1 Introductory remarks

In this paper we describe how the impacts of EU cohesion policies have been evaluated. There are many such policies, but we restrict ourselves to Structural and Cohesion Funds in the main Objective 1 countries and macro regions. Since one can only undertake such evaluations with the assistance of formal models of the recipient economies, evaluations are as much about selecting and using appropriate models as they are about deriving and interpreting quantitative impacts.

One can approach policy evaluation from the macro (or top-down) perspective, or from the micro (or bottom-up) perspective. These are radically different methodologies, and their characteristics are summarised in Table 1.

Although there are standard techniques of micro analysis available, bottom-up studies are quite rare and often take on the characteristics of “monitoring” rather than “evaluation”. Only recently have there been any efforts to systematise micro evaluation of large-scale Structural Fund programmes (HONOHAN, (ed.), 1997). In the remainder of the paper we focus exclusively on macro evaluation.

2 The role of macromodels in cohesion policy analysis

The reform and expansion of EU Structural Funds (SFs) in the late 1980s presented the European Commission and domestic policy makers with major challenges. The size of SF investment expenditures was not a problem for policy design or analysis. Indeed, evaluating the macroeconomic impact of public expenditure had been an active area of research since quantitative macromodels were first developed in the 1930s (TINBERGEN, 1939). What was special about the SFs was their declared goal: to transform and modernise the underlying structure of the beneficiary
economies in order to prepare them for greater exposure to international competition within the Single Market and EMU. SF policies moved far beyond demand-side stabilization, being aimed at the promotion of structural change, accelerated medium-term growth and real cohesion through mainly supply-side mechanisms.

The new breed of macroeconomic models of the late 1980s addressed the theoretical deficiencies of conventional Keynesian econometric models that had precipitated the decline of modelling activity from the mid-1970s (KLEIN, 1983). However, policy analysts were still faced with the dilemma of having to use conventional economic models, calibrated using historical time-series data, to examine future structural changes. The Lucas critique was potentially a serious threat to such model-based policy evaluations (Lucas, 1976). The relationship between public investment policies and private sector supply-side responses - processes that were at the heart of the SFs - were not generally incorporated into macro models.

The revival of growth theory in the mid-1980s provided guidelines to the complex issues involved in designing policies to boost a country’s growth rate, either permanently or temporarily (BARRO and SALA-Y-MARTIN, 1995; JONES, 1998). But empirical growth studies tended to be predominantly aggregate and cross-country rather than disaggregated and country-specific. Yet another complication facing SF analysts was that the first four main beneficiary countries - Greece, Ireland, Portugal and Spain - were on the geographical periphery of the EU, thus introducing spatial issues into their development processes. With advances in the treatment of imperfect competition, the field of economic geography had also revived during the 1980s (KRUGMAN, 1995; FUJITA, KRUGMAN and VENABLES, 1999). But the insights of the new research were confined to small theoretical models and seldom influenced the large-scale empirical models that are needed for realistic policy analysis.

3 A macromodel for cohesion policy impact analysis

The HERMIN macro model framework, developed in Ireland in the late 1980s specifically to evaluate the macro impacts of SFs, drew from the above revision and renewal of macro economic modelling. HERMIN was designed to take account of limited data availability in the poorer, less-developed EU member states and regions (i.e., Ireland, Northern Ireland, Portugal, Spain, the Italian Mezzogiorno, and Greece). The HERMIN framework was based on a simple theoretical framework that permitted inter-country and inter-region comparisons and facilitated the selection of key behavioural parameters in situations where sophisticated econometric analysis was difficult. HERMIN was designed for analysis of medium-term policy impacts involving large-scale public investments in physical infrastructure and in human resources. Such analysis requires certain structural features in a model:

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4 FISCHER, 1991 suggested that identifying the determinants of investment, and the other factors contributing to growth, would probably require a switch away from simple cross-country regressions to time series studies of individual countries.

5 Its origins lay in the complex multi-sectoral HERMES model that was developed by the European Commission from the early 1980s (D’ALCANTARA AND ITALIANER, 1982).

6 After German unification, the former East Germany was added to the list of “lagging” EU regions.

7 See Bradley et al, 2004 for technical details of the HERMIN model.
(i) It must be disaggregated into an adequate number of production sectors to permit the examination of key sectoral shifts in the economy as it develops.

(ii) It must specify mechanisms through which a “lagging” economy connects to the external world: through trade, inflation transmission, migration and foreign direct investment.

(iii) It must recognise a possible conflict between the actual situation in the country, captured in a model calibrated with historical data, and the desired situation towards which the lagging economy is evolving.

These structural requirements have implications for the more detailed features of the model. One needs to focus carefully on the degree of economic openness, exposure to world trade, and response to external and internal shocks. The relative sizes and features of the traded and non-traded sectors and their development, production technology and structural change become crucial mechanisms in the change process. Mechanisms of wage and price determination, the functioning and flexibility of labour markets and the possible role of international and inter-regional labour migration determine competitiveness relative to more developed economies. Development possibilities can be constrained through fiscal and other imbalances, emphasising the role of the public sector and the consequences of public debt accumulation, as well as the interactions between the public and private sector trade-offs in public policies.

To satisfy these requirements the HERMIN framework was designed with four sectors: manufacturing (a mainly traded sector), market services (a mainly non-traded sector), agriculture and government (or non-market) services. Although agriculture also has important traded elements, its underlying characteristics demand special treatment. Similarly, the government (or non-market) sector is non-traded, but is best formulated in a way that recognises that it is mainly driven by policy instruments that are available – to some extent – to policy makers.

Conventional Keynesian mechanisms are at the core of a HERMIN-type model. Expenditure and income distribution generate the standard income-expenditure mechanisms. But the model also has many neoclassical features. Output in manufacturing is not simply driven by demand. It can also be potentially influenced by price and cost competitiveness, where firms seek out minimum cost locations for production (BRADLEY and FITZ GERALD, 1988). In addition, factor demands in manufacturing and market services are derived using a production function constraint, where the capital/labour ratio is sensitive to relative factor prices. The incorporation of a structural Phillips curve mechanism in the wage bargaining mechanism introduces further relative price effects.

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8 For example, agriculture is seldom an “engine” of convergence in a European context. Rather, it facilitates rapid development through increases in productivity and a labour release mechanism.

9 Elements of public policy are endogenous, but one can handle these in terms of policy feed-back rules rather than behaviourally.
4 Calibrating macromodel behavioural equations

The dramatic nature of structural change in the “old” EU cohesion economies suggests that the data sample should be restricted to the post-1980 or post-1985 period. In the case of the CEE transition economies, data constraints require one to work with only about ten annual observations for the period 1994-2003, since data prior to 1994 are incomplete and not very reliable. The small number of observations available prevents one from undertaking sophisticated econometric estimation and hypothesis testing techniques commonly used to calibrate macro models. Consequently, three different approaches to model calibration (or estimation) are used in the literature of modelling the transition economies of the CEE region:

(i) Extending the data sample over different economic regimes

There is a temptation to make use of data from the pre-transition era.\(^{10}\) The disadvantage is that the extended data sample covers three very different economic regimes: the era of communist economic planning; the years immediately following the collapse of the communist economic system; and the era of rapid recovery and growth that followed the post-communist collapse.

(ii) The panel data approach

A series of CEE data bases can be assembled for the post Communist era, a generalised model posited that is appropriate to each of the constituent economies, and cross-economy constraints imposed (e.g., a common marginal propensity to consume).\(^{11}\) This has the advantage of increasing the degrees of freedom and obtaining more precise parameter estimates. A disadvantage is that the cross-economy restrictions are difficult to test, and may be inappropriate.

(iv) Simple curve-fitting to post 1994 data

This is the approach that has been used for all the CEE HERMIN models. By keeping the behavioural equations very simple, the number of behavioural parameters is kept to a minimum. Using ordinary least squares, a form of “curve-fitting” is used, where the derived parameters are examined and related to a range of estimates from other EU models, where longer data sets are available. In its extreme form, this reduces to the way in which computable general equilibrium (CGE) models are calibrated, by imposing all important parameters. Advantages include the tight theoretical control imposed on the model, the use of the most recent and consequently, most relevant data sample, and the use of judgement to ensure the relevance of the parameters. Disadvantages are numerous, including a complete lack of formal hypothesis testing.

Two related issues are involved with CEE models. First, the standard macroeconomic interrelationships that characterise “old” EU economies may already exist in some of the more advanced CEE economies such as the Czech Republic and Slovenia (i.e., sensitivity to international cost-competition and wage determination mechanisms that

\(^{10}\) For the Polish W8-2000 model, data for the period 1960-1998 are used (WELFE et al., 2002).

\(^{11}\) This is the approach used within the CEE models contained in the NIGEM model of the world economy developed by the London-based NIESR (BARRELL AND HOLLAND, 2002).
are becoming consistent with the need to maintain a cost-competitive position in the global economy), but we may simply have too few data observations to isolate the magnitudes of the relevant elasticities and parameters. Second, it may be the case that these interrelationships are not yet fully developed, but will develop in the immediate future after the CEE economies become EU members. Consequently, the experimental and speculative nature of such models must be kept in mind and policy simulations regarded as exploratory (BARRY, *et al*, 2003).

### 6 Preparing a macro model to evaluate Structural Fund impacts

An useful way of aggregating the Structural Fund investment measures and their constituent Operational Programmes (OPs) is to consider the following three economic categories:

(i) Investment expenditures on physical infrastructure;
(ii) Investment expenditures on human resources;
(iii) Expenditures on direct production/investment aid to the private sector.

For each of these categories, there are three possible sources of funding:

a. EU transfers in the form of subventions to the domestic public authorities;

b. Domestic public sector co-financing;

c. Domestic private sector co-financing.

Structural Fund actions influence the economies through a mixture of supply and demand effects. Short term demand (or Keynesian) effects arise as a consequence of increases in expenditure and income policy instruments associated with SF policy initiatives. Through “multiplier” effects there will be further knock-on increases in all the components of domestic expenditure (e.g., total investment, private consumption, the net trade surplus, etc.) and the components of domestic output and income. These demand effects are of transitory importance and are not the *raison d’être* of Structural Funds. Rather, the SF interventions are intended to influence the long-run supply potential of the economy.

The “supply-side” effects arise through policies designed to:

1) Improve physical infrastructure as an input into private sector production;
2) Increase human capital, through investment in training and education, as an input to private sector productive activity;
3) Channel public financial assistance to the private sector to stimulate investment and productive efficiency, thus increasing factor productivity and reducing sectoral costs of production and of capital.

SF interventions are designed to improve the regional aggregate stock of public infrastructure and human capital, as well as the private capital stock. Providing more and better infrastructure, increasing the quality of the labour force, or providing investment aid to firms, are the mechanisms through which the SFs improve the output, productivity and cost competitiveness of the economy. The longer-run effects of these policies are to create conditions where private firms enjoy the use of improved factors of production, sometimes at no cost to themselves. Alternatively,
they may help to make the current private sector inputs that firms are already using available to them at a lower cost, or the general conditions under which firms operate are improved as a consequence. In all these ways, positive externalities may arise out of the SF interventions.

Recent advances in growth theory have addressed the role of spill-overs or externalities which arise from public investments, for example in infrastructure or in human capital. Furthermore this literature has investigated how technical progress can be affected directly through investment in research and development (R&D). Here too externalities arise when innovations in one firm are adopted elsewhere, i.e., when such innovations have public good qualities.

Two main types of beneficial externalities are likely to enhance the demand-side (or neo-Keynesian) impacts of well designed investment and training initiatives. The first type of externality is likely to be associated with the role of improved physical infrastructure and of training in boosting output directly. This works through mechanisms such as attracting productive activities through foreign direct investment, and enhancing the ability of indigenous industries to compete in the international market place. We call this an ‘output externality’ since it is well known that the range of products manufactured in developing countries changes during the process of development, and becomes more complex and technologically advanced.

The second type of externality arises through increased total or embodied factor productivity likely to be associated with improved infrastructure or a higher level of human capital associated with training and education. We call this a ‘factor productivity externality’. Of course, a side effect of increased factor productivity is that, in the highly restrictive context of fixed output, labour is shed and unemployment rises. The prospect of such “jobless growth” is particularly serious in economies where the recorded rate of unemployment as well as the rate of hidden unemployment are already high. Thus, the factor productivity externality is a two edged process: industry and market services become more productive and competitive, but labour demand is weakened if output growth remains weak. On the plus side, however, factor productivity is driven up, real incomes rise, and these effects cause knock-on multiplier and other benefits throughout the economy.

An indication of the likely numerical values of the above externality elasticities can be obtained from a review of the extensive international research literature in this area (see Bradley, Morgenroth and Untiedt, 2002). Research suggests that the values for the elasticity of output and productivity with respect to increases in the stock of infrastructure are likely to be in the region of between 5 and 40 per cent, with small regions and countries characterised by values nearer the lower end of the scale (5 to 20 per cent). With respect to human capital, elasticities in the same range are found (ESRI, 2002).

Since research does not always exist for the lagging Objective 1 and CEE countries, we are forced to utilize results from analogous or more advanced economies. However, sensitivity analysis can be carried out over a plausible range of values of the externality elasticities. The implications of these externality elasticities will become clearer below when we set out the actual functional relationships that are incorporated into the HERMIN models.
How enduring are the beneficial externality effects likely to be? The infrastructure deficit in the Objective 1 countries is quite large, and is unlikely to match up to the level pertaining in the more developed EU countries until well into the next decade. Given this and the fact that there are substantial returns to the elimination of bottlenecks which will take some time to accomplish, it is unlikely that diminishing returns will set in for the immediate future.

7 Linking the SF policy externality mechanisms into the model

Output externalities can be viewed as operating directly through the multinational and indigenous firm location and growth process that is so important in the case of the EU periphery and, more recently, in the CEE countries. This draws directly from the extensive literature surveyed in BRADLEY, MORGENROTH and UNTIEDT (2002). The treatment of the manufacturing sector in HERMIN posits a supply side approach in which the share of the world's output being allocated to, or generated within, a peripheral country or region is determined by measures of domestic and international cost competitiveness (BRADLEY and FITZ GERALD, 1988).

However, this neglects the fact that many industries will require more than simply an appropriate level of, say, labour costs before they locate in, or grow spontaneously in, the EU periphery. Without an available labour force that is qualified to work in these industries, or without appropriate minimum levels of physical infrastructure, many firms simply may not be able even to consider the periphery as a location for production. Thus, a more realistic framework is one which posits a two stage process in which basic infrastructural and labour force quality dictates the number of industries which could conceivably locate in the periphery, while competitiveness decides how many of the industries which could locate in the periphery actually do locate there.

One simple way of describing this process is to link the growth of infrastructure and the increases in human capital to a modified version of the HERMIN behavioural equation that is used to determine manufacturing sector output (OT). We posit a hybrid supply-demand equation of the form:

\[
\log(OT) = a_1 + a_2 \log(OW) + a_3 \log(ULCT / POT) + a_4 \log(FDOT) + a_5 \log(POT / PWORLD) + a_6 t
\]

where OW represents external (or world) demand, and FDOT represents the influence of domestic absorption. The two remaining terms represent real unit labour costs (ULCT/POT) and price competitiveness (POT/PWORLD). To take account of output externalities associated with infrastructure and human capital, the following two terms are added to the above equation:

\[
\eta_1 \log(KGINF / KGINF_0) + \eta_2 \log(NTRAIN / NTRAIN_0)
\]

where output in the manufacturing sector (OT) is now directly influenced by any increase in the stock of infrastructure and human capital (KGINF and NTRAIN, respectively) over and above a baseline value for these stocks (KGINF₀ and
NTRAIN₀, respectively). We are forced to ignore any interactions and complementarities that may exist between physical infrastructure and human capital, since so little is yet known about this aspect of the SFs. The interaction between physical infrastructure and human capital is potentially of great importance, and is at the centre of the optimality of the SF design.

A second type of externality that works through factor productivity can be associated with improved supply conditions in the economy brought about as a result of investment in human capital and public infrastructure. These can be incorporated into HERMIN by endogenising the “scale” parameter in the CES production function, ‘A’, which is now modelled as a function of the stock of public and human capital. Increases in the value of ‘A’ imply that for a given amount of private capital and labour, a higher level of output is produced.

We can illustrate this schematically in terms of the simple production function

\[ Q = A \cdot f(K, L) \]

where A is the scale parameter, which can be considered to represent the state of technology, and K and L are the capital and labour inputs, respectively. Public infrastructural investment will increase the efficiency of the market services sector by cutting down on the costs of producing transport and other communication services, and by opening up greater opportunities for domestic competition to take place in the provision of non-traded goods. Such cost reductions will have a favourable supply-side effect on the internationally exposed manufacturing sector.

The infrastructure factor productivity externality can be incorporated into the production process in manufacturing and market services as follows:

\[ A_t = A_0 \left( \frac{K_{GINF_t}}{K_{GINF_0}} \right) \eta \]

where \( A_0 \) is the original (i.e., pre-SF) estimated value of the scale parameter and \( \eta \) is an unknown externality elasticity that can be assigned different numerical values in the empirical model.

Similarly, the SF programmes on education and training can be considered to promote the efficiency of the workforce in both manufacturing and services sectors and can give rise to a human capital externality. Incorporation of externality effects associated with the accumulation of human capital is not as straightforward as in the infrastructure case, since there is no readily available measure of the stock of human capital equivalent to the stock of infrastructure. However, one can estimate a measure of the extra number of trainees funded by the SF schemes. Hence, as a first approximation, one can use the inputs into training as a measure of the unknown outputs, although if the training courses are badly designed and poorly executed, the

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\[ 14 \] Thus, if the stock of infrastructure increases by 1 per cent relative to the baseline stock, output in manufacturing (OT) is boosted by \( \eta_1 \) per cent. If the stock of human capital increases by 1 per cent relative to the baseline stock, output in manufacturing (OT) is boosted by \( \eta_2 \) per cent. The modelling of these two stock accumulation processes in the HERMIN models is described in detail in BRADLEY, KANGUR AND LUBENETS, 2004.
relationship between training and increased human capital will be tenuous.\footnote{The macro output effects of a poorly designed training scheme, whose implementation was measured in terms of inputs, would show up in the form of very low externality elasticities.} Prior to the implementation of the SF, the number of labour force participants trained to a specified level, $N_{TRAIN_0}$, can be assumed known. If the SF is used to train an additional number of people, giving a total of $N_{TRAIN_t}$ trained labour force participants in year $t$, then the scale parameter in the production function can be modified as follows:

$$A_t = A_0 \left( \frac{N_{TRAIN_t}}{N_{TRAIN_0}} \right)^h$$

where $A_0$ is the original estimated value of the scale parameter. In the empirical model, this externality can be incorporated into the treatment of both the manufacturing and service sectors.

Note that we do not include any eternality mechanisms for the third type of SF expenditure, i.e., direct production/investment aid to the private sector. These are assumed to lower the user cost of capital, and have no long-term enduring effects.

\section*{8 Evaluating SF policy impacts}

The dilemma facing policy analysts when they use macro models to evaluate the impacts of Structural Fund programmes is that they cannot know how appropriate the design of the SF is in addressing a country’s future development challenges. Nor can they anticipate how effectively the SF investment programmes will eventually be implemented. At best, they can arrive at an informed qualitative judgement on the appropriateness of the SF, drawing on any available monitoring and micro analyses. Information can also be drawn from economic theory, detailed quantitative knowledge of the economy being analysed, and examining the impacts of any previous SF-like investment programmes. The insistence by the Commission that strict monitoring checks be observed helps towards more effective implementation, but cannot guarantee it.

During SF implementation, investment expenditures are a flow (the expenditure of $x$ euro per year). But their cumulative impact is to cause a long-lasting rise in stocks. For example, the stock of higher quality roads will increase. If these roads link up to each other, and serve to connect the main urban areas of a country, the economic “effectiveness” of the road stock also increases. Much the same applies to raising the “stock” of human capital, measured as the accumulated training and skill level of the national work force.

It is these increases in the stock of physical infrastructure and the stock of human capital that can generate spill-over (or externality) benefits to the rest of the economy, mainly in terms of increased output and higher productivity. To gauge the magnitude of these spillovers, analysts need to know the approximate values of four parameters: $\alpha_1$, $\alpha_2$, $\beta_1$, $\beta_2$, where:
1 % increase in the stock of infrastructure raises output by $\alpha_1$ %
1 % increase in the stock of infrastructure raises productivity by $\alpha_2$ %

1 % increase in the stock of human capital raises output by $\beta_1$ %
1 % increase in the stock of human capital raises productivity by $\beta_2$ %

These parameters have been the subject of very extensive international empirical research (see BRADLEY, MORGENROTH and UNTIEDT, 2002 for details). Based on an exhaustive review of this literature, one can bracket the upper and lower bounds and define the average values. In all cases a lower bound of zero appears reasonable. The range of elasticities (output elasticities of between 0.0 and 0.4, and productivity elasticities of between 0.0 and 0.2) are found in the literature. More is known about the role of infrastructure than about human capital. A further crucial question is that of the interaction between infrastructure and human capital. However, these links have yet to be investigated in the new growth literature, and we can say very little about them. The implication is that policy analysts cannot yet say much about the likely optimum balance of expenditure within a Structural Fund programme as between physical infrastructure and human resources.

9 A brief overview of Structural Fund macro impacts

HERMIN-type macro models have been used to evaluate the impacts of Structural Funds since the first Irish SF programme of 1989-1993 (BRADLEY, FITZ GERALD and KEARNEY, 1992). We illustrate the kinds of impacts using the most recent study, which examined proposals for the forthcoming programme that will cover the years 2007-2013. In these policy simulations the exact injection of Structural Funds (the EU finance plus domestic co-financing) differs between countries. For the new member states of the CEE region, it amounts to between 5 and 6 per cent of GDP per year for the period 2007-2013, inclusive of both the EC and the domestic co-finance elements. For Greece, Portugal and the Italian Mezzogiorno, it is in the region of 2 per cent of GDP per year; for East Germany, about 1 per cent, and for Spain, about 0.7 per cent.

In the absence of any information to the contrary, we make the assumption that all countries will implement the SF programmes with equal efficiency and effectiveness. Translated into model terms, this requires the use of identical mechanisms as well as identical elasticities for the policy externality elasticities, which are key influences on the longer term supply-side impacts of higher levels of the stock of physical infrastructure and of human capital. Consequently, the simulation outturns can only differ because the underlying HERMIN models for the different countries have different properties. This will arise due to the different sectoral structures in the economies being studied, the differing degrees of openness, the different calibrated parameter values in the HERMIN behavioural equations, etc.

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16 See BRADLEY, GÁCS, MORGENROTH AND UNTIEDT, 2004 for full details. This report also contains a full set of references to SF evaluations using the HERMIN models since 1989.
17 In a sensitivity analysis (not reported here), it is possible to examine the likely impacts of well-implemented and poorly implemented NDPs. Our reported results are for the average implementation effectiveness case.
While the Structural Fund investment expenditures are being made, and the stocks of physical infrastructure and human capital are increasing, the growth rate of GDP increases above the no-SF baseline value. However, when the SF investments terminate, the two stocks stabilize at their new (higher) values, the growth rate returns to its baseline value, but the level of GDP is at a higher value. Thus, the enduring benefit of the SF is an enduring higher level of GDP and not a permanent rise in the growth rate.

Models can be used to evaluate policy impacts on a wide range of target variables. But in what follows we focus on GDP, and only present summary results. The goal of the Structural Funds is to promote long-term convergence. Hence, the transient “demand” effects that arise during the seven-year implementation phase are of less interest than the enduring longer-term benefits. We take the year 2020 as the terminal year for the simulations, i.e., seven years after the 2007-2013 programme terminates. We summarise the long-run impacts on the level of GDP that were derived from all models in Table 2 below, where we have ranked them in order of decreasing impact.

*Insert Table 2 about here*

In the absence of any permanent increase in the GDP growth rate, the actual impacts of SF 2007-2013 as simulated in the HERMIN models might appear quite small. What Table 2 asserts is that (in the case of the Czech Republic), the level of GDP in the year 2020 will be 4.4 per cent higher than the level that it would have been in the complete absence of Structural Funds, and in the absence of any other policy changes (such as compensating domestic policy initiatives in the area of public investment). Since the “new” member states have levels of GDP per head that are between 35 and 55 per cent of the EU average, these would represent rather modest convergence steps.

A better summary measure of the likely return from Structural Fund investment expenditures is given by the “cumulative” multiplier, which attempts to capture the continued (if modest) semi-permanent increase in the level of GDP that should persist after the policy is terminated in the year 2013. Its definition is as follows:

\[
Cumulative \ SF \ multiplier = \frac{Cumulative \ % \ increase \ in \ GDP}{Cumulative \ CSF \ share \ in \ GDP}
\]

The cumulative SF multipliers for the full period 2007-2020 are shown in Table 3, where we have ranked them in order of decreasing size.

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18. The “no-SF” baseline usually assumes that the domestic authorities do not implement a domestically financed alternative. Other more realistic baselines could be used.

19. The stocks on physical infrastructure and human capital eventually decay due to depreciation, but this is a second order effect. See SIANESI AND VAN REENEN, 2002, for a discussion of “level” versus “growth rate” impacts of investment in human capital.

20. The interested reader is directed to the report prepared for DG-REGIO, which is available on the Commission web site (BRADLEY, GÁCS, MORGEnROTH AND UNTIEDT, 2004).

21. In ESRI, 1997, the HERMIN models for the three cohesion countries and Spain were used to evaluate the joint impact of the Structural Funds and the Single European Market initiative.
The case of the Czech Republic is illustrated in the following two graphs. In Figure 1 we show the evolution of the accumulated total Structural Fund injection, expressed as a percentage of Czech GDP. This consists of the EC contribution plus the domestic co-finance contribution that must be funded by the Czech government out of its own resources. The SF programme is assumed to cease at the end of 2013, and after that the accumulated total stays fixed at its end-year 2013 value of 34 per cent of GDP. Thus, the annual SF injection is about 5 per cent of GDP per year, for five years.

In Figure 1 we also show the evolution of the accumulated percentage increase in the level of Czech GDP. This starts off in year 2007 as slightly smaller than the SF injection, i.e., the impact multiplier is slightly smaller than unity. But it grows faster than the SF injection over time, under the influence of the Keynesian multiplier (during the implementation years, 2007-2013), and under the output and productivity-enhancing influence of the rising stock of infrastructure and human capital. This latter effect endures after the implementation phase is over.

The evolution of the cumulated SF multiplier is illustrated in Figure 2. From an initial value of slightly below unity, it increases steadily over time, reaching a value of 2.8 by the year 2020. In interpreting this number, two caveats need to be borne in mind. First, we have assumed values for the “spillover” parameters that are in the mid-range of values found in the international literature. Higher values would give higher multipliers; and lower values, lower multipliers. Second, the depreciation rates that we have assumed for the stock of physical infrastructure and human capital (2.5% and 5%, respectively) are probably on the low side. If these were higher, then the cumulated multiplier would level off a few years after the 2013 termination date, and start to decline.

Table 2 suggests that the 2007-2013 SF recipient countries tend to fall into three separate groups:

**Group 1: Star** performers, with cumulated multipliers of between 2.0 and 2.8. This includes the Czech Republic, Slovenia, Estonia, Poland and Portugal. For these countries, the returns from SF investments are high.

**Group 2: Average** performers, with cumulated multipliers of between 1.6 and 2.0. This includes Latvia, Romania, Spain and Hungary.

**Group 3: Under** performers, with cumulated multipliers near unity. This group includes East Germany, the Italian Mezzogiorno and Greece. For these countries/regions, the returns from SF investments are low.

In all the above model simulations we have used a common set of “average” “spillover” parameters, so the difference in performance must originate in differences in the underlying structures of the economies in question. If the assumed sizes of the
“spillover” parameters differed from country to country – thus capturing qualitative differences in design and implementation efficiency - , the ranking in terms of size of cumulative multiplier would change. But in light of the problems of modelling in Eastern Europe, perhaps it would be unwise to read too much into the differences between the star and the average performers.

It must be stressed that our analysis is not “bottom up”, in the sense of working from very detailed Structural Fund measures, up to Operational Programmes, and finally up to the aggregate effects. In fact, only three pieces of SF data are used that can influence the size of the cumulative multipliers: the distribution of EU funds between investments in infrastructure, human capital and direct investment aid to the productive sectors. The actual size of Structural Fund injection is filtered out by the normalization involved in the calculation of the cumulative multiplier. In reality, everything will depend on the actual mix of projects in the NDP, as well as the organizational ability to utilize and implement CSF efficiently and effectively. So, our model-based macro results are merely broad ball-park estimates. The real challenge is to reconcile the bottom-up micro analysis with the top-down analysis. Until this is achieved, one should approach macro impact analysis with extreme caution.

References


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<th>Micro (bottom-up)</th>
<th>Macro (top-down)</th>
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<td>Level of disaggregation</td>
<td>High (individual projects)</td>
<td>Low (aggregated, whole economy)</td>
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<tr>
<td>Use of theory</td>
<td>Weak (judgemental, CBA)</td>
<td>Strong (macroeconomics)</td>
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<td>Model calibration</td>
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<td>Treatment of externalities</td>
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Table 2: Increase in the level of GDP by year 2020
(% change over “no-SF” baseline level)

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Table 3: *Structural Fund (2007-13): Cumulative multipliers*

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*Mezzogiorno*
Figure 1: Evolution of accumulated SF injection (as % of GDP) and the accumulated percentage increase in the level of GDP.
Figure 2: Evolution of the Czech cumulative SF multiplier