financed. It is calculated considering total costs of investments as outflow and revenues generated by the project as inflow. It evaluates the overall financial profitability of the

project or, as more often it will be the case, the net cost for public finance when project revenues are zero or insufficient.

The financial return on equity capital (FRR/K) gives the rate of return of the project considering its financial burden, regardless the investment cost. In this case the outflows are own capital of private investor (when it is paid up), national contributions (local, regional and central levels), financial loan at the time they are paid back, in addition to operating costs and related interest, and inflows are revenues generated by the project.

Tab.2. Example of the table for the calculation of FRR/C

	YEARS									
	1	2	3	4	5	6	7	8	9	10
Sales										
Residual value										
Total revenues										
Total operating costs										
Total investment costs										
Total expenditures										
Net cash flow										
Financial internal rate of return (FRR/C) of the investment										
Financial net present value (FNPV/C) of the investment										

Tab.3. Example of the table for the calculation of FRR/K

	YEARS									
	1	2	3	4	5	6	7	8	9	10
Sales										
Residual value										
Total revenues										
Total operating costs										
Interests										
Loans reimbursement										
Private equity										
Total national aid										
Total expenditures										
Net cash flow										
Financial internal rate of return (FRR/K) of own capital										
Financial net present value (FNPV/K) of own capital										

The internal rate of return calculated in the economic analysis (the value that zeroes out the economic net present value of the investment, is the economic internal rate of return (ERR).

The difference between ERR and FRR (both of investment and own capital) is that the former uses accounting prices or the opportunity cost of goods and services instead of distorted market prices, and it includes as far as possible any social and environmental externalities. This distinction would be kept in mind in the following discussion.

3. THE ISPA PROJECTS CASE STUDY

Average GDP per capita in Central and Eastern Europe (CEE) is still much below than that of the Member States. More than 93% of population in CEE countries is living in regions with a per capita GDP below the 75% of the enlarged Union average.

Pre-accession strategy implemented by Structural Policies in 2000-2006 aims at:

- establishing a comprehensive accompanying strategy;

- creating a unique mechanism of intervention that includes all the different forms of EU aid (*Accession Partnership*);
- Familiarising accession countries with the policies and procedures of the Union to take actively part to the programmes and interact with EU legislation.

Pre-accession instruments include:

- Phare (whose objective is the consolidation of institutions in the accession countries, participation to EU programs, social and regional development, industrial reorganisation and SMEs development);
- Sapard (agricultural modernisation and rural development promotion);
- Ispa (supporting transport and environmental protection measures).

Financial endowment for years 2000-2006 is Euro 21,84 billions, distributed as shown in Tab. 4.

Tab.4 Breakdown of financial resources by year and instrument - Euro millions, 1999 prices.

	2000	2001	2002	2003	2004	2005	2006	Total
Phare	1560	1560	1560	1560	1560	1560	1560	10920
Sapard	520	520	520	520	520	520	520	3640
Ispa	1040	1040	1040	1040	1040	1040	1040	7280
Total	3120	3120	3120	3120	3120	3120	3120	21840

Source: European Commission, 2000.

Ispa Fund is the most important for infrastructural investments. Ispa financial resources are divided according to a minimum and maximum amount for each country, which can be adjusted according to progresses in the measures' implementation.

Tab.5 Breakdown of Ispa budget by countries.

Country	Range
Bulgaria	8.0% - 12.0%
Czech Republic	5.5% - 8.0%
Estonia	2.0% - 3.5%
Hungary	7.0% - 10.0%
Latvia	3.5% - 5.5%
Lithuania	4.0% - 6.0%
Poland	30.0% - 37.0%
Romania	20.0% - 26.0%
Slovakia	3.5% - 5.5%
Slovenia	1.0% - 2.0%

Source: European Commission, Official Journal L72, 21 March 2000, p. 21

For the period 2000-2002 more than 249 projects[8] have been funded for a total co-funding of Euro 5648 millions and a total eligible cost of investments of more than Euro 8700 millions. These amount represents more than 73% of the total ISPA budget announced for years 2000-2006.

[8] See the website: http://www.inforegio.cec.eu.int/wbpro/ispa/projec_en.htm

Tab. 6 Funding decided in 2000 and 2001 by country

Country	N. of projects	EU funding € million	Projects financed in 2001
Bulgaria.	9	349.6	Construction of regional wastewater treatment plants and the electrification of railway networks.
Czech Republic	14	171.4	Construction of roads, regional drinking and wastewater treatment plants and the decentralisation of the management system.
Estonia	14	82.4	Construction of roads, sewerage system upgrading, regional waste treatment plants and technical assistance
Hungary	23	337.1	Regional waste management, the rehabilitation of railway lines, a regional sewerage and sewage treatment programme, the preparation for implementing EU urban wastewater directives and technical assistance.
Latvia.	17	219.7	Waste management, road construction, modernisation of railway systems and technical assistance
Lithuania	16	143.6	Modernisation of telecommunications, the development of regional waste management systems and technical assistance.
Poland	35	1,402	Construction of sewage treatment plants, preparation and upgrading of railways, motorway construction, urban and municipal water and wastewater projects and technical assistance.
Romania	22	1,014.2	Construction and rehabilitation of regional wastewater treatment plants, road and motorway construction and technical assistance.
Slovak Republic	10	172.5	Upgrading and extension of regional wastewater treatment, motorway construction, modernisation of railway networks, and technical assistance.
Slovenia	9	45	Construction of regional water supply and wastewater treatment plants and the modernisation of a railway line

Fonte: http://europa.eu.int/rapid/start/cgi/guestfr.ksh?p_action.gettxt=gt&doc=IP/02/253|0|RAPID&lg=EN&display.

The main beneficiaries of the total estimated EU contribution for projects signed in 2000-02 are Poand (37%) and Romania (21%). All the other countries have a share of contribution between 10% (Hungary) and 1% (Slovenia).

The Ispa approach is quite similar to that of the Cohesion Fund and co-finances projects or groups of projects. Its priorities are:

- Familiarising them with the policies and procedures of the European Union
- Helping them catch up with EU environmental standards
- Expanding and linking with the trans-European transport networks

Ispa regulation states that projects applications must contain, besides basic information about the project (name of the responsible body, nature of the measure, a brief description, cost and localisation, implementation timesheet):

- A cost benefit analysis which includes direct and indirect employment effects, quantified, if possible, and the explicit indication of internal rate of return, net present value and cost/benefit ratio;
- Indication of environmental impact;
- Information on consistency with antitrust legislation;
- A financial sheet with clear indication of requested co-funding and other possible public funds (Ebrd, World Bank);
- Other information on consistency with EU and national legislation.

Methodologies and procedures to be followed for ex-post evaluation and monitoring are described in Annex IV of Ispa Regulation (EC Reg.1267/1999).

Selection and financial procedures is similar for all the projects. State proposer must provide all the significant information in order to enable the Commission to make the ex ante appraisal. The State proposes the project through the National Ispa Co-ordinator. Applications are examined by Ispa directorate of DG Regio. EU Commission could ask for additional information on specific issues, if provided information are

not sufficient to express an opinion. The final decision is the result of a strict dialogue with the proposer. When the project is acceptable it is submitted to the Management Committee, made up of representants of all Member States. After the favourable advice of the Management Committee the EU Commission adopts the project undersigning, together with the Candidate Country, the Financing Memorandum.

The co-financing rate is the percentage of investment costs to be covered by EU grant. When a project is proposed to the European Commission for co-financing the final decision by the Commission is about the co-financing rate to be applied. The way the investment project co-financing rate is determined by the EC is the subject of some debate. The new Regulations, while fixing a maximum co-financing rate, (see tab. 7) explicitly ask the Commission to determine the actual rate taking into account:

- the existence of project revenues;
- the polluter-pays-principle.

Tab. 7 Ceilings for the co-financing rate as from the Regulation[9]

Structural Funds	
Types of region/country	Max co-financing rate % of total eligible costs
Ob. 1	75
Ob. 1 + Cohesion Fund	80
Ob. 1 + Cohesion Fund /region ultra peripheral	85
Ob. 2 e 3	50
Cohesion Fund	
Cohesion Fund Country	80-85
Ispa	
Ispa Country	75-85 in exceptional cases

Fonte: Structural Fund Reg. 1260/1999, Cohesion Fund Reg. 1265/1999, Ispa Reg. 1267/1999.

There is no obligation for the Commission to disburse the maximum rate of co-financing; nevertheless it is necessary to determine a clear methodology to calculate the rate to be applied. CF Guidelines say:

> "The rate of assistance from the Cohesion Fund to the project will not exceed the ratio between the equity gap and the investment or the rate laid down in the Regulation, whichever is the lowest. The rate will be fixed in the light of the characteristics of the project and with particular attention to the results of the economic analysis, the need to maximise the multiplier effect and the application of the polluter-pays principle. The rate will be fixed so as to maximise the multiplier effect of the resources of the Fund; that means that the contribution of the Cohesion Fund has to be the minimum needed to make the investment materialise".

- ISPA Guidelines say:

> "Except in the case of repayable assistance or when there is a substantial Community interest in the project, the rate of assistance shall be modified from the maximum rate mentioned above, taking into account: *i)* the availability of co-financing; *ii)* the capacity of the project to generate revenues; and - the application of the polluter-pays principle".

In practice a rather simple procedure has been established. The procedure is based on the 'equity gap' or 'financing gap' approach. As stated in the CF Guide:

> 'A comparison between the current value of the net revenue and the current value of the investment determines the percentage of the investment that can be supported by revenue. Budgetary resources

[9] The maximum ceiling for co-financign rate stated by Ispa regulation (75% of total eligible cost) could be risen to 100% for technical assistance and to 85% for other sectors in exceptional case.

(equity gap) must cover the remainder of the investment. The ratio between the equity gap and net investment constitutes the ceiling on the assistance that may be granted to the project. The rate of assistance from the Cohesion Fund to the project will not exceed the ratio between the equity gap and the investment or the rate laid down in the Regulation, whichever is the lowest.'

The basic idea is to fill in the "financing gap" by EU grants. That means that, if C is the net present value of total cost of the investment, R the net present value of the revenues generated by the project, E the eligible cost, (C-R) is the financing gap, we have that r is the co-financing rate and G is the EU grant defined as follows: r= (C-R)/C and G= E*r.

Tab.8 The discount rate and the co-financing gap: an example*

Basic project data			
Total eligible cost			□ 36.000.000
Proposed ISPA grant			□ 27.000.000
Co-financing required			□ 9.000.000
Grant rate			75%
	The choice of a discount rate		
Scenario (DR)	6%	8%	
Co-financing gap	47%	51%	

* This example is based on an ISPA environmental project

In fact some obvious problem may occur with this procedure:

- if the accounting rules are not harmonised the results may vary widely;
- the procedure does not say anything about how to modulate the rate according to the project merit (for example according to the developmental and environmental merit of the project);
- the formula may give an incentive to exaggerate expected costs, and to bring down revenues; moreover it risks to give a larger grant to (financially) worse projects; and this is very questionable, as the social costs and benefit of the project does not enter in the allocation mechanism.

In principle it should be advisable to modify the procedure in two directions:

- use standard accounting rules, as those proposed to calculate total cost of investment;
- modulate the co-financing rate according to performance indicators.

The basic idea is that, after removing every inconsistencies due to different methodological approaches, which could bias the process, in our opinion in future it would be advisable to modulate the rate of the financial support according to the real economic and financial performance of the project, as they are measured by the appropriate indicators. This will make the co-financing rate endogenous and would create a system of incentives for projects that are particularly good in terms of their expected economic and development impact.

Some remarks should be made on the calculation and the real meaning of these indicators.

4. DATA AND TESTING

Our project database comprises 240 projects in eleven countries, based on data released in www.inforegio.com. Table 9 shows a breakdown by type of infrastructure and by country. Environment related projects are more than two thirds of the sample, the remaining being transport projects.

Tab. 9. Sample size - Breakdown by countries and sectors

	Water and Environment	Sewage	Environmental protection	Waste management	Airport	Highway	Railway	Road	Total
Bulgaria		11	2	1	1	1	1	1	18
Czech Republic	15	5	2			6	3	3	34
Estonia	2	4	4	2				3	15
Hungary		5	1	11		2	5	2	26
Lithuania		7	1	6			1	7	22
Latvia		2	6	1			4	4	17
Poland	5	20	7	3	1	5	5	6	52
Romania	6	8	8	2		1	1	4	30
Slovenia	2	4		1			3		10
Slovakia	2	9	1			1	3		16
Total	32	75	32	27	2	16	26	30	240

The countries with a higher number of projects in the sample are Poland (52), Czech Republic (34), Romania (30), Hungary (26). Tab 10 and 11 shows the average amount of ISPA grants, again by sectors and countries.

Tab. 10. ISPA grant (Euro millions) – Breakdown by countries

	Max	Min	Average	SD	Sample
Bulgaria	153.00	7.65	29.25	38.30	15
Czech Republic	72.78	9.15	22.81	17.31	12
Estonia	14.16	3.20	6.77	3.41	12
Hungary	133.23	4.88	29.88	31.08	23
Lithuania	45.56	2.75	11.26	9.72	21
Latvia	67.46	3.03	16.03	17.38	17
Poland	189.53	6.23	41.45	37.51	42
Romania	231.73	7.26	46.73	50.02	24
Slovenia	10.21	2.56	6.86	2.79	10
Slovakia	58.43	3.97	18.36	16.77	16
Total	231.73	2.56	27.15	32.93	192

The information available to us does not cover all the projects, and the sample is here of 192 projects (tables for other information are often based on smaller samples because of missing data). The average ISPA grant in our sample is of around 27 million Euro, but there is a very large standard deviation. The minimum is just 2,6 million, the maximum (a waste management project in Romania) around 231,7 million Euro. In our sample ISPA projects for Slovenia and Estonia are particularly small on average grant, while the average project in Poland and Romania get more EU funds. This high variability is confirmed by the breakdown by sector. For instance, the average sewage project obtains a 67 million Euro grant, while the average railroad project obtains 12,4 million.

Tab. 11. ISPA grant (Euro millions) – Breakdown by sectors

	Max	Min	Average	SD	Sample
Water and environment	40.52	2.56	17.00	13.64	13
Sewage	84.21	50.00	67.11	24.19	2
Environmental protection	189.53	17.12	68.41	64.02	9
Waste management	231.73	7.66	59.51	51.75	26
Airport	72.42	2.75	17.34	15.92	70
Highway	46.82	5.00	17.58	12.91	23
Railroad	45.43	3.03	12.43	10.30	26
Road	138.01	4.34	34.54	32.05	23
Total	231.73	2.56	27.15	32.93	192

As we have mentioned in a previous section, project proposer should give the Commission some forecast about the project performance. We show the following indicators:

a) FRR without ISPA, Tab. 12 and 13, respectively by countries and sectors, this is the financial rate of return before the EU grant, and reflects the project performance at market prices (often controlled tariffs). For our sample the average is a negative FRR, around – 2,5%. This is not surprising, because these infrastructures typically have low commercial returns and for this reason they ask a capital subsidy to the European Commission. It is interesting that the average FRR for this sample of ISPA project is quite low when compared with previous evidence on ERDF and Cohesion Fund. The sector breakdown shows a sizeable variability, with water and waste management projects forecasting substantial losses, while project in other sectors show modest but positive returns.

Tab. 12. FRR without ISPA – Breakdown by countries

	Max	Min	Average	SD	Sample
Bulgaria	5.00	5.00	5.00	-	1
Czech Republic	0.00	-28.30	-10.54	9.65	16
Estonia	n.d.	n.d.	n.d.	n.d.	n.d.
Hungary	5.51	-11.46	-3.98	4.64	9
Lithuania	0.00	0.00	0.00	-	1
Latvia	1.50	-3.80	-1.59	2.65	5
Poland	9.53	-6.40	2.81	3.51	17
Romania	9.00	-7.70	1.64	7.00	4
Slovenia	4.40	-3.08	1.34	2.76	5
Slovakia	n.d.	n.d.	n.d.	n.d.	n.d.
Total	9.53	-28.30	-2.52	8.07	58

Tab. 13. FRR without ISPA – Breakdown by sectors

	Max	Min	Average	SD	Sample
Water and environment	4.00	-28.30	-9.64	10.47	16
Sewage	9.00	-8.70	-0.11	4.87	19
Environmental protection	9.53	-3.80	2.04	5.03	6
Waste management	5.51	-11.46	-3.29	5.19	8
Airport	5.90	5.90	5.90	-	1
Highway	2.18	2.18	2.18	-	1
Railroad	5.60	0.40	2.71	2.25	5
Road	1.44	1.11	1.28	0.23	2
Total	9.53	-28.30	-2.52	8.07	58

b) FRR with ISPA, Tab 14 and 15, is the financial rate of return when the EU grant enters in the financial cash flows forecast of the project proposer. Our data sample shows an average of 6,8%, which is slightly above the 6% discount rate adopted by the new EC Guide. This result seems reasonable and expected because the "financing gap" approach described above tends to equalize the discount rate and the FRR with ISPA. However, the standard deviation by country or sectors is two times the average. The extremes are one railroad project in Poland that shows a FRR with ISPA of more than 100%, and a water project in Czech Republic that has negative returns of –17% even after the EU grant. Water project on average have a negative FRR even after ISPA, while some road and railroad project have very high returns. On average the ISPA grant allows a difference of 8,13 points (between the "with" and "without" grant FRR), see Tab 16 and 17.

Tab. 14. FRR with ISPA – Breakdown by countries

	Max	Min	Average	SD	Sample
Bulgaria	8.00	4.00	6.00	2.83	2
Czech Republic	11.97	-17.00	0.18	9.40	21
Estonia	n.d.	n.d.	n.d.	n.d.	n.d.
Hungary	17.19	-5.52	2.27	6.19	11
Lithuania	17.00	1.30	6.22	5.08	7
Latvia	19.40	-3.50	5.16	6.95	8
Poland	102.60	5.60	18.81	23.02	17
Romania	10.70	1.28	6.67	3.21	7
Slovenia	23.00	1.50	8.41	9.84	4
Slovakia	10.08	3.00	6.54	5.01	2
Total	102.60	-17.00	6.82	13.93	79

Tab. 15. FRR with ISPA – Breakdown by sectors

	Max	Min	Average	SD	Sample
Water and environment	8.00	-17.00	-2.65	8.29	17
Sewage	36.30	-2.88	7.71	7.62	26
Environmental protection	13.94	-3.50	5.58	4.61	12
Waste management	26.10	-5.52	5.37	8.94	11
Airport	13.10	13.10	13.10	-	1
Highway	n.d.	n.d.	n.d.	n.d.	n.d.
Railroad	102.60	5.00	25.97	34.23	7
Road	19.40	2.00	12.47	6.68	5
Total	102.60	-17.00	6.82	13.93	79

Tab. 16. FRR with ISPA - FRR without ISPA – Breakdown by countries

	Max	Min	Average	SD	Sample
Bulgaria	3	3	3	-	1
Czech Republic	16.60	-0.50	7.74	4.16	16
Estonia	n.d.	n.d.	n.d.	n.d.	n.d.
Hungary	11.68	2.13	5.58	2.96	10
Lithuania	6.53	1.30	3.92	3.70	2
Latvia	18.29	5.40	9.95	4.90	5
Poland	102.20	-3.50	13.96	29.62	11
Romania	4.59	1.70	3.43	1.53	3
Slovenia	18.60	-2.30	5.38	7.85	5
Slovakia	n.d.	n.d.	n.d.	n.d.	n.d.
Total	102.20	-3.50	8.13	13.93	53

Tab. 17. FRR with ISPA - FRR without ISPA –Breakdown by sectors

	Max	Min	Average	SD	Sample
Water and environment	12.60	-0.50	6.30	3.47	15
Sewage	16.60	-3.50	5.87	4.62	19
Environmental protection	9.50	2.49	5.32	2.58	5
Waste management	11.68	2.13	5.12	2.92	8
Airport	7.20	7.20	7.20	-	1
Highway	n.d.	n.d.	n.d.	n.d.	n.d.
Railroad	102.20	-2.30	32.93	47.02	4
Road	18.29	18.29	18.29	-	1
Total	102.20	-3.50	8.13	13.93	53

c) ERR, the economic rate of return, Tab 18 and 19, is based on shadow prices and consideration of externalities, etc. As expected, the ERR is considerably greater that the FRR, being around 13% on average, with a much smaller variability than the FRR (standard deviation 8,4). Projects in Poland expect particularly high socio-economic returns, around two times the returns expected in Czech Republic or in Slovenia. The breakdown by sector shows particularly high returns for roads, more than two times the returns of water projects.

Tab. 18. ERR – Breakdown by countries

	Max	Min	Average	SD	Sample
Bulgaria	23.87	7.78	13.26	6.52	6
Czech Republic	18.00	3.30	9.02	3.59	14
Estonia	14.80	14.00	14.40	0.57	2
Hungary	30.90	1.00	12.62	7.61	18
Lithuania	50.00	2.80	12.71	14.42	10
Latvia	19.00	7.00	12.20	4.93	8
Poland	40.00	5.99	17.64	9.67	27
Romania	30.00	0.00	12.17	7.65	21
Slovenia	17.00	1.01	8.34	5.02	7
Slovakia	17.90	9.00	12.33	3.47	5
Total	50.00	0.00	13.04	8.37	118

Tab. 19. ERR – Breakdown by sectors

	Max	Min	Average	SD	Sample
Water and environment	20.34	0.00	8.54	6.31	7
Sewage	38.71	1.01	11.15	7.71	32
Environmental protection	27.00	7.62	14.73	6.08	11
Waste management	40.00	0.00	12.57	11.75	13
Airport	13.10	8.40	10.75	3.32	2
Highway	23.87	7.50	13.55	5.03	11
Railroad	19.00	1.00	10.48	4.15	18
Road	50.00	7.00	18.23	10.34	24
Total	50.00	0.00	13.04	8.37	118

d) Co-financing rate (CFR), Tab 20 and 21, is the amount of EU grant on eligible costs, and is eventually is the key decision by the Commission. This information is available for 191 projects, and it reveals an average value of around 64%, however with sizeable differences among countries. Countries above the average are Bulgaria, Estonia, Romania, Latvia; countries below the average are Slovenia, Slovakia, Lithuania, and Hungary. When we consider the breakdown by sector, there is less dispersion of the CFR around the average: road being more clearly above the average.

Tab. 20. Co-financing rate – Breakdown by countries

	Max	Min	Average	SD	Sample
Bulgaria	75	37	69.07	12.33	14
Czech Republic	70	50	60.83	6.03	12
Estonia	84	56	72.42	7.00	12
Hungary	75	50	56.70	9.50	23
Lithuania	75	36	58.43	13.29	21
Latvia	75	47	70.00	9.05	17
Poland	75	49	65.26	8.39	42
Romania	75	68	74.04	1.94	24
Slovenia	75	39	51.80	9.72	10
Slovakia	75	49	54.13	8.79	16
Total	84	36	63.82	11.26	191

Tab. 21. Co-financing rate – Breakdown by sectors

	Max	Min	Average	SD	Sample
Water and environment	84	50	62.77	11.65	13
Sewage	75	44	62.33	10.05	70
Environmental protection	75	47	67.04	9.32	23
Waste management	75	49	62.88	10.21	26
Airport	75	37	56.00	26.87	2
Highway	75	52	66.50	9.46	8
Railroad	75	36	60.92	13.94	26
Road	75	36	69.78	11.88	23
Total	84	36	63.82	11.26	191

These descriptive statistics, compounded with previous research on ERDF, Cohesion Fund, World Bank and EBRD projects tell us something about the existence of different sources of variability of either performance indicators and co-financing decision. However, we need a slightly more technical analysis to be able to interpret our results.

5. ANALYSIS OF VARIANCE

Because of the high variance of the samples, we wish to test how confident we can be that the average differences reflect population differences. We took first ISPA grant and then co-financing rate as observations in different samples (first countries and then sectors) extracted from the same population, while we consider first sectors and then countries as factor.

Then we study variability among the samples and within the samples in the following way: the total deviation can be considered as the sum of the deviation among the groups (SS_A) and the deviation within the groups (SS_W).

$$SS_T=SS_A+SS_W$$

It can be demonstrated that the ratio of variance among and within groups has distribution F with r-1 and N-r degrees of freedom[10] and we use this statistics for checking the null hypothesis:

H_0: $\mu_1 = \mu_2 = \mu_3 = \ldots = \mu_r$

against the alternative H_1: $\mu_i \neq \mu_j$ for at least one pair of value. With the null hypothesis we postulate the zero effect of the level factor on the variable.

Tab. 22 Analysis of variance and components of variance

Variability sources	Sum of squares	Degree of freedom	Mean squares	F	Significance level	critical F	Test result
Among groups	SS_A	r-1	$SS_A / (r-1)$	$(SS_A / (r-1))/ (SS_W / (r-$	p(F)	p(α)	Acc or Rej
Within groups	SS_W	N-r	$SS_W / (r-1)$				
Total	SS_T	N-1					

In the first analysis we took countries as samples and sectors as factor. Our observations are the amount of ISPA grants.

Tab. 23 Average value of ISPA grant (million of Euro) –Breakdown by countries and sectors

	Bulgaria	Czech Republic	Estonia	Hungary	Lithuania	Latvia	Poland	Romania	Slovenia	Slovakia
Water and environment		32.35	4.58				24.81	20.93	6.38	10.89
Environmental protection		11.01	5.14	7.25	20.00	16.28	28.09	23.76		19.60
Road	30.00		12.15	37.07	14.88	12.62	47.29	84.27		
Railroad	153.00	39.33		75.33	45.56	28.22	67.57	231.73	9.28	47.91
Airport	50.00						84.21			
Highway		19.10					130.36	71.72		27.15
Sewage	13.11	14.70	6.94	16.40	6.02	4.24	27.25	34.06	5.75	9.05
Waste management	45.43		4.58	14.87	6.59	3.03	13.51	10.69	4.97	

From the results obtained we accept in the first case H_0, that is to say the hypothesis that the equality of the average values of ISPA grant is statistically significant. This means that the ISPA grant variance is explained

[10] r is the number of factor and N is the total of observations.

by the difference among sectors more than the ones among countries. Explanation of this result is well understandable: in absolute terms some sectors need more investments than others.

Tab. 24 Basic data for analysis of variance

Groups	Observations	Sums	Average	Variance
Bulgaria	5	291.54	58.31	3011.45
Czech Republic	5	116.49	23.30	145.39
Estonia	5	33.39	6.68	10.30
Hungary	5	150.92	30.18	758.87
Lithuania	5	93.05	18.61	261.34
Latvia	5	64.39	12.88	104.69
Poland	8	423.09	52.89	1548.62
Romania	7	477.16	68.17	5949.13
Slovenia	4	26.39	6.60	3.54
Slovakia	5	114.61	22.92	247.65

Tab. 25 Variance analysis: factor is sector

Variability sources	Sum of squares	Degree of freedom	Mean squares	F	Significance level	critical F	Test result
Among groups	25352.08	9	2816.898	1.916	0.075	2.101	ACC. H_0
Within groups	64704.51	44	1470.557				
Total	90056.59	53					

N.B. Countries are the samples of a populations and sectors are the levels of a factor.

The same analysis is conducted considering sectors like sample and countries like factors. The analysis of variance confirms the same results: F value is above the critical F value, the one for the acceptance of H_0.
So we reject the hypothesis that the equality of average values for sectors is statistically significant, that means that variance of Ispa grants is explained by sectors and not by countries.

Tab. 26 Basic data for analysis of variance

Groups	Observations	Sums	Average	Variance
Water and environment	6	99.95	16.66	123.13
Environmental protection	8	131.12	16.39	64.80
Road	7	238.28	34.04	671.60
Railroad	9	697.94	77.55	5003.05
Airport	2	134.21	67.11	585.21
Highway	4	248.33	62.08	2607.28
Sewage	10	137.51	13.75	98.43
Waste management	8	103.69	12.96	190.96

Tab. 27 Variance analysis: factor is country

Variability sources	Sum of squares	Degree of freedom	Mean squares	F	Significance level	critical F	Test result
Among groups	34303.6794	7	4900.526	4.04	0.002	2.216	REJ. H_0
Within groups	55752.9103	46	1212.020				
Total	90056.5897	53					

N.B. Sectors are the samples of a populations and countries are the levels of a factor.

Results are the opposite if we take co-financing rate as observations. First of all we calculate the average value for countries and sectors (countries are the sample and sectors are factors).

Tab. 28 Average value of co-financing ISPA rate – Breakdown by countries and sectors

	Bulgaria	Czech Republic	Estonia	Hungary	Lithuania	Latvia	Poland	Romania	Slovenia	Slovakia
Water and environment		70.00	79.50				58.40	75.00	50.00	60.00
Airport	37.00						75.00			
Highway		60.00					75.00	75.00		52.00
Railroad	45.00	53.33		50.80	36.00	75.00	75.00	75.00	54.67	58.33
Sewage	73.50	65.00	69.75	50.00	59.00	66.50	61.37	73.63	51.00	49.89
Environmental protection		62.50	68.67	50.00	50.00	68.00	60.00	73.29		70.00
Waste management	75.00		75.00	63.64	58.00	49.00	62.67	75.00	50.00	
Road	75.00		75.00	50.00	63.33	75.00	75.00	75.00		

From the analysis o variance we have that F value is above the critical F value, that is to say that the hypothesis that the equality of average value of co-financing rates is statistically significant is to be rejected. The concluding remark is that the variance of co-financing rate is explained by the variance among countries and not by the one among sectors.

Tab. 29 Basic data for analysis of variance

Groups	Observations	Sums	Average	Variance
Bulgaria	5	305.50	61.10	345.05
Czech Republic	5	310.83	62.17	38.06
Estonia	5	367.92	73.58	19.47
Hungary	5	264.44	52.89	36.23
Lithuania	5	266.33	53.27	116.36
Latvia	5	333.50	66.70	113.20
Poland	8	542.44	67.80	60.61
Romania	7	521.91	74.56	0.58
Slovenia	4	205.67	51.42	4.92
Slovakia	5	290.22	58.04	62.47

Tab. 30 Variance analysis: factor is sector

Variability sources	Sum of squares	Degree of freedom	Mean squares	F	Significance level	critical F	Test result
Among groups	3413.54687	9	379.282986	4.95820447	0.00012983	2.10087592	REJ. H_0
Within groups	3365.82557	44	76.4960356				
Total	6779.37244	53					

N.B. Countries are the samples of a populations and sectors are the levels of a factor.

This result is confirmed if we use sectors as sample and countries as factors. F test lead to the acceptance of equality hypothesis of average values, and moreover more than 90% of the variance of average values of co-financing rate is determined by the variance among groups (that is to say within each sector by the variance among countries), while only 10% is determined by the variance among groups.

Tab. 31 Basic data for analysis of variance

Groups	Observations	Sums	Average	Variance
Water and Environment	6	392.900	65.483	125.482
Airport	2	112.000	56.000	722.000
Highway	4	262.000	65.500	131.000
Railway	9	523.133	58.126	200.587
Sewage	10	619.632	61.963	86.419
Environmental protection	8	502.452	62.807	79.837
Waste management	8	508.303	63.538	117.172
Road	7	488.333	69.762	94.841

Tab. 32 Variance analysis: factor is country

Variability sources	Sum of squares	Degree of freedom	Mean squares	F	Significance level	critical F	Test result
Among groups	706.392	7	100.913	0.76437068	0.619769412	2.21641727	ACC. H_0
Within groups	6072.980	46	132.021				
Total	6779.372	53					

N.B. Sectors are the samples of a populations and countries are the levels of a factor.

This result suggests that there are some countries which systematically and independently by the sectoral breakdown of projects, get co-financing rates on average above the other countries.

We also made the χ independence test applied to the contingence table: this is the calculation of the sample numerousness with the aim of verifying if there is independence between sectors and countries characteristics.

Applying the test we obtain that the hypothesis of independence of countries and sectors in the distribution of the observations of ISPA grant is to be rejected, so the two characteristics are dependent or connected, that is to say that the distribution of ISPA grant in each sectors depends on countries and/or vice versa.

Tab. 33 Contingency table, sample of ISPA Grant-breakdown by countries and sectors

	Water and Environment	Airport	Highway	Railway	Sewage	Environmental protection	Waste management	Road	Total
Bulgaria		1		1	10		1	1	14
Czech Republic	1		3	3	3	2			12
Estonia	2				4	3	1	2	12
Hungary				5	4	1	11	2	23
Lithuania				1	7	1	6	6	21
Latvia				4	2	6	1	4	17
Poland	5	1	3	5	19	2	3	4	42
Romania	1		1	1	8	7	2	4	24
Slovenia	2			3	4		1		10
Slovakia	2		1	3	9	1			16
Total	13	2	8	26	70	23	26	23	191

Tab. 34 χ Test

Critical χ	χ (10-1)(8-1)	Test result
82	5286	REJ H_0

The same result is obtained applying the test to the co-financing rate, as the starting contingencies table is the same. All these results make us suppose that in some countries projects presented have financing gaps systematically above that of the other countries, as this is the variable that influence the choice of co-financing rate.

If we want now to consider the quality of the proposed projects, i.e. economic and social profitability, it is necessary to analyse the variance of economic internal rate of return of projects (Tab. 35).

Tab. 35 Average value of ERR - Breakdown by countries and sectors

	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Slovenia
Airport	8.40						13.10			
Environmental				19.20			7.62	19.97		
Highway		12.00						9.00	12.80	
Railroad		8.41		7.30	11.43		11.15	15.00	10.97	12.68
Road	17.50		14.00	25.05	10.27	13.20	24.61	19.88		
Sewage	9.92	3.60		11.74	16.25	4.54	20.36	10.00	13.45	3.15
Waste management				14.02		5.35	23.60	0.00		7.29
Water and environment							20.34	4.00		6.80

The analysis of the variance leads to a clear cut result: if sectors are factors and countries are the sample the hypothesis that the equality of the average values is statistically significant is to be accepted.

Tab. 36 Basic data for analysis of variance

Groups	Observations	Sums	Average	Variance
Bulgaria	3	35.82	11.94	23.76
Czech Republic	3	24.01	8.00	17.76
Estonia	1	14.00	14.00	n.a
Hungary	5	77.31	15.46	47.12
Latvia	3	37.95	12.65	10.06
Lithuania	3	23.09	7.70	22.87
Poland	7	120.77	17.25	43.47
Romania	7	77.84	11.12	58.34
Slovakia	3	37.22	12.41	1.66
Slovenia	4	29.91	7.48	15.43

Tab. 37 Variance analysis: factor is sector

Variability sources	Sum of squares	Degree of freedom	Mean squares	F	Significance level	critical F	Test result
Among groups	447.01141	9	49.6679345	1.4434065	0.215951048	2.2228761	ACC. H_0
Within groups	997.896303	29	34.41021735				
Total	1444.90771	38					

N.B. Countries are the samples of a populations and sectors are the levels of a factor.

On the opposite side, if sectors are the sample and countries the factors, the result is the same. This means that on average the expected quality of projects is similar and no sectoral no national differences systematically affect the economic internal rate of return.

Tab. 38 Basic data for analysis of variance

Groups	Observations	Sums	Average	Variance
Airport	2	21.50	10.75	11.05
Environmental protection	3	46.79	15.60	47.85
Highway	3	33.80	11.27	4.01
Railroad	7	76.93	10.99	6.57
Road	7	124.50	17.79	32.61
Sewage	9	93.00	10.33	34.74
Waste management	5	50.26	10.05	82.52
Water and environment	3	31.14	10.38	76.36

Tab. 39 Variance analysis: factor is countries

Variability sources	Sum of squares	Degree of freedom	Mean squares	F	Significance level	critical F	Test result
Among groups	334.283904	7	47.75484337	1.332944721	0.26842678	2.32316921	ACC. H_0
Within groups	1110.62381	31	35.82657452				
Total	1444.90771	38					

N.B. Sectors are the samples of a populations and countries are the levels of a factor.

Also with the χ test the hypothesis of independence is to be rejected.

Tab. 40 Contingency table, sample of ERR -breakdown by countries and sectors

	Water and Environment	Airport	Highway	Railway	Sewage	Environmental protection	Waste management	Road	Total
Bulgaria		1			3			1	5
Czech Republic			3	2	1				6
Estonia								1	1
Hungary				4	4	1	7	1	17
Lithuania					3		2	4	9
Latvia				3	2			3	8
Poland	1	1		3	6	1	2	3	17
Romania	1		1	1	5	3	1	4	16
Slovenia	1			3	2		1		7
Slovakia			1	2	2				5
Total	3	2	5	18	28	5	13	17	91

Tab. 41 χ Test

Critical χ	χ (10-1)(8-1)	Test result
82	1205	REJ H_0

We think that this result support the view that the variability of co-financing rate of ISPA projects by the European Commission is poorly related to their expected performance, either in financial or socio-economic terms.

CONCLUDING REMARKS

In this paper we have presented new evidence on the considerable effort the Commission is performing with the accession countries to co-financing their infrastructure capacity. European Union regional policies may play an important role in the process of real convergence across Member States and accession candidates. While there is a lively debate about the effectiveness of the current EC strategy and its implementation, it is quite uncontroversial that there is a need to raise the quality of development projects, particularly in transport and environment. The Commission should be applauded and encouraged to go on with its effort to get better infrastructure project proposals, and to change its role from a bureaucratic provider of ear-marked development funds to an active partner in the investment decision process.

As far as project analysis is involved there is room for improvement and we have shown that there is high variability of some key indicators that seems more country specific than sector specific. Overall the variability of expected financial returns before and after the EU grant is too high, and so is the variability across countries of the co-financing rate.

As far as the Commission development objectives are concerned, some remarks could be made about suitable benchmarks for FRR:

- FRR/C of development projects are expected to be very low, sometimes a negative rate (otherwise there would be quite limited justification for public intervention), but the financial sustainability should also be considered. From our sample of projects the average FRR/C was minus 2,5%. It seems advisable to use this average as a first benchmark. For an FRR/C less than *minus* 2,5% the applicant should give evidence on how the project will be sustainable in the long term, beyond the time horizon. Projects for which evidence is weak should be reconsidered or rejected. In future we suggest that a zero percent financial return target could be advisable (before EU grants).

Moreover development projects asking for public grants are not expected to have an excessive return on investment, (let us say FRR/C>6%) otherwise the private sector would be more suitable to finance the project.

- FRR/K is expected to be higher than FRR/C but not exceeding a given threshold, otherwise the project is maybe asking an excessive grant by EU. From our sample of projects a FRR/K of around 7% is an average value, (but with a too high standard deviation). The ratio between standard deviation and average (the coefficient of variation).
- Finally, development objectives (environmental sustainability, equal opportunity, distributional effects) are likely to be measured by ERR and not by either FRR/C or FRR/K. Because externalities and shadow prices are now considered, most projects with low or negative FRR/C will now show positive ERR. Then projects with a low ERR (say ERR< 5%) should be considered low priority by the Commission services. Moreover EU grant could offer a premium to the most deserving projects.

The main idea is that the Commission should be wishing to finance project with a strategic importance for development objectives (high ERR), not generating excessive revenues compared with investment costs but sustainable in the long term (-3% > FRR/C > 6%) and the EU grant should be not too high as to generate an extra rent to the proposer (FRR/K<7%).

Obviously the application of the given thresholds must not be too rigid, but should be modulated according to sectoral and national specificities.

Moreover, we would suggest to endow in future this kind of programmes with a further incentive mechanism, similar to the Performance Reserve for the Structural Funds (art. 44 Reg. 1260/99). For example a fund worth 10% of the total allocation of EU infrastructure funds for a given country could be set aside in first instance, and redistributed as a bonus to those projects or project proposers that outperform a given benchmark. The benchmark could be the average economic rate of return for projects of the same sector across the countries in any given period of time. The objective of this "bonus reserve" would be to accompany the financial evaluation with an incentive for high returns in terms of social costs and benefits.

In conclusion, we suggest to move away from high co-financing of the more financially demanding projects, to a system where the most socially deserve projects get a higher level of transfers. In order to do so, financial and economic rates of return should be considered jointly, and in comparison with sectoral benchmarks. Under such approach, greater consistency in project appraisal and evaluation would be needed.

BIBLIOGRAPHY

Armstrong, Harvey W. European Union Regional Policy: Sleepwalking to a Crisis, *International Regional Science Review. Vol. 19 (3). p 193-209. 1996.*

Armstrong, H.W., Kehrer, B., Wells, P., 2001, *Initial Impacts of Community Economic Development Initiative in the Yorkshire and Humber Structural Funds Programme*, Regional Studies, Vol 35 (8). P.673-88.November.

Bachtler, J., Michie, R., 1995, *A New Era in EU Regional Policy Evaluation? The Appraisal of the Structural Funds*, Regional Studies, Vol. 29 (8), p. 745-51, December.

Barry, F., ed. *Understanding Ireland's economic growth.*, New York: St. Martin's Press; London: Macmillan Press. P/. xii, 242. 1999.

Barry, F., Bradley, J, Hannan, A., 2001, *The Single Market, the Structural Funds and Ireland's Recent Economic Growth*, Journal of Common Market Studies, Vol. 39 (3). P.537-53, September.

Barry, T. V S. Infrastructure and Regional Growth in the European Union, *University of Birmingham, Department of Economics Discussion Paper: 96/25. p 18. August 1996.*

Begg, Iain. *Previsiones sobre convergencia regional en la Union Europea*. (With English summary.), Papeles de Economia Espanola. Vol. 0 (80). p 100-122. 1999.

Belli, P., Anderson, J. R., Barnum, H.N, Dixon, J. A., Tan, J-P, 2001, *Economic Analysis of Investment Operations. Analytical Tools and Practical Applications*, WBI, World Bank, Washington D.C.

Bradley, John, et al. *Regional aid and convergence: Evaluating the impact of the structural funds on the European periphery*, *Aldershot, U.K.; Brookfield, Vt. and Sydney: Ashgate, Avebury. p xiv, 299. 1995.*

Bristow, G., Blewitt, N., 2001, *The Structural Funds and additionality in Wales: Devolution and Multilevel Governance*, Environment & Planning A. Vol. 33(6). P. 1083-99, June.

Boldrin, M. and Canova, F., *Regional Policies and EU Enlargement*, CEPR Discussion Paper No. 3744, February 2003.

Dauce, P., 1998, *L'evaluation des politiques communautaires de developpement regional: Enjeux, methodes, resultats*. L'exemple de l'objectif 5b en Bourgogne, Revue d'Economie Regionale et Urbaine, Vol. 0(3). P.379-94.

Esteban, J. Regional Convergence in Europe and the Industry Mix: A Shift-Share Analysis, *Regional Science & Urban Economics. Vol. 30 (3). p 353-64. May 2000.*

European Commission, *Annual Report of Cohesion Fund*, Bruxelles, 1999.

European Commission, *11th Annual Report on Structural Funds*, Bruxelles, 1999.

European Commission, *Structural Actions 2000-2006, Commentary and Regulations*, Bruxelles, 2000.

European Commission, *Second Report on economic and social cohesion*, Bruxelles, January 2003.

European Commission, *Guide to cost-benefit analysis of investment projects - Structural Funds-ERDF, Cohesion Fund and ISPA,* prepared for the Evaluation Unit, DG Regional Policy, Bruxelles, 2001.

European Commission, *Second progress Report on Economic and Social Cohesion*, Bruxelles, 2001.

Fayolle, J., Le Cacheux, J., 1998, *Elargissement, PAC, politiques structurelles et "juste retour": la quadrature du cercle budgetaire europeen, Revue de l'Ofce*, Vol. 0(66), p. 37-60, July.

Fayolle, J., Lecuyer, A., 2000, *Croissance regionale, appartenance nationale et fonds structurels europeenss: Un bilan d'etape*, Revue de L'Ofce, Vol. 0(73), p. 165-96, April.

Fernandez Martinez, P., 1999, *Los nuevos reglamentos de los fondos estructurales y el Fondo de Cohesion para el periodo 2000-2006*, Informacion Comercial Espanola, Vol 0(776), p. 73-83, February.

Florio, M., 1997, *The economic rate of return of infrastructures and regional policy in the European Union*, in "Annals of Public and Cooperative Economics", 68:1.

Florio, M., 1999, “An international Comparison of the Financial and Economic Rate of Return of Development Projects”, DEPA Working Paper, 99.06-dicembre

Florio, M., Vignetti, S., C*ost benefit analysis and project appraisal under EU structural funds co-financing*, Paper presented at the conference 'Evaluation and EU Regional Policy: New Questions and New Challenges', Aix-en-Provence, France 31st May and 1st June 2002.

Goybet, P., 1998, *Le developpement de l'evaluation au niveau communautaire: Enjeux et perspectives*, Revue d'Economie Regionale et Urbaine, Vol. 0(3). P.357-67.

Heijiman, W., 2001, *European Structural Policy: Bend or Break*, European Journal of Law & Economics. Vol. 11(2). p.165-75. March.

Healey, Nigel M., ed. 1995. *The economics of the new Europe: From Community to Union*, London and New York: Routledge. p. xvi, 317.

Landaburu Illarramendi, E., 1999, Espana, *La Agenda 2000 y la politica europea de cohesion economica y social*, Informacion Comercial Espanola, Vol. 0(776), p. 63-72, February.

Lawless, P., 2001, *Community Economic Development in Urban and Regional Regeneration: Unfolding Potential or Justifiable Scepticism?*, Environment & Planning C-Government & Policy. Vol. 19(1). P. 135-55, February.

Lolos, S. E. G., Theodoulides, A. Th., 2001, *The role of EU Structural Funds in the Development of Lagging behind European Regions*, Economic & Financial Modelling, Vol. 8(1), p. 29-46, Spring.

Lolos, S. E. G., Zonzilos, N. G., 1994, *The Impact of European Structural Funds on the Development of the Greek Economy: A comparison of two Models*, Economic & Financial Modelling, Vol. 1(2), p. 87-104, Summer.

Nicolaides, P., 1999, *The Economics of Enlarging the European Union: Policy Reforms v Transfers*, The Cyprus Review. Vol. 11 (1). P.97-108. Spring.

Payne, D., Mokken, R., Stokman, F., 1997, *European Union Power and Regional Involvement: A Case Study of the Political Implications of the Reform of the Structural Funds for Ireland*, Aussenwirtschaft, Vol. 52(1-2), p. 119-49, June.

Pereira, Alfredo M. *Development Policies in the EU: An International Comparison,* Review of Development Economics. Vol. 1 (2). p 219-35. June 1997.

Smith. A., 1998, *The sub-regional level: key battleground for the Structural Funds?, Regions in Europe*. Le Gales, P., Lequesne, C., eds, European Public Policy Series. London and New York: Routledge. p. 50-66.

Swinnen, J.F.M., 2001, *Will Enlargement Cause a Flood of Eastern Food Imports, Bankrupt the EU Budget, and Create WTO Conflicts*? Eurochoices. Vol. 0(0), p.48-53. Spring.

Tomaney, J., Pike, A., 1997, *The Impact of European Union Policy on 'Peripheral' Regions. Competing from the periphery: core issues in international business*. Fynes, B., Ennis, S., eds. Irish Studies in Management. Dublin: Oak Tree Press. p. 83-115.

Tsoukalas, D., Loizides, I., 1999, *Regional Aspects of the Cyprus Economy and the Impact of the Eu Structural Funds*, Ekonomia, Vol. 3(2). p. 141-56, Winter.

Vanhove, N., 1999, *Regional Policy: a European approach*, third edition, Aldershot, U.K., Brookfield, Vt. And Sydney: Ashgate, p. xx, 639.

Vickerman, R., Spiekermann, K., Wegener, M., 1999, *Acessibility and Economic Development in Europe*, Regional Studies. Vol. 33 (1). P.1-15. February.

Welfens, P.J.J., 1999, *EU eastern enlargement and the Russian transformation crisis*, Heidelberg and New York: Springer. P.x, 147.