FOCUS

EU Cohesion Policy

Iain Begg, Christiane Krieger-Boden, Kadri Ukrainski, Hanna Kanep, Margit Kirs, Erkki Karo, Cristina Serbanica, Daniela Luminiţa Constantin, Alina Schoenberg, Marcus Drometer and Chang Woon Nam

CESifo

Reproduction permitted only if source is stated and copy is sent to the ifo Institute.

www.cesifo-group.de

CESifo FORUM

FOCUS

EU Cohesion Policy

SPECIALS

SPOTLIGHT

TRENDS

EU Cohesion Policy

Iain Begg

Innovative Directions for EU Cohesion Policy after 2020[1]

Much is expected of EU cohesion policy, but it may struggle to deliver because some of the demands on it pull in competing directions and the resources assigned to it are relatively limited. Even so, it is the policy that currently absorbs the highest share of the EU budget and, with the process of negotiating the next Multi-annual Financial Framework (MFF) about to start, the objectives, scale and scope of the policy will come under renewed scrutiny.

Several dilemmas and paradoxes characterise cohesion policy. For the European Commission, it is the investment policy of the EU, contributing to the build-up of public capital, yet a sizeable proportion of academic economists consider its function to be primarily redistributive. Its roots are in regional policy, implying selectivity in the territories it supports, but in the last two MFFs, there have been cohesion policy interventions in even the richest member states. Moreover, certain social aims of the policy are not spatially targeted. There are profound disagreements over the results of the policy, with empirical studies of different sorts arriving at conflicting verdicts (see the overview by Bachtler *et al.* 2016).

Some of the most difficult challenges facing the policy will probably be how to fit into the system of EU economic governance. The wider policy architecture has evolved in a number of ways, ranging from the many reforms of macroeconomic governance to the advent of the European Fund for Strategic Investment (EFSI), which can also claim to act as the EU's investment policy. The implications for cohesion policy include managing expectations of which policy does what, including how to reconcile conflicting views on conditionality in these various domains.

This article starts by looking at the demands on cohesion policy and how they can be expected to evolve, then explores what kind of growth is conducive to achieve economic development goals, emphasising innovation. It subsequently turns to governance, identified as a crucial component of a successful policy, elaborating on the challenges of integration with other policies. This leads into a discussion of future directions for cohesion policy followed by a few conclusions.

SHIFTING DEMANDS ON COHESION POLICY

By any standards, the last decade has been an economically and politically turbulent one for the EU. In particular, the protracted recession is likely to have aggravated cohesion problems by destroying existing productive capacity and, perhaps more significantly from the perspective of divergence, the endogenous capacity of regions to raise growth rates. The seventh Cohesion Report (European Commission 2017a) finds that during the crisis years many of the less developed regions lost employment and saw unemployment rise more rapidly than richer regions. Although there are signs that this divergence trend came to an end for employment in 2014 and GDP per head in 2015, the legacy of the crisis years is bound to represent a challenge for future cohesion policy.

The report also points to regions stuck in a middle-income trap, squeezed between a relatively high cost base and a lack of innovation capacity. It goes on to emphasise the contribution made by cohesion policy to investment, noting that it provides "funding equivalent to 8.5 percent of government capital investment in the EU, a figure which rises to 41 percent for the EU13 and to over 50 percent for a number of countries" (European Commission 2017a, xxii). At a time of low pubic investment in many member states, this investment role is often crucial, but so too is the contribution of cohesion policy to alleviating the adverse social consequences of the crisis. The difficulties of dealing with migration add to these demands.

Funding for cohesion policy is unlikely to remain at its current level. The combination of the expected loss, following Brexit, of at least some of the British net contribution to the EU budget, along with demands

Iain Begg
London School of Economics and Political Science

to fund 'new priorities', will trigger a search for cuts in established lines of expenditure.[2] A strong *status quo* bias (Begg 2018) is likely to deter huge changes, but both Cohesion Policy and direct payments under the Common Agricultural Policy (CAP) are likely to be vulnerable to some reduction in funding.

Several recent contributions to the analysis of regional disparities and the drivers of regional development can be expected to influence future cohesion policy. A major worry for the EU in an era of intense global competition has been the decline in productivity growth. While the continuing relative decline of industry is part of the explanation, a distinctive cause for concern is the growing gap between lead regions and lagging regions in productivity growth. This suggests a problem of diffusion of new technologies and leading-edge activities. It also implies a different approach to economic development policy in which the focus is more on identifying and overcoming obstacles to innovation-led growth. As Bachtler *et al.* (2017) note, commenting on the growing productivity gaps: while EU market and economic integration has been a successful convergence machine for countries, these gains have not been distributed equally inside each country.

WHAT KIND OF GROWTH?

Many of these demands on cohesion policy invite a reappraisal of the model of economic growth and development. Since 2006, the conflation of cohesion policy with the EU's Lisbon, Europe 2020 and Sustainable Development strategies signalled the objective of facilitating wide-ranging structural reform. This objective sits uncomfortably alongside the treaty goal of reducing regional disparities. However, it also implicitly acknowledges shifts in thinking on the determinants of growth, giving greater weight to endogenous growth, mobilising local potential and going beyond mere 'catch-up'.

There are striking trends in what makes regions attractive to the growing areas of economic activity, leading Iammarino *et al.* (2017, 4) to argue that "the current long wave of development fundamentally favours geographical concentration of the best jobs and most innovative activities". Cities, in particular, have become recognised as the sources of much of the innovation occurring in advanced economies (Florida *et al.* 2017). The importance of metropolitan areas in leading regional development is likely to be greater after 2020 because successful cities attract both more advanced business services and increasingly prominent creative industries. In this regard, and in contrast to their experience in earlier decades, there has been a resurgence in many (though by no means

all) regions characterised by large cities, reflecting their attractiveness to these high-value services and creative industries.

Although there are systematic influences on the concentration and dispersion of economic activity (for an overview, see Iammarino *et al.* 2017), their incidence on the prospects of individual regions can be very diverse. Growth potential is influenced not only by public investment, but also by the sectoral mix in a locality (Boschma *et al.* 2017) and how it relates to innovation. High value-services and other 'knowledge' sectors are strengthened by spending on 'digital' rather than on the sort of R&D supportive of innovation in manufacturing.

The OECD (2016) has called for a far greater emphasis on productivity as the key to regional development. To redress the widening productivity gap between leading and lagging regions, a comprehensive approach to boosting productivity in laggard regions is required, including not just subsidies, but transformative strategic investments. For cohesion policy, these sorts of investments can be difficult to achieve, partly because of conflicting incentives at national and local levels, but partly also because of capacity constraints in the delivery of programmes.

The most tricky challenge is likely to be how to manage the evolution from an approach in which the emphasis was on physical capital to one focused on innovation. Differences in the innovation performance and, arguably more importantly, in the potential of regions are striking, with only a relatively small group standing out as leaders. This ties into productivity divergence between the relatively small number of regions that are productivity leaders and the larger mass of followers.

The Role of Innovation

Support for innovation has been given increased prominence in cohesion policy over the last three programming periods. However, evidence suggests that its impact on productive potential has been limited (Bachtler *et al.* 2016), while practitioners have found it harder to reframe programmes around an innovation narrative compared to one focused on physical capital.

The OECD has used the term 'democratisation' to advocate an alternative approach to innovation aimed at greater inclusivity, because innovation tends to occur in relatively few firms and localities, leaving others as followers and inhibiting inclusive growth. Given the prominent link from innovation to growth, the inclusiveness of innovation strategies – meaning encompassing localities and social groups hitherto neglected in national policy approaches – could become a significant theme of post-2020 cohesion policy. In arguing for a democratisation of innovation, the OECD (2015, 83) asserts that although there are advantages in clustering, "concentrating innovation

activities and democratising innovation are not opposites". This reframing of the long-running equity *versus* efficiency debates in regional policy implies new thinking on how to integrate sectoral and spatial policy aims in economic development. One option could be to regionalise sectoral policies, such as the promotion of 'digital', much more explicitly.

Smart specialisation has become the favoured approach to innovation support, despite lingering ambiguity over how it should be applied. The underlying problem is how to match aspirations for an innovation strategy with regional potential and capabilities. In particular, the level of competence and experience of those implementing programmes are often pivotal, if under-recognised features. It follows that a strategic approach to enhancing innovation has to emphasise more than innovation policies. Instead, it has to enhance the relevant economic development skills and expertise, create the financial and other frameworks conducive to an innovation culture, and promote engagement with other domains of policy.

The Pattern of Innovation

Basic indicators of innovation, such as patenting rates and spending on research and development as a proportion of GDP, offer some insights into medium and longer term economic development prospects. These data can be somewhat misleading in cases where what is recorded is affected by certain industry clusters or a dominant large company, but the sheer scale of regional level disparities suggests a fundamental challenge for those at the lower end of the scale. Two revealing statistics are the number of patents taken out by high-tech and ICT inventors, expressed per million inhabitants, and recorded in the European Commission's competitiveness database (averaged for 2011–2012). In leading regions, the number is in the hundreds, but there are many places where the rate is in single figures.

The patenting rate on either or both indicators in several of the regions of Bulgaria, Croatia, the Czech Republic, Greece, Poland, Portugal, Romania and Slovakia was zero or one and attained a maximum of eight. The position was slightly better in the Baltic countries, but only one region in Hungary and one in Slovenia achieved rates in double figures, respectively, 16 and 12. In Spain only Catalonia, Madrid and the Basque County had rates above 10 (just), while in Italy the most inventive region (Liguria) had rates of 18 (high-tech patents) and 24 (ICT), but no region in the South was in double figures.

The weakness of all these southern European regions contrasts with those in the North. In Finland, Denmark and Austria, all regions were in double figure for both indicators and, in Sweden, even the more remote and rural regions, although in single figures, exceeded the best of the first group listed above. The intensity of patenting on these two indicators in the most inventive regions of Finland, Sweden, Germany and the Netherlands was as much as twenty-five times as high as the best of the first group and ten times as high as the best in Spain.

Data on the intensity of research and development, for which a key Europe 2020 target is to attain 3 percent of GDP, tell a similar story. Several northern regions exceed this target, albeit with the highest rates concentrated in relatively few regions, such as Braunschweig (7.3 percent), Stuttgart (6.0 percent), Styria (4.9 percent), Midi-Pyrenées (4.8 percent) and East Anglia (4.7 percent). By contrast no region in Croatia or Romania has an R&D share of GDP above 1 percent, and there is only one each in Bulgaria (Yugozapaden, with 1.1 percent), Greece (Crete, with 1.4 percent) and Slovakia (Bratislava, with 1.6 percent). Indeed, in the South and among those member states that acceded to the EU from 2004 onwards, there is just one region (the Basque country, at 2.2 percent) in which R&D spending is above 2 percent of GDP.

How much does this matter? Plainly, regions with economies dominated by primary activities or tourism are far less likely to need, let alone have advanced innovation systems and thus to score well on innovation indicators. But to the extent that a capacity to innovate is vital for making the transition to newer and higher productivity economic activities, capable of sustaining higher incomes, the weak innovation record in so many regions already at the wrong end of the income league tables is worrying. An attendant risk is of locking a region into a low growth and/or low income equilibrium is often reinforced by incentives for more qualified workers to leave. If potential investors associate a region with only a limited range of skills and a relative dearth of higher skills, they will only create jobs attuned to this skills mix. The upshot is likely to be a bad equilibrium, as De Stefanis (2012) shows for labour markets in southern Italy. Much the same reasoning is likely to apply to the propensity to innovate. For regional policy generally, and cohesion policy specifically, the challenge is how to break such a pattern.

GOVERNANCE AND ADMINISTRATIVE CHALLENGES

How effectively space-based policies are implemented has become recognised as vital, bringing various aspects of governance to the fore (Rodriguez-Pose 2013). They include the notion of the 'logic of intervention', with the message for regional actors that they will need a more effectively designed conceptual basis for future programmes. In practice, regions have to identify what it is in the region that inhibits development; and thus what needs to be overcome to make progress. They then have to establish realisable objectives that address these needs and to focus on results in the implementation of the programme. While

Figure 1

Shares of EFSI Approvals by Project Type
As of 06 February 2018
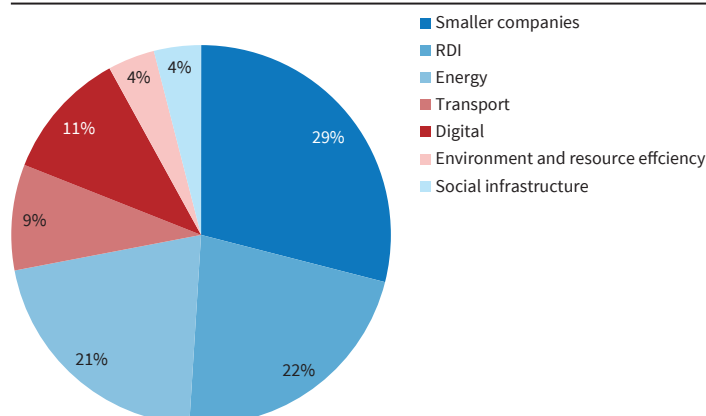
Source: European Investment Bank.

© ifo Institute

this might seem both obvious and desirable, it implies a shift away from a mentality of simply spending the money, spreading it to satisfy competing local interests, or of being concerned principally about direct project outputs, such as kilometres of road built or business supported.

Instead, an intervention logic should articulate a development strategy capable of achieving the desired transformation of the economy supported: out*comes* rather than out*puts* (Bachtler *et al.* 2016). These strategic objectives should, moreover, evolve as successive milestones are achieved. This approach is intrinsically more complex and may require different skills from economic development practitioners as interventions shift from more familiar investments in basic infrastructure to some of the less tangible forms of support for human and social capital enhancement or for inclusive growth.

Deficiencies in governance can have a debilitating effect on the results of cohesion policy for two distinct reasons. Firstly, they can mean, simply, that available resources are not used in a timely manner and may, in the extreme, be lost to the region. This effect is compounded if complementary investment is deterred. Secondly, they may mean that the coherence and quality of the programmes and projects undertaken may be sub-optimal, and thus that they contribute too little to regional development. Poor quality administration does not necessarily signal corruption, or that there is illegality, though they may coincide.

Policy Integration

At an EU level, policy integration has to reconcile what falls under the umbrella of cohesion policy with the substantial intervention of the European Fund for Strategic Investment (EFSI), but also with the recast governance of economic and monetary union. In parallel, local inputs are vital to avoid the obvious traps of too prescriptive a policy model.

The original aim of EFSI was to support investment projects which either would not have been carried out, or only undertaken on a smaller scale, without the support of the fund. As with the EU's Horizon 2020 research programme, EFSI was not intended to have geographical quotas and there was to be some preference for riskier projects. Information on the dedicated EFSI web-site shows that transport and energy projects account for 30 ercent of projects approved, but also that just under 30 percent of the funding went to SMEs and 22 percent to research development and innovation, but only 11 percent to 'digital' projects (Figure 1).

Some projects, for example for hospitals or social housing (under the heading of social infrastructure) or for airports and railway rolling stock (under the transport heading), seem to be similar to those that would be funded under cohesion policy. There is a surprisingly large variation in the value of EFSI projects approved to date, with some countries having few projects and low rates of investment, including Germany and Britain (highlighted), whereas Bulgaria, Greece (highlighted) and Portugal have had approvals close to one percentage point of 2017 GDP.

There is a sharp contrast between the allocation of EU spending among member states for cohesion

Figure 2

Value of EFSI Projects Approved as a Proportion of 2017 Nominal GDP
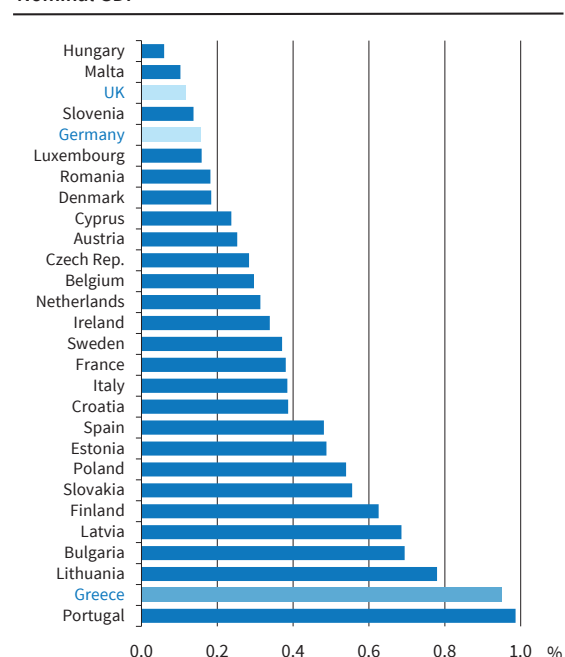
Source: European Investment Bank.

© ifo Institute

Figure 3

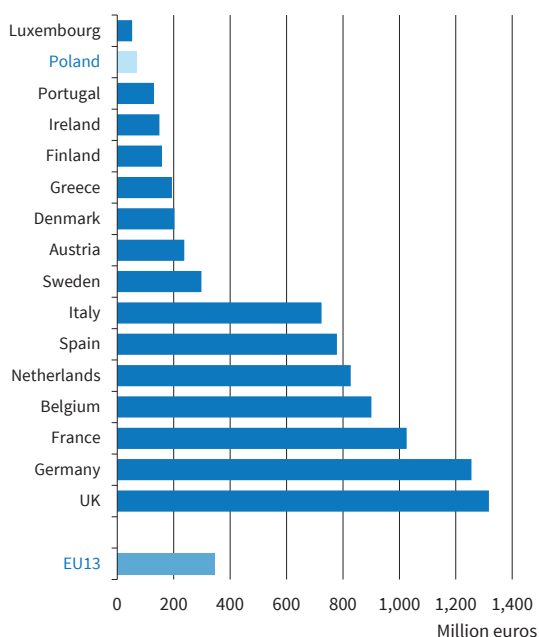**Distribution of EU Research Funding among Member States in 2016**

Source: EU Financial Report (2016). © ifo Institute

policy compared with spending on research. Figure 3 shows strikingly how research spending flows overwhelmingly to richer member states in North-West Europe. In fact, as can be seen from the last column in the research chart, the aggregate amount for all thirteen countries acceding to the EU from 2004 onwards is barely higher than Sweden and well below the Netherlands: 4 percent of the total research budget. By contrast, as Figure 4 shows, the newer member states are major beneficiaries from cohesion policy, securing 55 percent of the total disbursed in 2016.[3] Even here, the substantial amounts accruing to 'older' Europe (Greece, Italy, Portugal and Spain) are noteworthy.
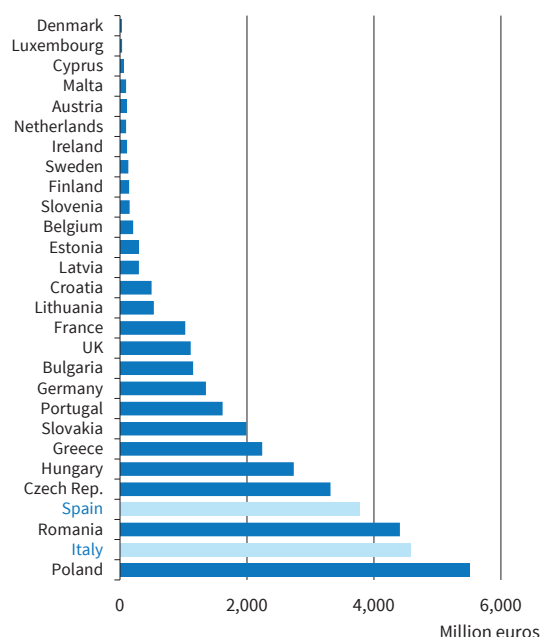
Conditionality

A likely area of contestation in the design of policy will be conditionality, a term that elicits strong reactions, but also encompasses very distinct procedures. *Ex-ante* conditionalities were among the reforms introduced in 2013, requiring recipients of support from the European Structural and Investment plans to have strategic plans, including provisions for enhancing institutional capacity to deliver. The emerging evidence suggests that these obligations have improved the quality of operational programmes and should be further refined for policy beyond 2020.

[3] Data for a single year may potentially give a somewhat distorted picture, but 2016 is not only the most recent year, but is also well into the respective programmes; and thus less likely to reflect the delays in starting programmes that were a feature of cohesion policy spending in a number of member states.

So-called macroeconomic conditionality is much more contentious because it links Cohesion Policy programmes to (especially) compliance with the various disciplining processes associated with assuring the effective governance of EMU. Part of the rationale is that public investment will achieve less if it is not accompanied by discipline in public finances, because its absence will deter private investors and public co-financing will be hard to obtain. Moreover, if appropriate structural reforms are not undertaken, investments supported by regional policy will generate a lower effective return. Although sound governance in this context relates to actions of national governments, what regional governments do cannot be seen in isolation, and an implication is that the latter nevertheless have a responsibility to ensure that the national level conforms to rules and recommendations. As explained in the 6th Cohesion Report: "macroeconomic conditionality, therefore, increases the incentive for all tiers of government to manage public finances prudently and there is a collective responsibility to ensure this" (European Commission 2014, 248).

There have also been suggestions to extend the principle to compliance with other political aims such as sharing the burden of coping with asylum seekers. Macroeconomic conditionality was hotly contested in the run up to the current programme period, but a closer link to overall economic governance and the semester process is foreshadowed in the Reflection Paper on the EU's finances (European Commission 2017b). The two questions at the heart of this are,

Figure 4

Distribution of EU Cohesion Policy Funding by Member States in 2016

Source: EU Financial Report (2016). © ifo Institute

firstly, whether incentives can be suitably aligned; and secondly, whether the proposed conditions are enforceable.

The incentives dilemma is that a regional programme could be subject to curbs because of the actions of a national government over which the region holds no sway. For example, failing to implement country-specific recommendations under the European semester, to correct a fiscal deficit under the Stability and Growth Pact (SGP), or to unwind a macroeconomic imbalance (the MIP) could be triggers for penalties. Experience of enforcement of fiscal and other macroeconomic rules is not encouraging, with recent evidence suggesting a continuing reluctance to impose the financial penalties provided for under these processes, let alone to go further by suspending ESIF allocations (Begg 2017). At an EU level, political economy considerations have inhibited the use of the financial sanctions notionally available to bolster enforcement.

A more constructive alternative would be to reward 'good' behaviour by reserving a proportion of funding as additional support for recipients meeting relevant criteria. A crucial difference would be avoiding disruption of existing programmes and projects because of suspension of payments, even if the aggregate flow of resources to a programme is initially lower. Moreover, the prospect of receiving additional funding can motivate the identification of new opportunities.

IMPLICATIONS FOR FUTURE COHESION POLICY

A key question is how cohesion policy should adapt to, on the one hand, a changing conceptual basis for regional policy interventions and, on the other, various new demands, ranging from the aftermath of the years of crisis to the long-run dimensions of sustainable economic development. The strong emphasis in the past on physical infrastructure was justified by the manifest gaps in many of the less developed regions of the European Union. While there are still regions insufficiently well-connected, and scope remains for upgrading the stock of physical capital and the services associated with infrastructure, 'softer' policy objectives are becoming more important. The latter include boosting human capital, social inclusion, various facets of governance and, increasingly, the seizing of opportunities afforded by the digital economy.

An implication for cohesion policy is that the barriers to growth have to be identified as part of a 'needs' assessment. The ensuing logic of policy intervention should be to customise support to counter these barriers. Place-based polices, however, have to work in concert with sectoral and other policies, rather than being seen as separate. In this respect, cohesion policy has to move on from optimising purely spatial multi-level governance to integration across policy domains. The catch here is that what is so

easily stated is beset by implementation difficulties, including the formal legal frameworks for different policy domains.

What happens to the EU budget overall is plainly of central importance. Cohesion policy is likely to face a double squeeze from a reduced British net contribution and pressures to allocate more funding to new priorities. In the past cohesion policy has, to some extent, been able to accommodate such pressures by setting its own priorities. Thus, under both the 2007–2013 and 2014–2020 regulations, operational programmes had to devote at least a set proportion to policies to counter climate change. A reshaping of the thematic priorities for 2014–2020 could easily be used to enable cohesion policy to replicate this approach. If, for example, integration of migrants or security were identified as needing additional funding, they could become new themes.

However, it is less likely that cohesion policy will be able to repeat this trick after 2020 for three main reasons. The first concerns the underlying narrative of the EU budget. Europe 2020, while still in the background, has declined in visibility and influence, whereas the annual semester process has been in the ascendancy. Governance of EMU seems set to be more influential, potentially shifting the emphasis from regional and territorial concerns towards the macroeconomics of both fiscal adjustment and sectoral polices. If so, old battles between sectoral and spatial priorities in economic development are likely to be re-fought.

Secondly, after over three decades of cohesion policy in its present form, there will be renewed calls for more fundamental restructuring of the policy. While many incremental reforms have been introduced over the years, especially those applied during the current period, certain key questions have not yet been addressed. For example, should cohesion policy be limited to poorer member states? Thirdly, the politics of budget making are likely to demand visible EU actions to key challenges, making it harder to subsume them within Cohesion Policy. There might, for example, be moves to establish new budget lines for dealing with the integration of migrants or border security, perhaps echoing the Connecting Europe and Youth Guarantee initiatives.

CONCLUSIONS AND IMPLICATIONS FOR THE POLICY REFORM DEBATE

Despite the powerful *status quo* bias in EU expenditure policies, the conjunction of Brexit, the aftermath of years of crisis and the political salience of new policy priorities makes a more comprehensive reform of cohesion policy more likely than in previous rounds. New thinking on the sources of regional economic success makes a fresh approach all the more timely. Yet change will be hard to effect and one imperative will be to avoid overloading cohesion policy. It is perhaps

unavoidable that it will have to find its niche within the overall economic governance framework, but it also has to avoid too many goals and expectations.

Moving towards a more innovation-centred policy should be a priority, but one that requires a more subtle approach than in previous rounds. Building on local knowledge and experience will be vital in devising innovation policies that reflect local capacities, while also avoiding the trap of importing inappropriate policy objectives and instruments. While the smart specialisation philosophy goes some way in this direction, it has struggled where institutional capacity has not been commensurate. More fundamentally, the lesson from the indicators of innovation presented above is that policy has to target the potential for regions to innovate.

The implication for the future can perhaps be summarised as constructing a *policy for innovation*, able to overcome obstacles to boosting innovation and to exploit local advantages, *not just an innovation policy* aimed primarily at stimulating such activity in (particularly) smaller businesses. This implies looking at how different policy mechanisms can add value to innovation efforts. Better integration of EFSI and of EU research funds with cohesion instruments will be part of this approach, but the design of an innovation strategy also has to take account of the role played by finance and research providers. Assuming the aggregate cohesion policy budget is reduced, leverage of complementary funds will become more important. With national funding squeezed, private investment will assume greater importance. However, as noted in the report of the HLGOR (2016), richer member states and regions typically find it easier to make use of financial instruments. The ramifications of a more extensive use of them will have to be monitored taking care to avoid exacerbating disparities.

Conditionality will have to navigate a minefield. On the one hand, a sound appraisal of programmes and projects is needed, especially if the overall budget is destined to shrink. Improved strategic planning and coherent priorities are crucial, and there will be a premium on identifying what has to change for the region to prosper sustainably. However, extreme caution is required in imposing punitive conditionality, both for reasons of fairness and to avoid creating adverse incentives. In this regard, blunt threats to withdraw funding for reasons outside the control of the regional authority are more likely to be counter-productive than helpful. At the same time, having some positive incentives in the form or performance reserves could be beneficial.

Cohesion will also increasingly have to connect to the wider economic governance procedures of the semester, with its country-specific recommendations, and the disciplining mechanisms bearing on fiscal policy and the macroeconomic imbalances. This could prove uncomfortable for economic development practitioners if it means regional priorities have to be reframed to relate to macroeconomic goals. This leads us to the conclusion that cohesion policy has to adapt, which is never an easy challenge to meet.

REFERENCES

Bachtler, J., I. Begg, D. Charles and L. Polverari (2016), *EU Cohesion Policy in Practice*, London: Rowman and Littlefield International.

Bachtler, J., J. Oliveira Martins, P. Wostner and P. Zuber (2017), *Towards Cohesion Policy 4.0: Structural Transformation and Inclusive Growth*, Regional Studies Association, http://www.regionalstudies.org/news/article/towards-cohesion-policy-4.0-structural-transformation-and-inclusive-growth.

Begg, I. (2017), "Fiscal and Other Rules in EU Economic Governance: Helpful, Largely Irrelevant or Unenforceable?", *National Institute Economic Review* 239, R3–R13.

Begg, I. (2018), *The EU's Finances: Can the Economically Desirable and the Politically Feasible Be Reconciled?*, https://www.coleurope.eu/study/european-economic-studies/conferences-events/high-level-policy-dialogues.

Boschma, R., L. Coenen, K. Frenken and B. Truffer (2017), "Towards a Theory of Regional Diversification: Combining Insights from Evolutionary Economic Geography and Transition Studies", *Regional Studies* 51, 31–45.

De Stefanis, S. (2012), *Skills for Competitiveness: Country Report for Italy*, OECD Local Economic and Employment Development (LEED) Working Paper 2012/04.

ECA (2018), *Future of EU Finances: Reforming How the EU Budget Operates*, European Court of Auditors' Briefing Paper, February, https://www.eca.europa.eu/Lists/ECADocuments/Briefing_paper_MFF/Briefing_paper_MFF_EN.pdf.

European Commission (2014), *Investment for Jobs and Growth: Sixth Cohesion Report on Economic, Social and Territorial Cohesion*, Luxembourg: Publications Office of the European Union.

European Commission (2017a), *My Region, My Europe, Our Future: Seventh Report on Economic Social and Territorial Cohesion*, Luxembourg: Publications Office.

European Commission (2017b), *Reflection Paper on the Future of EU Finances*, https://europa.eu/european-union/sites/europaeu/files/whitepaper_en.pdf.

Florida, R., P. Adler and C. Mellander (2017), "The City as Innovation Machine", *Regional Studies* 51, 86–96.

HLGOR (2016), *Future Financing of the EU*, Final Report and Recommendation of the High-Level Group on Own Resources, http://ec.europa.eu/budget/mff/hlgor/library/reportscommunication/hlgor-report_20170104.pdf.

Iammarino, S., A. Rodríguez-Pose and M. Storper (2017), *Why Regional Development Matters for Europe's Future*, Working Paper 7/2017, DG Regio, European Commission.

OECD (2015), *Innovation Policies for Inclusive Growth*, Paris.

OECD (2016), *OECD Regional Outlook 2016: Productive Regions for Inclusive Societies*, Paris.

Rodríguez-Pose, A. (2013), "Do Institutions Matter for Regional Development?", *Regional Studies* 47, 1034–1047.

Christiane Krieger-Boden

What Direction Should EU Cohesion Policy Take?

Christiane
Krieger-Boden
Kiel Institute for the
World Economy

There is little the European Union today needs more urgently than cohesion, unity and solidarity. From this perspective, it seems almost like a miracle that cohesion (earlier known as regional) policy has existed for over 60 years, an exercise in solidarity, building on the financial resources of the EU Structural Funds. Of course, the motives for this kind of policy were quite practical at the outset. The European Social Fund (ESF) was set up in 1957 as a means for providing the booming German and French economies with guest-workers from the unemployment-stricken Italian economy. The European Fund for Regional Development (ERDF) was created in 1975 to compensate the then new entrant Britain for being in a net-payer position *vis-à-vis* the Common Agricultural Policy (CAP). Moreover, the EU funds originally were used solely for refunding the member states for certain costs incurred by them as a result of the EU Treaty; and the EU institutions themselves had no say in this. However, the budgets for this kind of policy increased substantially by a factor of at least 40, or from a share of less than 0.1 percent of EU GDP to over 0.5 percent. For single regions in need, the funds may even amount to up to 4 percent of their GDP. Over the years, the thrust of this type of policy has changed considerably, as has the influence of various central EU institutions on its design and implementation. Now, going into a new programming period 2021-2027 and with Brexit, revived nationalism and general unrest among some member states shaking the very foundations of the European Union, it is time to think about how to further adjust and thereby sustain this element of European unity.

WHY DO WE NEED AN EU COHESION POLICY?

Nowadays the basic cohesion motive guiding the EU cohesion policy and the financial instruments assigned to it, known together as the European Structural and Investment Funds (ESIF),[1] is stated in the Treaty on the Functioning of the European Union

(TFEU 2007) Article 174: "in order to promote its overall harmonious development, the Union shall develop and pursue its actions leading to the strengthening of its economic, social and territorial cohesion. In particular, the Union shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions". Nonetheless, cohesion policy always was, and still is, at the centre of divergent interests in terms of its purpose, and of contradictory arguments in terms of its conception.

Various Interests Trying to Appropriate the Structural Funds

During most of its history, EU cohesion (or earlier regional) policy mainly aimed to reduce regional economic disparities within the Union and cushion economic adjustment processes; in other words it had convergence-oriented redistributive objectives. But even in its early days, cohesion policy was organised according to two different policy threads with different aims and by different European actors, namely the cohesion policy proper under the responsibility of the EU DG Regional Policy and EU state aid control under the responsibility of the EU DG Competition. The latter in particular strived for rule-based EU policy coherently coordinated with the regional policies of member states. Since 2007, cohesion policy has been influenced by a third thread, namely the EU strategic agendas under the joint responsibility of the EU Council and the EU Commission. With the former Lisbon Strategy ('turning the EU into the most competitive and dynamic knowledge-based economy in the world') and the current Europe 2020 Strategy ('smart, sustainable and inclusive growth'), cohesion policy was therefore formally subjected to a largely growth-oriented approach (in line with Art. 179 of the TFEU).[2] Further objectives are also to be observed, *inter alia*, strengthening R&D, expanding ICT infrastructure, supporting SMEs, enhancing cross-border relations, protecting the environment, fighting unemployment, promoting social inclusion, preserving cultural heritage. Occasionally, the idea has been put forward of adding a fourth thread focusing on macroeconomic stability, whereby the ESIF would be utilised for a fiscal policy of balancing business cycles and avoiding currency crises in the European Monetary Union. Cohesion policy might lack coherence and reliability if it is thus torn by various actors into varying directions without clear-cut responsibilities.

---

[1] These include besides ESF and ERDF: the EAFRD (European Agricultural Fund for Rural Development, former EAGGF/Guidance – European Agricultural Guidance and Guarantee Fund, Section Guidance, launched in 1962); the CF (Cohesion Fund, launched in 1993); the EMFF (European Maritime and Fisheries Fund, former FIFG – Financial Instrument for Fisheries Guidance, launched in 1993); and the FEAD (Fund for European Aid to the Most Deprived, launched in 2014).

[2] Art. 179 of the TFEU reads: "the Union shall have the objective of strengthening its scientific and technological bases by achieving a European research area in which researchers, scientific knowledge and technology circulate freely, and encouraging it to become more competitive, including in its industry, while promoting all the research activities deemed necessary by virtue of other Chapters of the Treaties".

Trade-off between Equality and Efficiency

Moreover, given the broad array of objectives for cohesion policy, it is hard to imagine that there would be no conflict between them, particularly between equality (convergence) and efficiency (competitiveness and growth). The European Commission tends to neglect such conflicts and to argue that 'growth and cohesion are mutually supportive' (EU Commission SEC(2004)924). Economic literature, however, casts doubt on the harmony of this relationship. Theories like the new economic geography and the theory of endogenous growth argue that there is a substantial trade-off between growth objectives and convergence objectives.[3] Economic growth tends to occur on a spatially unbalanced basis and favour large agglomerations, particularly in the early stages of an integration process, that is, when trade costs are starting to decline and countries and regions that had been isolated from each other start to increase their economic interactions. Such agglomeration forces tend to be strong, thus all efforts to stop an often-observed exodus from peripheral backward regions have largely proven unsuccessful to date. Some degree of re-dispersion can only be expected in an autonomous self-contained process at later stages of the integration process, when trade costs are sufficiently low. Accordingly, growth for all regions is best promoted in prospering agglomerations, from where, while exacerbating regional disparities, it is expected to trickle down and to lift all boats in the end, thus benefitting the deprived periphery too. A convergence-oriented policy, by contrast, would impede overall growth, since it would diminish agglomeration incentives by supporting backward regions. From this point of view, policies should aim to provide people with opportunities to move to leading areas, and not to relocate production to lagging areas (World Bank 2009). Only very few measures are designed to prevent this trade-off, like boosting further integration in the hope of achieving the redispersion effect at low trade costs; or paving the way for technological progress to also reach the periphery.

Contrary to this argument, it has been pointed out that such trickling-down effects are difficult to verify to date on an empirical basis (OECD 2012), and that backward regions may well dispose of growth potential and may even overtake and replace former growth centres (Rodriguez-Pose 2017). This has been observed, for instance, for the German case of Bavaria or for the US sun-belt regions in comparison to the rustbelt regions.

---

[3] See the comprehensive overviews by Breinlich *et al*. (2014); Proost and Thisse (2015) and the literature cited there; see Redding and Rossi-Hansberg (2017) for an overview over empirical evidence on these theories.

Place-based versus People-based Policies

Closely related to this trade-off is the question of who should be the addressee of cohesion policy. Should it be the poor regions (place-based), regardless of whether some people in the location may be wealthy and privileged; or should it be the needy individuals (people-based) no matter where they live, and should these needy individuals simply be compensated for living in poor circumstances, or activated to discover new opportunities? According to the trade-off argument, people-based policies, specifically activating policies, would clearly be favoured over place-based policies, because the former could be targeted more precisely, and the latter would be deemed inefficient or even distortionary (Partridge *et al*. 2015).[4]

At the other end of the scale, it is argued that location-based policies may help to mobilise the region's own forces for a broad departure from poverty by improving the overall economic environment of a poor region. This approach acknowledges that people may not be as mobile as sometimes assumed. And it takes into account that economically depressed regions, if left on their own as 'places that don't matter', may 'take revenge' by becoming politically radicalized (Rodriguez-Pose 2017). In line with this view, place-based cohesion policies would help preserve democracy and unity in the EU.

Weighing up the arguments, it is the preferences of citizens that should set the yardstick for the appropriateness of policies. Passive redevelopment, the common fate of backward places that are running out of economic activities and inhabitants, may be caused by pull or by push factors. People may feel pulled to large agglomerations due to the higher income levels there and an inspiring urban atmosphere; or they may feel pushed out of their home due to poverty and unemployment. In the pull factor case, a place-based policy aimed at preventing outmigration, would clearly be misguided. In the push factor case, one could advocate some limited start-up support for people mobilising their energies in order to try to help themselves, and at least, no stoke must be put in their wheel.

Fiscal Federalism Ideas on Allocation of Tasks

Another question concerns the allocation of competencies for different layers in a multi-layer government system – specifically for the field of cohesion policy. What tasks and objectives should be pursued at the central EU level, as well as at a national or even local level? The theory of fiscal federalism offers some guidance as to an optimal allocation of tasks and responsibilities between these different

---

[4] Even then, the activating infrastructure, such as education facilities and transport means to promote mobility towards the growth centres, would need to be provided place-based.

layers – for recent overviews, see Oates (2005) and Weingast (2013). Accordingly, tasks should be assigned to the central level: (i) if there are economies of scale in the production of a respective public good; (ii) if there are strong externalities of public policy measures spilling over to neighbouring regions; (iii) if consumer preferences across the lower jurisdictions are relatively homogenous; and (iv) if accountability can be guaranteed better at the central than at the local level. These conditions, however, become less clear-cut, if the asymmetric information and selfish behaviour of principals and agents in the policy field are taken into account. In particular, it is difficult to decide whether the accountability of political actors is best achieved at the most central or the most local level. For several policy fields, the supremacy of the European level for fulfilling the tasks appears obvious due to the conditions (i) and (ii), like trade and competition policies that are indeed under the responsibility of the EU, or defence, foreign affairs and migration policies that are not.

Turning back to cohesion policy, redistribution as one of its objectives is also conceived as a central task due to economies of scale and externalities. Within-country redistribution, however, should be in the competency of the nation states (under some EU-wide rules preventing migration flows induced solely by social security differentials between member states). The EU level should primarily be responsible for between-country redistribution, even more so as this is often seen as a form of compensation for the regional inequality caused by the European integration process itself.[5] Similarly, growth policy may be understood as a central responsibility, if one believes in the necessity of supporting outstanding growth centres for the benefit of all. Moreover, as far as negative spill-over effects occur, a system of unit subsidies for internalising them would be coordinated most effectively at the central level. Centralised redistribution policies may also act as insurance against asymmetric shocks, in order to mitigate coerced pro-cyclical spending behaviour at the local level.[6] Some inter-jurisdictional transfers therefore seem to be required at the EU level, and the related flow of funds needs to be centrally organised, as is the case with the ESIF and EU cohesion policy.

A different question is whether the central EU level should also be responsible, and to what degree, for the implementation of redistributed funds in local projects. From the standpoint of preferences that are likely to be quite heterogeneous between different jurisdictions, local responsibility may seem more appropriate. At the local level there may be

better information available on the preferences of a constituency, and the varying exigencies of different jurisdictions may be better matched than by a central all-purpose blend. A better informed and more closely engaged electorate may ensure a better accountability of implemented policy actions. Moreover, variation in public goods between local jurisdictions may allow for voting on foot, enabling people to sort themselves into more homogenous units. But local jurisdictions may, on the contrary, also be in danger of log-rolling due to some sort of local nepotism, and the temptation may arise to try to raid the commons. Centrally organised transparency and monitoring of local funding decisions may be required, as well as strict no-bail-out rules, to limit access by the lower authorities to the funds distributed from above.

CURRENT STATE OF EU COHESION POLICY

Considerable progress has certainly been observed in the objectives of cohesion policy. EU regions did grow as intended, and productivity increased – although perhaps not as swiftly as for some competitors. There was also some Europe-wide convergence between countries in terms of per capita income, productivity, and even industrial structures. At the same time, however, regional disparities within countries remained considerable, and even increased in some cases. Numerous influences may have driven these results, starting with an autonomous trend towards income convergence between countries observed worldwide. In addition, there are several policy fields other than cohesion policy interfering – by the EU as well as by member states – some of which, acting spatially-blind, that end up favouring agglomeration areas rather than the periphery (such as research policy, deregulations, bail-outs for endangered trusts and for banks during the financial crisis, etc.). It is thus difficult to assign cohesion success or failure to any specific cohesion policy.

Are EU Transfers Effective?

A vast number of reports and studies on the effects of the EU cohesion policy have been undertaken over the years, many of them commissioned by the EU DG Regio itself as a background to its various cohesion reports, and others independent of such commissions. The evidence that they provide is rather mixed.[7] Several studies, including the EU official reports themselves, find that cohesion policy has positive effects on the GDP of the assisted regions, or, a usually less pronounced impact on its employment. Some results suggest a peak for efficiency, beyond which further funding is useless (Becker *et al.* 2012; Cerqua and Pellegrini 2017). Other studies find few results or such that are

---

[5]   The governments of member states could also agree on certain amounts of re-distribution among themselves. However, due to the impossibility of formulating complete contracts, it is useful to transfer the more detailed interpretation of it to a superordinate level, namely the EU.

[6]   The ESIF are, at any rate, much too small to offer a really substantial effect of this kind. The best option for balancing business cycles would be a European tax policy, since it would allow for built-in flexibility *via* a progressive income tax.

[7]   For comprehensive surveys of econometric evaluations see Hagen and Mohl (2009); Pieńkowski and Berkowitz (2016), and the literature cited there.

conditional to the availability of further determinants like human capital or good institutions (e.g. Rodriguez-Pose and Garcilazo 2015). A few studies find overall negative results. The ambiguity of these results seems due to the variation in the design of the studies, which differ considerably regarding approaches, observation areas and periods (Dall'Erba and Fang 2017). All in all, the results of cohesion policy do not seem very robust.

Moreover, even although the identification strategies of such studies have grown increasingly sophisticated, they still suffer from the difficulties of obtaining detailed time-series data and of defining the counterfactual situation. Several adverse effects related to the implementation of the policy are difficult to consider in such estimations. These effects include losses through the pocketing of funds for projects that would have been realised anyway; waste in the form of deserted industrial parks, for instance, due to a lack of absorption capacity in the assisted regions; unintended substitution effects when capital-intense production is boosted in regions plagued by high labour unemployment. The opportunity costs of alternative uses of funds are also hardly ever taken into account. All of these factors cast even greater uncertainty over the net benefit of cohesion policy measures.

To What Extent Does EU Cohesion Policy Align with Its Own Explicit Objectives?

As described above, the asserted cohesion objectives changed over time and became increasingly diverse. However, if one observes the allocation of the ESIF appropriations during several periods, it becomes obvious that the largest amounts of the ESIF were always dedicated to the convergence objective (including the 'cohesion fund' in Figure 1). Other objectives

like modernisation of employment (including measures against long-term and youth unemployment), or help for regions under structural adjustment pressure (including regions affected by industrial decline or rural transition), or territorial cooperation across borders, gained much less attention. Under the Lisbon Strategy, after introducing with much ado the new growth and competitiveness objective, the allocations to the convergence objective even reached a maximum. They declined somewhat under the Europe 2020 agenda, due to the (re-)introduction of a youth employment initiative and some funding for transition regions, but still account for over 70 percent of all appropriations.

The idea of the Lisbon Strategy and the Europe 2020 agenda was, of course, to pursue growth-oriented targets, even while funding convergence regions under the convergence objective. A cumbersome planning and approval procedure between EU institutions and national and local decision-makers seeks to ensure that the implemented projects are in line with such predetermined objectives and targets. Whether this was successful hardly seems to have been rigorously tested to date. Looking at the lists of transfer beneficiaries, however, may give us a clue. The Commission publishes these lists in order to meet the transparency requirements;[8] but they are only available in the language of each respective country. The quality of the information provided differs considerably between the various countries, but often tends to be sparse. In Germany at least, most of the resources seem to go to enterprise investments, for 'environmental consulting and auditing', for hiring an 'innovation assistant', for 'acquiring a five-colour-offset printing machine', or simply for supporting a specific beneficiary (e.g. project 'Wühr Karl' for beneficiary Karl Wühr without any further explanation). Other resources go to communities and development agencies, e.g. in Britain, for 'highway construction', 'technology park and industrial estate development', 'urban renewal and development', 'waterfront projects', and 'broadband access'. In Spain, huge amounts of funding go to the central governance institution in each region, such as the Junta de Extremadura and the Generalitat de Catalunya, for all kinds of public investments, without offering any further details. Some bizarre examples

Figure 1

Objectives of ESIF Appropriation, 1989–2013ᵃ
Share in total appropriations
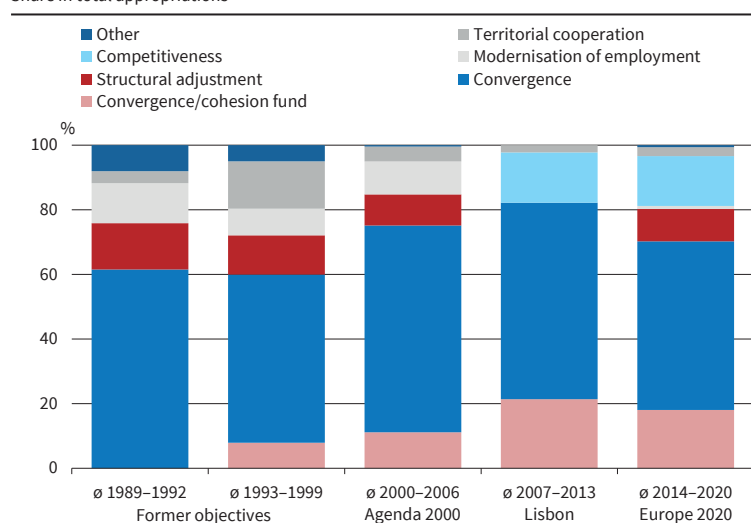
ᵃ For a better comparison across the programming periods, the objective aiming at broadly comparable objectives are aggregated.

Source: European Commission; own calculation.   © ifo Institute

[8]   See European Union online, *List of Beneficiaries*, http://ec.europa.eu/contracts_grants/beneficiaries_en.htm, and http://ec.europa.eu/regional_policy/en/atlas/beneficiaries/.

of funding concern the development of a particular opening sound for re-closable beer bottle caps in Flensburg, or the development of self-unfolding tents, or the worldwide first audio-tracking for a long-distance cycle path. In view of some of these examples, the claim that cohesion policy is oriented towards predetermined objectives sounds a bit hollow.

The Commission tries to further strengthen the alignment of the actual use of the ESIF with the cohesion policy's set of objectives and targets through installing conditionalities such as the 'de-commitment rule' (whereby any committed funding not spent within two years is lost to the respective programme), or the 'Lisbon earmarking' (which requires the allocation of at least 60 percent of expenditure to pre-determined growth-oriented investment categories). Except for the de-commitment rule, however, such conditionalities have neither proven very effective nor particularly appropriate to their aim to date (Bachtler and Ferry 2015).

HOW TO ORGANISE FUTURE EU COHESION POLICY?

To conclude, financial transfers at EU level like the ESIF seem justified and necessary. In accordance with the EU principle of subsidiarity, these funds should continue to augment national policies in cases, where the respective problems are particularly strong so as to require EU-wide solidarity. EU cohesion policy, however, should be organised more coherently in terms of objectives and responsibilities, and more modestly and realistically in its claims. The processes could also be organised more straightforwardly and efficiently.

As far as objectives are concerned, contrary to current practice, mixing redistributive and growth policy objectives should be avoided, since these tend to be conflicting objectives. In line with this, the responsibilities for each type of this policy should be attributed more clearly to one EU actor, instead of the current mixture.

Accordingly, the *cohesion policy proper* should focus on redistributive objectives only. Given the low persuasiveness of cohesion policy effects in the empirical studies, however, it should not nourish high-flying illusions as to the extent of convergence to be achieved. Instead, a modest, perhaps 'old-fashioned' but realistic approach should be pursued. No funds should be directed into physical investment by enterprises, but rather into improvements in basic local infrastructure and local institutions, as well as into investment in human beings.

– The ERDF could thus be directed towards a place-based policy that funds public infrastructure for safeguarding the basic needs of existence and securing equity of opportunities for all European citizens, and in particular for each European child no matter where s/he is born. Minimum standards for education capacities, medical services, care for the elderly and care facilities, transport and communication means should be defined and ERDF funds should help to provide them everywhere in Europe. ERDF funds should also aim to improve public institutions. Projects that fight public fraud, waste and corruption should be given priority, and regions in need should receive training, mentoring, and monitoring.

– The ESF could complement these efforts with a people-based policy. One focus could be the support of unemployment programmes, particularly for activating young people who are already unemployed or in danger of becoming so. A lack of prospects for young and adolescent people in problem areas, and the violence resulting from this, has proven a problem not only of local or national, but of Europe-wide relevance; and European efforts to resolve it therefore seem completely justified. Another focus of engagement for the ESF could be the digitalization process and supporting the adjustments in labour markets that may be required in response to it. Finally, ESF funds should be used to support cross-border exchanges and face-to-face encounters of all kinds of European citizens, be they students, teachers, administrative staff, researchers, craftsmen, managers or from any other background. By getting acquainted and learning from one another, people can acquire that feeling of European unity and solidarity that seems so urgently missing these days.

The *competitiveness and growth policy*, by contrast, should not be pursued by cohesion policy, but rather by means of the Research Framework Programmes, ERASMUS, and similar. Generally, promoting growth is a challenging task in itself. Frequently, growth policies promote some activities or some 'clusters' of activities that are supposed to be of future relevance. However, by the time such future relevance is officially recognised, the respective activities are usually already widespread, able to grow on their own and do not require any more funding. By contrast, the true 'hidden champions of tomorrow', those that really could take advantage of growth support, are not yet known. Growth policy should therefore abstain from the idea of steering growth and should abandon the futile search for growth industries that are worth being funded. The best way to promote growth is to enhance education, particularly higher education, and (unspecific) research, particularly in places where these prosper, that is in agglomerations, and not in peripheral backward regions.

This said, there may be a case for putting a greater emphasis on competitiveness and growth policy by shifting more funds to EU activities supporting research and education, even perhaps at the expense of the ESIF. Moreover, the budget could be expanded at the expense of the Common Agricultural Policy, as was already demanded by the Kok report in 2004.

As far as processes are concerned, responsibility for implementing the transfers into concrete projects should remain largely at the local level, where information on what is needed is more readily available. This is largely the case with EU cohesion policy. But the planning and approval process preceding the implementation is too cumbersome and does not yield the desired results. Reducing it to the definition of a number of conditionalities on what is admissible and what is not may increase its efficiency – if these conditionalities are few, coherent and precise, and if compliance with them is strictly monitored after implementation.[9] Transparency and accountability are important tasks in improving the efficiency of cohesion policy – the monitoring elements of cohesion policy and the publication of beneficiaries' lists are therefore important steps in the right direction (although they should be published in further languages and the explanations should be more profound). Inefficiencies should, however, be disclosed and sanctioned more vigorously.

The little miracle of a cohesion policy based on solidarity is valuable in times of an EU whose members are becoming increasingly isolationist, and even nationalist. It must be maintained over the forthcoming budget negotiations. At the same time, it must be implemented in a way that does not discredit precisely this solidarity.

REFERENCES

Bachtler, J. and M. Ferry (2015); "Conditionalities and the Performance of European Structural Funds: A Principal-Agent Analysis of Control Mechanisms in European Union Cohesion Policy", *Regional Studies* 49, 1258–1273.

Barca, F. (2009), *An Agenda for a Reformed Cohesion Policy: A Place-based Approach to Meeting European Union Challenges and Expectations*, Brussels: European Commission, http://www.europarl.europa.eu/meetdocs/2009_2014/documents/regi/dv/barca_report_/barca_report_en.pdf.

Becker, S.O., P.H Egger and M. von Ehrlich (2012), "Too Much of a Good Thing? On the Growth Effects of the EU's Regional Policy", *European Economic Review* 56, 648–668.

Breinlich, H., G.I.P. Ottaviano and J.R.W. Temple (2014), "Regional Growth and Regional Decline", in: Aghion, P. and S. Durlauf (eds.), *Handbook of Economic Growth*, Volume 2, Amsterdam: Elsevier, 683-779.

Cerqua, A. and G. Pellegrini (2017), "Are We Spending Too Much to Grow? The Case of Structural Funds", *Journal of Regional Science*, DOI: 10.1111/jors.12365, 1–29.

Dall'Erba, S. and F. Fang (2017), "Meta-analysis of the Impact of European Union Structural Funds on Regional Growth", *Regional Studies* 51, 822–832.

Hagen, T. and P. Mohl (2009), *Econometric Evaluation of EU Cohesion Policy – A Survey*, ZEW Discussion Paper 09-052.

Kok, W. (2004), *Facing the Challenge: The Lisbon Strategy for Growth and Employment*, Report from the High Level Group, Luxembourg: Office for Official Publications of the European Communities.

Oates, W.E. (2005), "Toward a Second-generation Theory of Fiscal Federalism", *International Tax and Public Finance* 12, 349-373.

OECD (2012), *Promoting Growth in All Regions*, Paris: OECD Publishing, http://dx.doi.org/10.1787/978926414634-en.

Partridge, M.D., D.S. Rickman, M.R. Olfert and Y. Tan (2015), "When Spatial Equilibrium Fails: Is Place-based Policy Second Best?", *Regional Studies* 49, 1303-1325.

Pieńkowski, J. and P. Berkowitz (2016), "Econometric Assessments of Cohesion Policy Growth Effects: How to Make Them More Relevant for Policymakers?", in: Bachtler, J., P. Berkowitz, S. Hardy and T. Muravska (eds.), *EU Cohesion Policy: Reassessing Performance and Direction*, Abingdon and New York: Routledge, 55-68.

Proost, S. and J.F. Thisse (2015), *Skilled Cities, Regional Disparities, and Efficient Transport: The State of the Art and a Research Agenda*, Paper for EU Horizon2020 – COEURE Project, http://www.coeure.eu/wp-content/uploads/Skilled-Cities-Regional-Disparities-and-Efficient-Transport.pdf.

Redding, S.J. and E. Rossi-Hansberg (2017), "Quantitative Spatial Economics", *Annual Review of Economics* 9, 21-58.

Rodriguez-Pose, A. (2017), *The Revenge of the Places that Don't Matter (and What to Do about It)*, CEPR Discussion Paper 12473.

Rodriguez-Pose, A. and E. Garcilazo (2015), "Quality of Government and the Returns of Investment: Examining the Impact of Cohesion Expenditure in European Regions", *Regional Studies* 49, 1274–1290.

Weingast, B.R. (2013), "Second Generation Fiscal Federalism: Political Aspects of Decentralization and Economic Development", *World Development* 53, 14-25.

World Bank (2009), *Reshaping Economic Geography: World Development Report 2009*, Washington DC: World Bank.

---

[9]   In my view, all funding should also be subjected to the pre-conditionality that the recipient country still adheres to the *Acquis Communautaire*. Should it fail to do so, cutbacks in ESIF allocations should be provided.

Kadri Ukrainski, Hanna Kanep, Margit Kirs and Erkki Karo

Segregation of EU13 Countries in EU Framework Programmes Illuminates Important Challenges for Cohesion Policy[1]

INTRODUCTION

The broader discussion over the synergies of the aims and funds of cohesion policy and the framework programmes (FPs) has been on the agenda on the European level for several years. As far as the EU13 country group[2] is concerned, the most striking problem is the divide compared to the EU15. The trend is still prevalent in the framework of *Horizon 2020* (hereinafter H2020) and is a persistant problem, despite heavy criticism of the issue in the academic debate in the context of FP7 (Rauch and Sommer-Ulrich 2012; Schuch 2014; MIRRIS 2014) and its recent prominence in policy debates.[3]

Previous analyses highlight science excellence, the level of R&D financing, and networking and learning effects (including previous experience and management skills) as the most important structural features for successful participation in FP (Rauch and Sommer-Ulrich 2012; Schuch 2014). In this context, the low participation of the EU13 country group is surprising, despite the growing research capabilities in those countries and simultaneous increases in co-publication rates with EU old members (Makkonen and Mitze 2015). The main reasons have been identified as static network patterns (Okubo and Zitt 2004; Tijssen 2008), as well as geographical, cultural, institutional and technological barriers (Scherngell and Lata 2011). The lower quality of proposals submitted by the EU13 organisations is also highlighted, and derived from the information, knowledge and language barriers that continue to prevail (including the limited understanding of FP, practice in project management and transnational cooperation in general), but also insufficient motivation to participate in FPs. The previous is exemplified by the lack of necessary complementarity for building R&D capabilities and for their exploitation at the national level.

In fact, the EU13 country group finances 22–24 percent and the EU15 country group 1–13 percent of R&D expenditure from abroad (and within the funding-from-abroad category, H2020 plays a varying role and is more significant in Southern, Northern and smaller member states as well as in EU13 countries) – see Ukrainski *et al.* (2017). While FP funding seems to substitute for the resources from other (mainly national) funding sources in old member states, in Central and Eastern European (CEE) countries, it primarily tends to compensate for less developed (knowledge) infrastructures. Hence, it has been argued that FP research subsidies are only a viable option for increasing regional innovativeness in combination with other policies (Varga and Sebestyén 2016b).

The general strategy for small countries is to build their scientific excellence *via* international networks to avoid insulation in increasingly specialised fields of science (Luukkonen *et al.* 1992). Therefore, small nations often try to integrate into a broader range of international cooperation networks, which, however, can compromise the depth of integration. As many EU13 nations are small, integration patterns compared to isolation patterns remain relevant in their research policy agenda. As not all EU13 countries are affected by the same problems and to similar extents; the dichotomy of EU13 *versus* EU15 may somewhat simplify the reality of the situation. Comparing participation patterns between EU13 *versus* EU15 is nevertheless useful to understand progress towards widening of European Research Area (ERA), as well as the performance of national policies encouraging international research collaboration, as well as the more general aims of cohesion policy in research and innovation.

This article aims to evaluate how segregated (separated) or integrated (homogenously distributed) EU13 participants are across projects in FP7 and H2020; and how this segregation has changed over time. The strategy for empirical study is to measure the degree to which a group (EU13) is concentrated in particular projects ('*evenness*' of the distribution); the extent to which one group dominates or shares particular projects ('*exposure*' to participants from other groups); and, the probability (or degree) of contact between members of different groups as a result of their mutual segregation ('*clustering*') – see also Morrill (2016). The article first discusses the changing context of FP7 and H2020 from the cohesion policy perspective, and subsequently presents the empirical standpoints, and discusses these results.

DEVELOPMENT OF FP TOWARD COHESION POLICY AIMS: MAIN CHALLENGES

As mentioned already, FP and cohesion policy are distinct, but complementary policy instruments (programmes) facing the main challenges of general

Kadri Ukrainski
University of Tartu

Hanna Kanep
Universities Estonia

Margit Kirs
Tallinn University of Technology

Erkki Karo
Tallinn University of Technology

---

[1] This article is based on the applied research reports (Ukrainski *et al.* 2017 and 2018) funded by Interreg and the Estonian Ministry of Education and Research as well as ERDF and the Estonian Research Council.
[2] Under EU13 we mean the following countries and abbreviations throughout the paper: BG – Bulgaria, CZ – Czech Republic, CY – Cyprus, EE – Estonia, HR – Croatia, HU – Hungary, LT – Lithuania, LV – Latvia MT – Malta, PL – Poland, RO – Romania, SI – Slovenia, and SK – Slovakia. Under EU15 group, the rest of EU countries is considered.
[3] See Ex-Post-Evaluation of the 7th EU Framework Programme 2007–2013 (2015); European Commission (2016b and 2017a).

fragmentation, but particularly of weak coordination and strategic alignment between different policy levels (European, national, regional). Better interoperability, mutual enforcement, and synergies have therefore been seen as essential in forming a common frame-work for research and innovation (Van Vught *et al.* 2011).

Over time, the policy rationales behind the FPs have become more oriented towards overcoming existing structural differences and creating the integrated ERA (see Nedeva 2013). However, the ambivalence of the European 'research, development and innovation' (RDI) policy in terms of strengthening the competitiveness of its leading parts and improving the conditions of those performing poorly in the same institutional and policy frame-work arguably exacerbates the existing structural problems of ERA (Young 2015; Lepori *et al.* 2015; Karo and Kattel 2018) and thus contradicts cohesion policy aims too.

The specific aim of the H2020 was to introduce a break with the past by making major changes in the distribution mechanisms of FPs (primarily aimed at covering the entire innovation cycle together with orientation towards closer-to-market applications and significant societal challenges) – see Table 1.

As this shift has been pursued in the politico-economic conditions still hampered by the last economic crisis (see European Commission 2017b; Karo *et al.* 2017; Young 2015), it has had a two-fold impact on participation patterns in H2020. On the one hand, all national governments across Europe have made participation in EU research funding schemes a central focus in their R&D policy agendas, particularly to compensate for cuts in investments in R&D at a national level (Enger 2017; Enger and Castellaci 2017). On the other hand, the submission of applications by private players grew by over 130 percent between FP7 and H2020 (European Commission 2017b). As the competition for H2020 funds has become fiercer and vastly outstripped supply, the considerable problems of oversubscription and dissatisfaction have emerged (European Commission 2017b). Here, according to the evaluations by European University Association (EUA 2016), R&D institutions perceive themselves as the group hit the hardest by the aforementioned changes in H2020 (and particularly the limited funding devoted to basic and disruptive research).

In view of this situation, analysing the factors affecting participation in the ERA is full of complexities. Firstly, different types of players (such as nation-level actors, independent organizations, individuals) may have different incentives and capacities for participating in FP projects and other EU (including cohesion policy) instruments (for example, Åström *et al.* 2012; EUA 2016; European Commission 2016a).

Table 1

Key Changes from FP7 to H2020 towards Cohesion Policy Aims

Recommendations from FP7 *ex-post* evaluation	H2020 goals and changes towards cohesion policy aims
Focus on critical challenges and opportunities in the global context	• focus on major societal challenges • boost private sector participation including SMEs • maximise synergies between different areas of research and innovation and new digital technologies
Align research and innovation instruments and agendas in Europe	• support the alignment of national research strategies • better coordinate with EU regional funding • help the EU countries reform their research and innovation strategies • identify obstacles to research and innovation • ensure that research proposals support innovation
Integrate different sections of research funding programmes more effectively	• focus on better consistency across the funding programme • ensure cross-cutting issues are considered • simplify access to research and innovation funding • apply a single set of rules consistently • efficiently coordinate across the Commission in managing the funding
Bring science closer to citizens	• better communicate with the general public on science issues in general and Horizon 2020 in particular • strengthen open access to research publications and data • involve citizens in research strategy and topics
Establish strategic programme monitoring and evaluation	• better monitor and evaluates funding and socioeconomic impacts • improve feedback loop from project results to policy making

Source: European Commission (2017b).

Secondly, given that FPs have evolved over 30 years and through complex and cumulative political compromises, the instruments of FPs cover different policy rationales – see e.g. Bach *et al.* (2014); Reale *et al.* (2013); European Commission (2017b). This implies that not all policy instruments should be of equal importance and suitable for different nations (given the differences in development stages), or specific research fields, organisations, and individuals (given their missions and interests).

In the following, we try to evaluate the overall participation outcome indicating the degree of the success of broader integration of EU13 countries in ERA. Key areas for policy intervention are discussed on the basis of this analysis.

MEASUREMENT FRAMEWORK FOR EU13 SEGREGATION IN FP

Here we use the indices of segregation that are commonly used quantitative measures describing social separation. "People get separated along many lines and in many ways. There is segregation by sex, age, language, religion, colour, taste, comparative advantage and the accidents of historical location. Some segregation results from the practices of organisations; some is deliberately organised; and some results from the interplay of individual choices that discriminate. Some of it results from specialised communication systems, like different languages" (Schelling 1971, 143).

In our article, segregation is an outcome of the individual choices of researchers, which are affected by the individual, organisational (university, company), national or system level factors (availability of alternative funding sources, interactions with other players etc.) – see Enger and Castellaci (2017). The limitations of the use of such segregation indexes are related to the fact that the underlying segregation processes are not revealed, for example the extent to which these general trends are attributable to lower investment in R&D (personnel, infrastructures), less efficient R&D systems and policies, closed networks, and brain drain problems due to salary gaps (Galsworthy and McKee 2013).

In short, the segregation measurement framework can be described as follows. The total number of participations is noted with T; and M represents the participations from the EU13 country group, hence $0 < M < T$. The overall fraction of EU13 country participations is $P = M/T$. In case there are n projects, $p_i = m_i/t_i$ is the fraction of EU13 participants in the particular project i. EU13 can be considered in the analysis as a minority group comprising 13 percent from EU28 by HRST ('human resources in science and technology') indicator, which is relatively stable across the years under analysis 2007–2016.[4]

[4] The data of H2020 participation have the cut-off date of 28 February 2017.

The share of EU13 participations is $P_{FP7} = 0.0798$ and $P_{H2020} = 0.0845$.

Firstly, we calculate the index of dissimilarity (D) originating from Duncan and Duncan (1955), but in this version adopted from Baroni and Ruggieri (2015)

$$(1) \quad D = \frac{1}{2P(1-P)} \sum_{i=1}^{n} \frac{t_i}{T} |p_i - P|$$

where $2P(1 - P)$ is a normalisation factor to place the index in the range between 0 and 1. The dissimilarity index would be at its minimum when the distribution of participants from EU13 countries is uniform over all projects. D measures the 'concentration' or 'evenness' of the distribution, hence it is interpreted as the proportion of the minority group that would have to 'move' for all projects to have the same average proportion. (The similar measures of the Theil and Gini indexes could be calculated here, too – see Duncan and Duncan (1955)).

Secondly, we calculate the isolation index, which is defined as the likelihood of a participant from EU13 countries being exposed to another member of the same country group in a project. For the particular project i, this is estimated as the product of the likelihood that a member of the EU13 countries is in the project (m_i/M) divided by the likelihood that she is exposed to another EU13 participant in the unit (m_i/t_i, or p_i), assuming that the two events are independent:

$$(2) \quad I = \frac{1}{M} \cdot \sum_{i=1}^{n} m_i \cdot p_i$$

The isolation index runs over the range from P (overall fraction of minority group participation) to 1, whereby higher values denote higher segregation. Again, the minimum value is acheeded where $p_i = P$; the maximum value is reached where there is only k, such that $m_k = t_k = M$, which means the unit contains all EU15 members and no EU13 member, therefore I measures the 'clustering' of the minority group.

A complementary measure is the interaction (or exposure) index, or the likelihood that a member of the minority group is exposed to a member of the majority group in a unit, which is the following:

$$(3) \quad \text{Int} = \frac{1}{M} \cdot \sum_{i=1}^{n} m_i \cdot (1 - p_i)$$

The index of interaction measures how the majority group dominates (or shares, if the index value is lower) the project participations; it runs from $P - 1$ to 0, where higher values show higher domination. It is clear from (2) and (3) that $I + \text{Int} = 1$. As the totals of T and M cannot be so easily detected from the data, but also participants can join several projects, we use here $T = \sum_{i=1}^{n} t_i$ and $M = \sum_{i=1}^{n} m_i$, thus the size of the total population of participations is by definition the sum of the sizes of the unit (project) populations,

Table 2

Segregation Index Values for EU13 Participations in Framework Programmes (FP7 and H2020)

	Index of dissimilarity (D)	Index of isolation (I)	Index of interaction (Int)
FP7	0.61	0.32	0.68
H2020	0.64	0.37	0.63

Note: Total number of projects in FP7 is 25205, and H2020 is 10,966.
Source: Author's calculations based on eCORDA.

and similarly for the minority group (Baroni and Ruggieri 2015).

EU13 PARTICIPATIONS IN FP EVALUATED BY SEGREGATION INDICES

Here we use the segregation indices and their dynamics to assess whether the EU13 countries have achieved wider integration within ERA science cooperation (which they are aiming at) or not. The empirical results show that the segregation of EU13 in the H2020 programme has increased compared to FP7 – the dissimilarity index has increased from 0.61 to 0.64 (Table 2). As the dissimilarity index measures the 'evenness' of the distribution, showing that the degree to which EU13 countries have concentrated in particular projects, has increased.[5] Paradoxically, this growth of segregation has emerged while the overall participation of EU13 members in FP has grown a little – in FP7, the share of this group was 7.98 percent and, respectively, in H2020 8.45 percent of all participations. Thus, one can conclude that while EU13 has managed to gain more participation (and funding) from FP, this has not necessarily increased the integration of these countries within ERA.
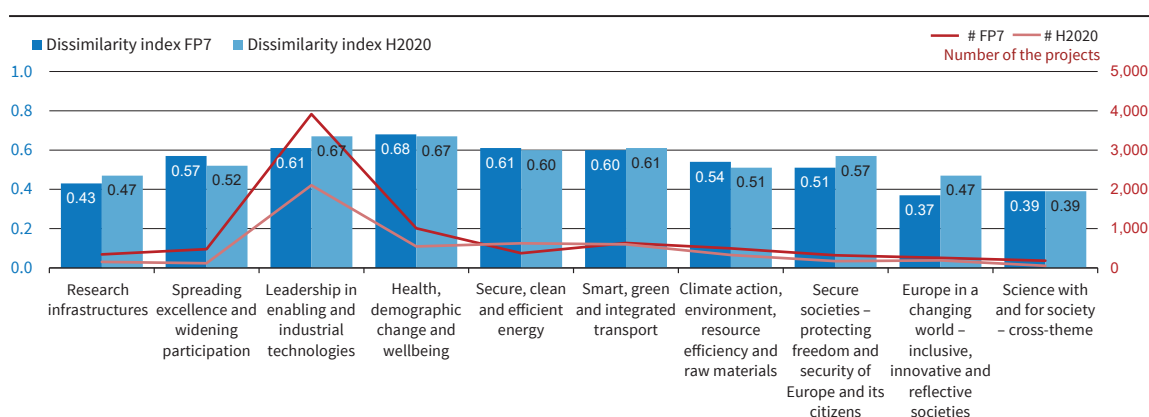
Similar results are also shown by the indices of isolation and interaction. The index of isolation expresses the probability of meeting another member

---

[5] There are no common rules on how to judge or interpret more broadly these indices, e.g. Marcińczak *et al.* (2015) suggest adapting commonly used thresholds in ethnic segregation (D < 30 indicating low and D > 60 high segregation) to a lower level in case of socio-economic segregation, thus D < 20 indicating low and D > 40 high segregation.

of the EU13 within the cooperation project. It has grown between FP7 and H2020 and shows that the EU13 members have clustered into certain projects, as opposed to widening participation across all types of projects or becoming critical mass members in projects they participate in. The index of interaction shows the probability of meeting (or being exposed to) another member of the majority group (EU15 member, respectively). The dynamics of the index support our claims of H2020 being much more complex in terms of the governance forms of instruments, requiring greater relational proximity, which, in turn, limits the wider participation of EU13 countries. However, smaller projects and the single/small number of participants involved also lower the probability of having other EU13 partners in the project.

According to the latest data, the total share of funding allocated to the EU13 remains relatively low and has increased only slightly from 4.2 percent in FP7 to 4.4 percent in H2020 (as of 1 January 2017); while the success rate of applications from EU13 has fallen from 18.0 percent to 11.1 percent (European Commission 2017b). Whereas previous analyses of FP7 have highlighted the limited participation rates of EU13 in particularly well-financed FP areas (e.g. Rauch and Sommer-Ulrich 2012; European Commission 2016b), the central issue today concerns their limited range of participation in the different types of FP instruments. Here the success of the EU13 country group is argued to rely heavily on bottom-up or horizontal instruments like SME promotion, RIA (research and innovation actions) and CSA (coordination and support actions). These instruments, together with more complex and top-

Figure 1

Value of Dissimilarity Index by Thematic Priorities

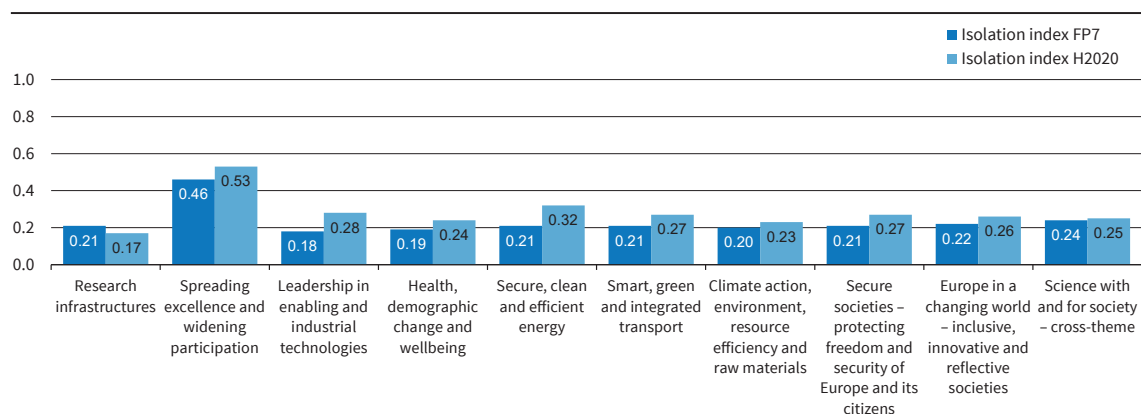
Source: Authors' calculations based on eCORDA.   © ifo Institute

Figure 2

Value of Isolation Index by Thematic Priorities

Source: Authors' calculations based on eCORDA.

© ifo Institute

down governance structures, remain out-of-reach (Ukrainski *et al.* 2018). The failure at the governmental level to provide the necessary commitment and symbolic leadership required for participation in FP may become a crucial barrier from a long-term perspective. At the national level, the relatively higher share of SMEs in contrast to larger companies involved in FPs has also been highlighted.

On the project level, it is found that the EU13 countries are involved in H2020 projects where the average contribution per participant and per coordinator is lower. They mostly participate in consortia led by other countries, rather than acting as coordinators (Ukrainski *et al.* 2017). Nevertheless, some smaller EU13 countries (Slovenia, Cyprus, Estonia) are said to outperform the EU15 averages (FP contributions in comparison to the size of the population, the number of researchers and national investments in R&D) – see also European Commission (2017b). Here the variations in wages and reimbursement rates between EU15 and EU13 need to be considered, arguably accounting for up to 80 percent of the total variation in financial returns from FP (Council of European Union 2011). The low salary level of EU13 is also a major reason for low

motivation to take up the role of the coordinator in H2020 (European Commission 2017a).

An analysis of the projects with larger numbers of EU13 participants reveals that the Teaming and Marie Curie instruments have gained relevance in H2020 with new instruments targeting wider EU13 participation. Thematically, 'leadership in enabling technologies' has lost in relevance, as it is one instrument with a relatively larger number of EU13 participations in FP7. The segregation indices by thematic fields or priorities (as far as these have been comparable between FP7 and H2020; see Figure 1) show that projects under SEWP ('spreading excellence and widening participation') have clearly reduced overall segregation, but nevertheless increased the isolation (clustering) of EU13 countries in H2020 at the same time (Figure 2).

The vast differences between EU13 and EU15 become even more evident once we look at the EU contributions across different thematic instrument groups (so-called 'Juncker's priorities'[6]). In EU13 countries, widening instruments are more visible

[6] Here, division of thematic priorities (called also thematic pillars) are constructed following the High Level Group suggestion based on priorities and budget allocations in European Commision (2017).

Figure 3

Value of Interaction Index by Thematic Priorities
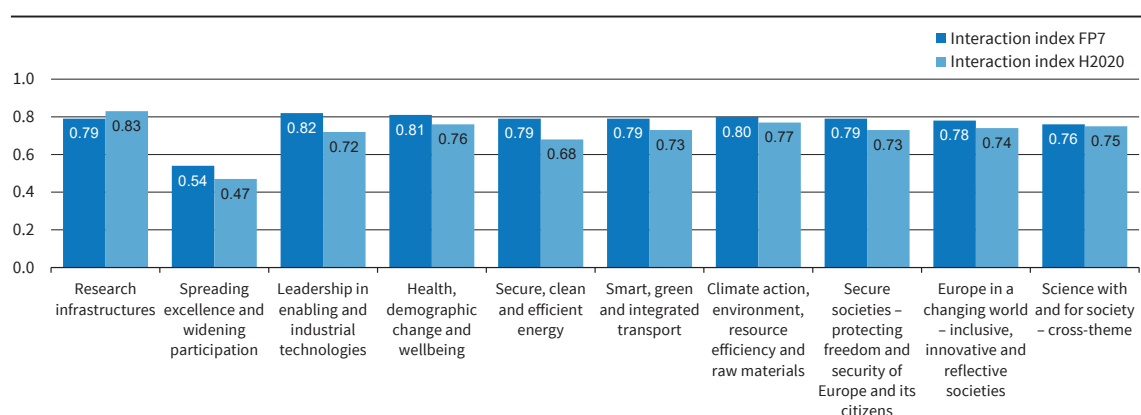
Source: Authors' calculations based on eCORDA.

© ifo Institute

and potentially compensate for overall segregation in terms of Commission's contribution. If one looks at the size of this instrument, however, it accounts for around 1.1–1.2 percent of total budget allocations (European Commission 2017a), which is clearly too small to produce a change in the overall pattern of participation. In certain cases, the success of widening instruments converges around single (large) projects in Estonia and Latvia, for example (Ukrainski et al. 2017).

SPECIFIC CHALLENGES TO PARTICIPATION IN H2020 FOR EU13 COUNTRIES

The specific challenges facing the EU13 countries are summarised in Table 3. It seems that the current EU funding patterns are limited in their ability to foster structural reforms at the national level in the EU13. This group of countries is under great pressure to obtain funding from H2020, but is failing to provide the requisite complementarity of national funding for R&D (Veugelers 2014) – one of the key factors incentivising R&D players to design and pursue excellent research projects at the European level and to increase their competitiveness in FPs (EUA 2016; Rauch and Sommer-Ulrich 2012; Schuch 2014). While the Estonian and Latvian success rates (higher than 16 percent), despite the declining national funding (EUA 2016), may seem to point to different arguments and conclusions, the 'success rate' here needs to be interpreted in the context of the specifically EU13 targeted 'widening' measures (see above).

Furthermore, successful participation in FPs is found to depend heavily on research capabilities (academic reputation, size of research personnel), as well as on learning and network effects gained from previous participation (Lepori et al. 2015). According to European Commission (2017b), the H2020 has opened up the existing 'clubs' via the increased participation of newcomers from industry (here the attractiveness of the SME instrument can play its role), as well as from the EU13. Nevertheless, application activity still tends to converge overwhelmingly in the hands of R&D institutions (approximately ten times higher on average than for industrial partners during the first three years of H2020) – see European Commission (2017b). In the case of EU13, even although EU accession has had a positive impact on international scientific collaboration in terms of the rising number of co-publications, it has also been found that this collaboration is more significant within EU13 than between researchers/groups from EU13 and EU15 (Makkonen and Mitze 2016). Similar proof of segregation between EU13 and EU15 countries is found in the case of region-specific Baltic Sea collaboration instruments (Ukrainski et al. 2017).

While in the case of FP7 it was argued (by e.g. MIRRIS 2014) that EU13 countries were often involved in research consortia due to their 'favourable position' (geographical location, size, etc.), in the case of H2020 (and given its revised logic vis-à-vis FP7) the dominant role of larger and EU15 countries as consortia coordinators and members seems to be reinforced again, especially as they possess higher levels of

Table 3

Key Challenges of EU13 in Participating in FP as Derived from the Discussion on Segregation

Key challenges	National level	Organizational / project level
'Evenness' of distribution	The functional synergies between the EU research foci and R&D systems of EU13 remain limited, reflected primarily by the EU13's overwhelming participation in horizontal and bottom-up instruments in contrast to those with more top-down and complex governance structures, presuming, in turn, more active and strategic involvement by the national governments, as well as compliance with the EU strategic aims.	The potential of SEWP ('spreading excellence and widening participation') instruments to compensate for overall segregation remains unfulfilled, mainly due to the limited share devoted to the instrument in the total FP allocations, as well as its currently limited impact, while tackling the structural issue of isolation of EU13 countries in H2020.
'Exposure' to participants from other groups	The growth of segregation between EU13 and EU15 has emerged, while the overall participation of EU13 members in FP has grown a little; the segregation is evident also in the case of region-specific collaboration instruments, particularly worrisome due to certain expected geographical, relational, etc. proximity here.	The participation activity in general, as well as the submissions of successful applications, has concentrated in the hand of limited leading groups, whereas entry barriers in FP-like international research networks become higher (presuming steep learning curves) and more structural in their essence.
'Clustering'	The insufficient access of EU13 to existing so-called 'old boys' networks, relying heavily on academic reputation at the international level. The latter is particularly important in this context, where existing networks matter more in FP than existing capabilities developed in isolation.	Weakly constructed national networks that act as an important structural barrier for building consortia and engagement of participants (user-side) from own countries and beyond.

Source: Compiled by authors.

international and national (user-level) collaboration partners. Newcomers from the EU need to buy into these 'closed clubs', often without strong international and domestic networks of partners (Enger 2017; Enger and Castellaci 2016; Lepori *et al.* 2015; Council of European Union 2011). This means that for weaker performing research systems, the entry barriers in FP-like international research networks are not only high but also of a highly structural nature.

One could assume that the more active EU13 members have at least managed to increase their readiness to participate in FPs: Estonia, for example, experienced an increase of nearly 100 percent in the number of overall applications between FP7 to H2020 (European Commission 2017b). The relatively low success rates, however, indicate that the effectiveness of participation has remained limited; and it can therefore be argued that EU13 countries may have already maximised their current potential. This is primarily reflected in the convergence of participation activity in general, as well as submissions of relatively few strong applications into the hands of limited, leading groups in these countries (Ukrainski *et al.* 2017 and 2018).

We can only conjecture that, given the shifts in H2020 towards innovation and societal challenges, this may be due to imbalances in the domestic RDI system (fewer capable public sector user-level partners and large firms), as well as limited capacities to coordinate and manage the more substantial diversity of domestic and international partners required in current H2020 projects. To summarise, the EU13-specific vital barriers to participating in H2020 are related to the RDI and cooperation capabilities of different types of players within innovation systems, but also to the formal and informal institutions (such as networks, commitment, agreement on strategic aims) shaping the cooperation.

CONCLUSION

The major challenge facing EU13 countries remains the participation divide in FPs. As converging/catching-up economies, the EU13 countries seem to expect different impacts from FPs than the leading EU15 economies. Thus, debates regarding the participation of EU13 countries in FPs are by necessity more critical and emphasize the challenges (as opposed to specific opportunities) of entering and participating in FP activities. The policy reducing the segregation of EU13 needs to consider enhancing:

– the participation (especially coordination) capabilities of EU13 countries;
– mutual cooperation of EU13 members within FP projects (instead of forming even smaller thematic groups); and
– the intake of broader geographical coverage of partners to the projects.

REFERENCES

Åström, T. *et al.* (2012), *On Motives for Participation in the Framework Programme: The Country Analysis of Norway*, Stockholm: Technopolis Sweden – Technopolis Group.

Bach, L., M. Matt and S. Wolff (2014), "How Do Firms Perceive Policy Rationales behind the Variety of Instruments Supporting Collaborative R&D? Lessons from the European Framework Programs", *Technovation* 34, 327–337.

Baroni, A. and S. Ruggieri (2015), "Segregation Discovery in a Social Network of Companies", in: *International Symposium on Intelligent Data Analysis*, Berlin: Springer, 37–48.

Council of European Union (2011), *Analysis on Low Participation in FP7 – Widening Participation in the European Framework Programme: Challenges and Opportunities*, European Commission Analysis of September 2011 at the Request of the Polish Presidency.

Duncan, O.D. and B. Duncan (1955), "A Methodological Analysis of Segregation Indexes", *American Sociological Review* 20, 210–217.

Europan Commission (2016a), *An Analysis of the Role and Impact of Industry Participation in the Framework Programmes*, Final Report, https://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/ki0416320enn.pdf.

Europan Commission (2016b), *Second H2020 Monitoring Report 2016*, http://ec.europa.eu/research/evaluations/pdf/archive/h2020_monitoring_reports/second_h2020_annual_monitoring_report.pdf#view=fit&pagemode=none.

Europan Commission (2017a), *Contribution to Juncker Priorities and Current Challenges: Issue Papers for the High Level Group on Maximising the Impact of EU Research and Innovation Programmes*, https://ec.europa.eu/research/evaluations/pdf/hlg_issue_papers.pdf.

Europan Commission (2017b), *Interim Evaluation of Horizon 2020*, Final Version, https://ec.europa.eu/research/evaluations/pdf/book_interim_evaluation_horizon_2020.pdf.

Enger, S.G. (2017), *Closed Clubs: Cumulative Advantages and Participation in Horizon 2020*, TIK Working Paper on Innovation Studies 20170703, University of Oslo.

Enger, S.G. and F. Castellaci (2016), "Who Gets Horizon 2020 Research Grants? Propensity to Apply and Probability to Succeed in a Two-Step Analysis", *Scientometrics* 109, 1611-1638.

European University Association (2016), *EUA Member Consultation: Horizon 2020 Mid-Term Review*, http://www.eua.be/Libraries/publications-homepage-list/eua-membership-consultation-2016-a-contribution-to-the-horizon-2020-mid-term-review.

Ex-Post-Evaluation of the 7th EU Framework Programme 2007–2013 (2015), *Commitment and Coherence: Essential Ingredients for Success in Science and Innovation*, https://ec.europa.eu/research/evaluations/pdf/fp7_final_evaluation_expert_group_report.pdf.

Galsworthy, M. and M. McKee (2013), "Europe's 'Horizon 2020' Science Funding Programme: How Is It Shaping Up?", *Journal of Health Services Research & Policy* 18, 182–185.

Karo, E. and R. Kattel (2018), "Innovation (Policy) and Transformative Change in the European Union", in: Vihalemm, P., A. Masso and S. Opermann (eds.), *The Routledge International Handbook of European Social Transformation*, Abingdon: Routledge, 239–249.

Karo, E., R. Kattel and R. Raudla (2017), "Searching for Exits from the Great Recession: Coordination of Fiscal Consolidation and Growth Enhancing Innovation Policies in Central and Eastern Europe", *Europe-Asia Studies* 69, 1009–1026.

Lepori, B. *et al.* (2015), "Participations to European Framework Programs of Higher Education Institutions and Their Association with Organizational Characteristics", *Scientrometrics* 105, 2149–2178.

Luukkonen, T., O. Persson and G. Sivertsen (1992), "Understanding Patterns of International Scientific Collaboration", *Science, Technology & Human Values* 17, 101–126.

Makkonen, T. and T. Mitze (2016), "Scientific Collaboration between 'Old' and 'New' Member States: Did Joining the European Union Make a Difference?", *Scientometrics* 106, 1193–1215.

Marcińczak, S. *et al.* (2015), "Patterns of Socioeconomic Segregation in the Capital Cities of Fast-Track Reforming Postsocialist Countries", *Annals of the Association of American Geographers* 105, 183–202.

MIRRIS Interim Report (2014), *Participation of EU13 Countries in FP7: Mobilising Institutional Reforms for Better RDI Systems/Institutions in Europe*, Part I, http://www.mirris.eu/Pagine/Downloads.aspx.

Morrill, R.L. (2016), "On the Measure of Geographic Segregation", *Geography Research Forum* 11, 25–36.

Nedeva, M. (2013), "Between the Global and the National: Organising European Science", *Research Policy* 42, 220–230.

Okubo, Y. and M. Zitt (2004), "Searching for Research Integration across Europe: A Closer Look at International and Inter-regional Collaboration in France", *Science and Public Policy* 31, 213–226.

Rauch, M. and J. Sommer-Ulrich (2012), *Participation of the Central and Eastern European EU Member States in the 7th Framework Programme: Analysis, Evaluation, Recommendations*, Leipzig: Fraunhofer MOEZ.

Reale, E. *et al.* (2013), *Investments in Joint and Open Research Programmes and Analysis of their Economic Impact*, JOREP, Executive Study, Brussels: European Commission.

Schelling, T.C. (1971), "Dynamic Models of Segregation", *Journal of Mathematical Sociology* 1, 143–186.

Scherngell, T. and R. Lata (2013), "Towards an Integrated European Research Area? Findings from Eigen-Vector Spatially Filtered Spatial Interaction Models Using European Framework Programme Data", *Papers in Regional Science* 92, 555–577.

Schuch, K. (2014), "Participation of the 'New' EU Member States in the European Research Programmes: A Long Way to Go", *Foresight-Russia* 8, 6–17.

Tijssen, R.J. (2008), "Are We Moving towards an Integrated European Research Area? Some Macro-Level Bibliometric Perspectives", *Collnet Journal of Scientometrics and Information Management* 2, 19–25.

Ukrainski, K. *et al.* (2017), *Participation in ERA and Baltic Sea RDI Initiatives and Activities: Analysis and Policy Implications for Widening Participation of Strong and Moderate Innovators*, Baltic Science Network WP 5.2, University of Tartu & Tallinn University of Technology.

Ukrainski, K. *et al.* (2018), *Estonian Potential in Framework Programs: Analysis and Policy Options*, Support for Knowledge-based Policy Formulation by RITA, Activity 4, University of Tartu & Tallinn University of Technology (forthcoming).

Van Vught, F. *et al.* (2011), *Synergies between FP7, the CIP and the Cohesion Policy Funds*, Final Report of the Expert Group, https://ec.europa.eu/research/reports/2011/pdf/seg_final.pdf.

Varga, A. and T. Sebestyén (2016), "Does EU Framework Program Participation Affect Regional Innovation? The Differentiating Role of Economic Development", *International Regional Science Review* 40, 1–35.

Veugelers, R. (2014), *Undercutting the Future? European Research Spending in Times of Fiscal Consolidation*, Bruegel Policy Contribution 2014/06.

Young, M. (2015), "Shifting Policy Narratives in Horizon 2020", *Journal of Contemporary European Research* 11, 16–30.

Cristina Serbanica and
Daniela Luminiţa Constantin

EU Cohesion Policy and Innovation Support in Central and Eastern Europe: A Critical Review

Cristina Serbanica
Constantin Brancoveanu
University, Romania

Daniela Luminiţa
Constantin
Bucharest University of
Economic Studies

INTRODUCTION

During the post-socialist transition, supporting innovation became an important policy objective for Central and Eastern European (CEE) countries that joined the European Union in 2004 (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia), 2007 (Bulgaria and Romania) and 2013 (Croatia). During their transition phase, CEE countries face a number of common challenges, even if they are no longer a single and homogenous area. There is no doubt that CEE countries have embarked on strong and sustainable growth paths in recent decades (Aghion *et al.* 2011). They have also achieved indisputable successes in terms of social advancement, improvements in living standards, and political and institutional reforms. After 1990, these countries underwent substantial socio-economic restructuring and opened their markets to global capital and external sources of knowledge (Capello and Giovanni 2013), while integrating into European and global production networks. Low (unit) labour force, coupled with a well-trained, educated workforce and expanding markets attracted large FDI inflows and important investors in the region (Gauselmann *et al.* 2011). However, there is a clear disjunction between the fast growth in productivity in the CEE region and the performance in developing innovative capacities (Gorzelak 2017). Some authors suggest that the CEE countries are suffering from a serious innovation 'deficit' (Havas and Keenan 2008), and despite massive FDI and the introduction of modern production and management methods, there have not been sufficient spill-overs of technology and know-how into the domestic economy (Economist Intelligence Unit 2008). As a result, these countries are still far removed from approaching the technology frontier (Aghion *et al.* 2011; Estrin *et al.* 2014), have a low propensity for innovation (Becker *et al.* 2010) and less efficient national and regional innovation systems (Kravtsova and Radosevic 2012).

Some explanations for this phenomenon relate to the communist legacy and lock-in effects: for example, innovation processes were organised according to a linear science-push innovation model during socialist times and interactive learning processes were underdeveloped or non-existent (Koschatzky *et al.* 2001). During their transition to market economies, CEE economies did not grow based on research-driven innovation (Radosevic 2017). Instead, growth at the firm-level was closely related to export, vertical specialisation, non R&D innovation (Radosevic and Stancova 2015) and the majority of companies engaged in process innovation in the form of the acquisition of new machinery and mastery of production capabilities (Tiits *et al.* 2008). Despite a strong potential advantage in many pure and applied science fields (Camagni and Capello 2014), there is a substantial gap in demand for research and technological development (Radosevic 2011) and firm innovations are mostly of an in-house nature (Zenka *et al.* 2014). Even if the results show positive trends in terms of the CEE region catching up in science knowledge generation, its absorptive capacity is still limited (Radosevic and Yoruk 2014).

Many deficiencies in policy frameworks and institutional capacities emerge at the CEE level (Bachtler *et al.* 2014). Regional innovation systems are highly fragmented, lack regional autonomy, strong science bases and local capabilities (Krammer 2017). In addition, the benefits of transformation in these countries have been unequally distributed and major disparities in economic and innovation performance exist between capital regions and the less developed peripheral regions. CEE countries, or at least most of the regions in this part of Europe, are classified as 'peripheral' or 'lagging-behind' areas, which exhibit fundamental differences in innovation, be it sectoral, structural, behavioural, related to resources and capabilities, related to externalities or issues of market failures, etc. (McCann and Ortega-Argiles 2015). The 'common denominators' in these peripheral areas are the deficits in the supply of skilled human capital, the differences in the structural and sectoral composition of the 'economic fabric' that makes them less prone to innovation, the brain drain phenomenon and the deficient institutional settings (Rodriguez-Pose 2015).

The rationale behind EU policy intervention in the region was to alleviate these regional disparities and help CEE countries to catch-up with Western Europe. It is estimated that between 2007 and 2015, EU Structural and Cohesion funds contributed 11–24 percent of the GDP of CEE member states, making considerable contributions to these countries' infrastructure, transportation systems and modernization, among others (KMPG 2016). The largest share of structural funds went into infrastructure and environmental investments, followed by productive investments (Brown *et al.* 2017).

This paper aims to offer an in-depth review of EU policy interventions to support innovation in the CEE countries. As illustrated in the literature on this topic, there are two main rationales underpinning the logic of such interventions: either addressing market or system failures that hinder the capacity of companies to compete and grow or to support their

start-up in the most promising and relevant sectors (European Commission 2016a). The second part of the paper therefore looks at the logic of intervention and the strategic orientation of policy frameworks for innovation and enterprise in the region in three distinct financial frameworks: 2000–2006, 2007–2013 and 2014–2020, while distinguishing between funding allocations for research, technological development and innovation (RTDI) and enterprise support. The third part of the paper presents the outputs of the interventions – as revealed by the strategic evaluations carried out at the EU level, but also by dedicated literature in this field. The paper concludes by highlighting different policy recommendation strands that deal with necessary changes and adaptations, especially in the context of the smart specialization paradigm.

COHESION POLICY INVESTMENTS IN INNOVATION AND ENTERPRISE IN CEE COUNTRIES

2000–2006: The Initiation Phase

Except for the capital regions of the Czech Republic (Prague) and Slovakia (Bratislava), all the regions in the CEE countries that joined the EU in 2004 (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia) were classified as 'objective 1 / convergence' regions in the 2000–2006 EU financial framework and exercised considerable discretion in allocating EU funds. Unlike the more developed 'objective 2 / competitiveness' regions – whose focus was on encouraging advanced research and development processes and innovation links, the main policy objective for CEE regions was to support and/or diversify the economy, thus inter-twining the themes of innovation and enterprise. On average, cohesion regions spent 4.9 percent of their total available structural funds on research, technological development and innovation, while the more competitive objective 2 areas spent on average 9.8 percent of total funds on the same purposes (Technopolis 2006). When compared to the most advanced countries, CEE countries were considerably more active on attracting foreign direct investment and in the creation of industrial parks and enterprise incubators, while on the innovation side they mainly supported investments in basic infrastructure, clusters and applied research. This was coherent with the low R&D capacities in these countries and the lack of expertise in managing innovation support measures, which also explains the

preference for more 'supply side' interventions and the extensive use of direct instruments (Holm-Pedersen *et al.* 2009; Technopolis 2006).

2007–2013: The Experimentation Phase

A key difference in the strategic orientation of enterprise and innovation support in the 2007–2013 framework – compared to the 2000–2006 period was its greater thematic differentiation. Under the convergence objective, financial support was aimed at the modernisation and diversification of economic structures and the creation of sustainable jobs. In this respect, member states were encouraged to target their resources on key-priorities, including the improvement of knowledge and innovation for growth, which comprises different sub-priorities, such as: (1) strengthen research and development capacities and their integration into the European Research Areas (RTDI) and (2) facilitate innovation and promote entrepreneurship through aid to SMEs and to technology transfer, development of business networks, innovation funding through financial engineering instruments, etc. (Enterprise). Figure 1 presents the allocations for these priorities (expressed as a percentage of total cohesion policy investments) in CEE countries, by the end of 2014.

In the 2007–2013 financial framework there was no legal obligation for CEE countries to earmark expenditure falling under the heading of 'improving knowledge and innovation' and this explains the large intra-country variations in allocations. On average, CEE countries spent around 22 percent of their total cohesion policy allocations on RTDI, Enterprise and ICTs, with Slovenia and Estonia taking the regional lead in these chapters of expenses. At the other end of the spectrum, Bulgaria and Romania had very low allocations for RTDI, while Slovakia and the Baltic countries devoted only limited funds to enterprise support. By contrast, the most developed countries in the EU (EU15 countries) allocated large
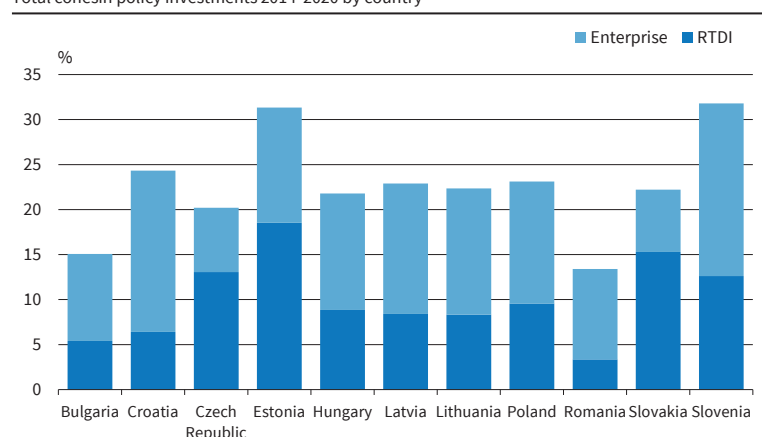
Figure 1

Financial Resources for Enterprise and Innovation
Total cohesin policy investments 2007–2013 by country
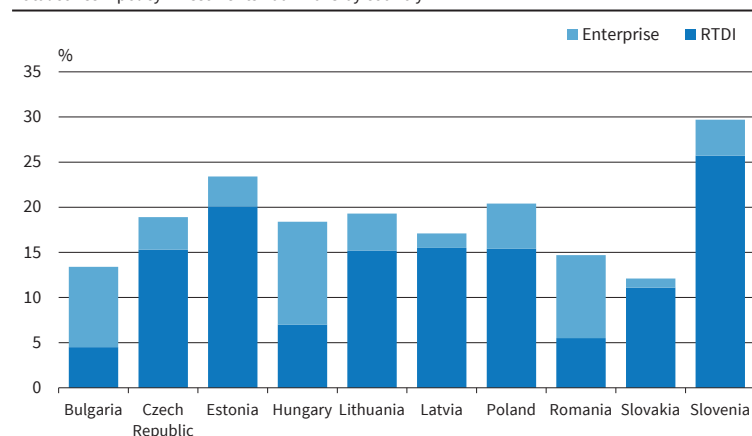
Source: Authors' processing based on European Commission (2016b).   © ifo Institute

Figure 2

Financial Resources for Enterprise and Innovation
Total cohesin policy investments 2014–2020 by country

Source: Authors' processing based on European Commission (2017).   © ifo Institute

and the sectoral structure of the economy (Foray *et al.* 2011). The new concept emphasises the need to adjust priorities to fit closeness to the technological frontier (Aghion *et al.* 2011), so it is seen as 'crucial', particularly for the regions/countries that are not on a major science-technology frontier. For CEE countries, the EU funds continue to represent a key financial lever to public funding for 2014–2020; and some authors position 'smart specialisation' as the third external and conditionality-based reform of economic policy rationales – after Washington Consensus and Europeanization (Karo and Kattel 2015). So far, all CEE countries and most of their regions created 'Regional Innovation Strategies' (RIS3) and allocated important shares of their total Cohesion Policy resources to RTDI and Enterprise (Figure 2).

shares of support to enterprises and focused more on the thematic priority of innovation and the knowledge economy. It is also worth noting that in the EU15 countries, national state aid for SMEs was far higher than that of the cohesion policy, while in the CEE countries structural funds represented the only (or most significant) source of funds for industrial policy (European Commission 2016a).

The financial crisis drove the absorption of funds in the 2007–2013 period and some categories of investments – including those in RTDI – struggled in terms of performance; while programme authorities preferred actions where they had experience and where results were quickly tangible (e.g. investments in 'hard infrastructure'), instead of more sophisticated interventions in the RTDI field (Ferry 2014). This is why over the course of the programming period, some of the CEE countries shifted funds from RTDI to other operational programmes (like other investments in enterprises, energy, social infrastructure, etc.) – see European Commission (2016b).

No significant changes can be observed when comparing 2007–2013 and 2014–2020 allocations for innovation and enterprise in the CEE region. The modest innovators – Romania and Bulgaria – devote about 15 percent to these objectives, while the sole strong innovator in the region – Slovenia – and its follower, Estonia – spend over 30 percent of their total allocations for the same purposes. Even if it is still early days to assess the changes that have occurred within the national and regional innovation system, preliminary evidence finds that there are grounds for concern in many Eastern European regions in the take-up of the RIS3 agenda (McCann and Ortega-Argiles 2016; Karo *et al.* 2017), especially due to their different institutional arrangements, the dominant presence of public research in processes of consultation, the underrepresentation of relevant firms in the periphery (Kroll 2017) or the lack of
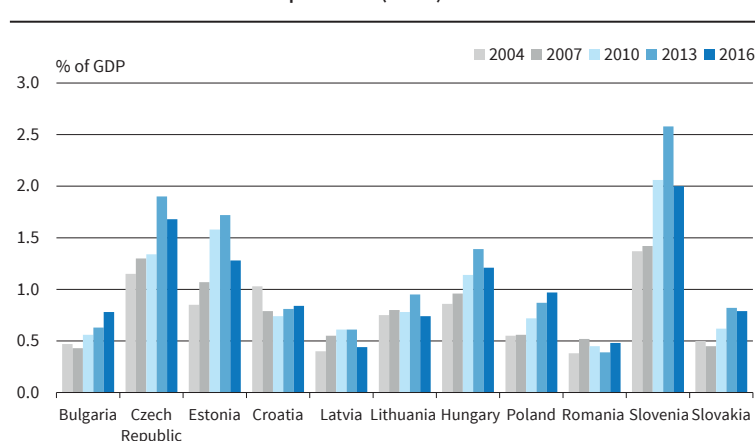
2014–2020: The Specialisation Phase

The reformed cohesion policy 2014–2020 was asked to respond to some of the major weaknesses of its predecessors, including the deficit in strategic planning, in adopting territorial perspectives or the lack of focus on priorities (Barca 2009). The 'smart specialisation' concept – which is the leitmotif for interventions to support innovation in the new financial framework – emphasises the principle of prioritisation in a vertical logic, as an effort to reduce fragmentation and address the missing or weak relations between R&D and innovation activities

Figure 3

Evolution of Intra-Mural R&D Expenditure (GERD) in CEE Countries

Source: Authors' processing based on European Commission (2016b).   © ifo Institute

attention paid to internationalisation processes (Radosevic and Stancova 2015).

OUTPUTS AND EFFECTS OF COHESION POLICY INVESTMENTS IN INNOVATION AND ENTERPRISE

Substantial Contribution to National R&D Efforts

Despite the various barriers to the implementation of cohesion policy in CEE countries, some important achievements are emphasised in the literature on this topic. Firstly, the relative importance of the EU's cohesion policy is underlined by its substantial contribution to the national R&D efforts: expenditure on R&D increased from 40 euros per inhabitant in 2004 to 91 euros per inhabitant in 2007 and to 144 euros per inhabitant in 2016 at the CEE level, even if the share relative to GDP is still below the EU average (2 percent) for all countries – except for Slovenia (Figure 3).

Since over the programming period, ERDF funding was often the only source of funding for industrial policies in the CEE region, this type of support was meant to counterbalance the decline in governmental expenditure in a period of severe economic crisis (European Commission 2016a).

New Policy Instruments, New Players

In many regions, cohesion policy pushed forward an initial concept of a regional innovation policy and helped to introduce new policy instruments, new monitoring and evaluation systems, while mobilising new players, especially from the private sector (Technopolis 2006). The main results of EU investments in R&D in the CEE region translate into the support offered to RTDI and cooperation projects, the creation of new jobs and support for start-up initiatives. By the end of 2014, CEE countries supported over 12,000 RTDI projects (of which around a quarter were in Hungary) and about 3,000 cooperations between companies and research institutes. This, in turn, led to the creation of around 15,000 new research jobs, of which about a third were in Poland. On the enterprise side, some 70,000 SMEs across the region received direct support and more than 5,500 new businesses were helped to

launch start-ups. In total, around 175,000 new jobs were created as a result of cohesion policy support in the region (Table 1), which helped to offset large declines in employment due to the economic crisis (European Commission 2016a).

Technological Upgrading and Job Creation

The evaluations indicate that the Operational Programmes helped to modernise production processes and the purchase of both tangible and intangible assets (new equipment, machinery, the purchase of patents and licenses, etc.). This, in turn, increased the value-added produced by SMEs, increased turnover, profitability and exports and, in a number of cases, it also led to behavioural changes, like SMEs being more willing to take risks, to innovate and to develop new products (European Commission 2016c). Among the CEE countries, the Czech Republic, Hungary and Poland devoted some shares of funding to large enterprises, be this for technological upgrading, investments in large-scale projects or to increase employment in less developed regions. This type of support proved to be one of the most efficient measures in terms of job creation and led to significant increases in productivity – as the support provided to large enterprises went beyond simple replacement investments, and extended to the deployment of cutting-edge technologies. For Hungary, this support helped to lessen the disequilibria between centre and periphery and mitigate significant internal disparities, as support was focused on regions where larger firms were much less present (European Commission 2016b). Last but not least, the support offered through financial instruments (loan guarantees, subsidized interest rates, guarantees, venture capital etc.) also had a positive effect on investments, making it easier for SMEs to access financing and to overcome the constraints they faced in capital markets during the crisis (European Commission 2016c).

No Significant Changes in Innovation Performance

At the aggregate level, analyses need to be conducted with caution, given the 'time-lag' issue between

Table 1
Main Outputs of Cohesion Policy for Enterprise Support & Innovation (2007–2013)

By the end of 2014	RTDI projects	Cooperation projects	New RTDI jobs	Start-ups	Investments in SMEs	New jobs created
Bulgaria	71	37	244	–	–	6,018
Czech Republic	1,423	636	3,900	26	8,047	–
Estonia	2,000	–	–	–	–	10,908
Hungary	3,916	640	3,623	1,991	40,644	41,453
Latvia	153	336	336	1,184	163	3,333
Lithuania	1,526	31	674	1,993	1,509	7,841
Poland	1,382	1,057	5,000	–	14,955	87,427
Romania	569	41	1,160	101	2,898	13,228
Slovakia	504	279	40	291	2,104	3,111
Slovenia	655	–	–	25	–	3,101

Source: Authors' processing based on European Commission (2016b).

investment and effects (Leon *et al.* 2011) and the fact that many impacts (and particularly those resulting from RTDI investments) are expected to be long-termed. However, one can easily observe that CEE countries are still lagging behind in innovation performance. With the exception of Slovenia, which is a strong innovator, all the other parts of the CEE region are moderate or modest innovators, according to the European Innovation Scoreboard 2017. Some say that CEE countries were very successful at meeting output targets, but unable to convert their initial success into longer-term results (Holm-Pedersen *et al.* 2009). Significant improvements in scholarly outputs are observed (Rodriguez-Pose 2015), but this does not translate into higher capacities for innovation (Clar *et al.* 2015), higher participation in the FP / Horizon 2020 programmes (Leon *et al.* 2011) or higher broader socio-economic benefits (Rodriguez-Pose 2015).

Variable Impacts at the Macro Level

Different authors point to the fact that, up until now, no clear and unambiguous results have emerged at the macro level, which is partly due to the multi-dimensional character of the concept of cohesion and to the challenges of isolating cohesion policy from other interventions (Ferry and McMaster 2013). Existing evidence demonstrates a positive correlation between the allocations for productive environments and per capita GDP growth, but no effect on productivity (Pontarollo 2017). On the other hand, the impact of RTDI interventions was highly variable: RTDI initiatives turned out to be extremely useful in those regions where a critical mass of research activities was already present (Camagni and Capello 2013); or in those regions more endowed with human capital, workforce flexibility, entrepreneurship, innovation, information and telecommunication policies etc. (Fratesi and Perucca 2014). By contrast, investments in RTDI funds had limited socio-economic benefits in peripheral areas, as these territories had longstanding difficulties in transforming both basic and applied research into innovation (Rodriguez-Pose 2015). Since there is evidence that structural funds were used as a substitute for national funding in the CEE countries, the incentive provided did not ensure long-term efficiency (Radosevic and Lepori 2009). The conclusion is that, despite some positive impact on territorial convergence, cohesion policy did not succeed in alleviating regional differences (Gorzelak 2017).

CONCLUSIONS AND POLICY IMPLICATIONS

This paper offered a review of the results of cohesion policy investments in RTDI and enterprise in Central and European countries that joined the EU after 2004. The results look very mixed and variable between countries, as well as between the regions within those countries. On the one hand, there are invaluable outputs and outcomes in the form of new research infrastructures, cooperation networks, new jobs in the RTDI sector, the creation of innovative start-ups, etc. On the other hand, the impacts are mixed and heterogeneously distributed, with important disparities in terms of knowledge production, technology absorption or innovation performance.

The evaluations carried out to date conclude that there is still much room for improvement in the logic of policy interventions in CEE countries, as well as in the management of national and regional innovation systems. Different policy recommendations are formulated in the literature on this topic, which can be grouped into eight categories as follows.

Change the Logic of Intervention

Different authors point to the fact that the main-stream model of R&D-based growth which establishes direct links between R&D, innovation and productivity, is not suitable for CEE countries, as it ignores production capacity and technology capacity as major sources of productivity improvements (Gorzelak and Ferry 2014). Nowadays, the science-push model of innovation is still very influential at the CEE level (Havas *et al.* 2015), while demand-side policies linking the modernisation of the economy and public services with innovation impulses are often neglected (Edler 2009). Thus, shifting funding from direct financial aid to demand-side policies is seen as a solution that may potentially accelerate catch-up processes and address bottlenecks in demand for innovation at the CEE level (Muscio *et al.* 2015).

Consider Specific Innovation Patterns in Policy-Making

Designing place-based policies is one of the main arguments behind the logic of smart specialization, which contrasts the 'one-size-fits-all' approaches. Since the geography of innovation was found to be much more complex than a simplistic core-periphery dichotomy, identifying the 'innovation patterns' followed by each region (Camagni and Capello 2014), overcoming the differentiation between advanced research areas (the core) and co-application areas of general purpose technologies (the periphery) (Camagni and Capello 2013) and designing spatially-targeted interventions (Rodriguez-Pose 2015) emerge as generalised solutions for CEE countries' policy-making.

Adopt New Approaches to Financing Innovation

Securing funding for research and innovation is one of most relevant challenges for the CEE region (Gorzelak and Ferry 2014) and evidence confirms that structural funds were often a substitute, and not a complement to national funding. In this respect, recommendations

aim to diversify the sources of funding for innovation, be it through ensuring a better connection between structural funds, FP and other community innovation programmes (Radosevic and Lepori 2009); or by orienting fiscal policies towards encouraging R&D activities and supporting more private–public partnerships (Gorzelak and Ferry 2014). Some authors point to the fact that the focus should not be on increasing investments in R&D (providing the R&D effort is maintained), but on addressing the incapacity of the economic fabric to transform knowledge into innovation (Rodriguez-Pose 2015), while different evaluations confirm that strengthening local conditions are more important than giving subsidies in terms of, for example attracting large enterprises to a region (European Commission 2016c).

Contextualise Support Measures and Focus on Incremental Innovation

Support measures aimed at raising awareness of innovation and promoting innovation management (Technopolis 2006) and training and infrastructure-type investments (Muscio *et al.* 2015) are still considered relevant at the CEE level, given the historical deficit in the region's innovation culture. However, a change of approach is needed to adopt a market-driven rationale (Muscio *et al.* 2015) and to orient the logic of intervention towards final aims (like increasing productivity, sales, exports, etc.), not intermediary aims (investments in production factors: capital, labour, R&D capacity) – see European Commission (2016a). Some authors recommend that less innovative regions carry out applications from leading regions, instead of focusing on investing and researching into general purpose technologies (Foray *et al.* 2011), while many others encourage a bundling of external knowledge (in the form of patents, researchers, scientific consultancy, direct investments, etc.) with local competences and productive traditions, with a focus on incremental innovation (Camagni and Capello 2014).

Adopt Gradual Sectoral Changes

Advocates of the smart specialisation concept plead for keeping the focus on existing industrial strengths, instead of building up novel high-tech industry (Foray *et al.* 2011; Tiits *et al.* 2015). Thus, science, technology & innovation policies are expected to promote knowledge–intensive activities in all sectors, including low and medium-technology industry and services (Havas *et al.* 2015), to help them take gradual steps towards change. In view of the specific sectoral distribution of economic activities, the recommendations are to restructure agricultural areas, integrate bio-tech & agro-industries, link tourism industry to other value added activities, exploit the untapped potential of renewable energy or provide advanced logistics and ICT for the personalisation of services (Technopolis 2006). Along the same lines, the countries and their regions are also advised to avoid picking winners that do not fit into the regional industrial space and to stop support for declining industries (Boschma and Gianelle 2014).

Support International Knowledge Networks and Global Value Chains

In the literature on this topic, interregional knowledge networks are often seen as the substitutes for the critical mass of localised resources for innovation in peripheral or less developed economies (Gorzelak and Ferry 2014), meaning that external learning and the creation of cross-border research and innovation networks are largely encouraged. In particular, CEE countries are encouraged to integrate FDI and innovation policy (Radosevic and Stancova 2015) and to exploit the synergies between FDI and local culture. The integration of regional firms into global value chains is also well considered (Technopolis 2006; Rodriguez-Pose 2015), to facilitate the inflow of new knowledge and the internationalisation of the R&D environment. Research has shown that economic players stand to benefit more from interaction with innovators located outside the region (Iammarino and McCann 2013) than from cluster strategies that foster local interactions and increase the risk of lock-in in cases where critical mass does not exist. Greater engagement in international linkages and extra-local connections is seen as a very viable option as a result.

Adopt the Broader View of Innovation

The broader view of innovation goes beyond R&D based innovations to issues that address the role of entrepreneurship, higher education, human resources and other policies in fostering structural change in less developed regions (Clar *et al.* 2015). Prioritising the transformation of the socio-economic fabric and enhancing firms environment (Rodriguez-Pose 2015), improving market entry and exit conditions (Correa and Guceri 2014), creating innovative economic structures and entities (Gorzelak and Ferry 2014) and better matching educational supply to local needs to improve the absorptive capacity of firms – are all part of a new development model that is necessary at the CEE level. At the same time, substantial efforts are needed to strengthen higher education, R&D job creation (Tiits *et al.* 2015) and to stop the brain drain and emigration of the scientific milieu (Camagni and Capello 2014).

Change Routines and Address Institutional Bottlenecks

Developing systems for continuous entrepreneurial discovery and functional national/regional innovation

systems requires more flexible approaches to bureaucratic rules and regulations (Karo *et al.* 2017) and changes in routines and governance practices at the CEE level (Kroll 2015). Weak institutional capacity is currently perceived as the key inhibitor in many lagging regions and specific policies must be developed to promote institutional reforms and alleviate institutional bottlenecks (Rodriguez-Pose 2015), to strengthen strategic management capabilities and to foster the emergence of 'innovation platforms' (Muscio *et al.* 2015). Creating a culture of openness, mutual trust and cooperation is the key pillar that can make the whole innovation system work in practice.

REFERENCES

Aghion, P., H. Harmgart and N. Weisshaar (2011), "Fostering Growth in CEE Countries: A Country-tailored Approach to Growth Policy", in: Radosevic, S. and A. Kaderabkova (eds.), *Challenges for European Innovation Policy*, Cheltenham: Edward Elgar Publishing, 47–76.

Bachtler, J., C. Mendez and H. Oraze (2014), "From Conditionality to Europeanization in Central and Eastern Europe: Administrative Performance and Capacity in Cohesion Policy", *European Planning Studies* 22, 735–757.

Barca, F. (2009), *An Agenda for a Reformed Cohesion Policy – A Place-based Approach to Meeting European Union Challenges and Expectations*, http://www.europarl.europa.eu/meetdocs/2009_2014/documents/regi/dv/barca_report_/barca_report_en.pdf.

Becker, T., D. Daianu, Z. Darvas, M. Landesmann, J. Pisaini-Ferry, D. Rosati, A. Sapir and B. Weder di Mauro (2010), *Whither Growth in Central and Eastern Europe*, Brussels: Bruegel-wiiw Publication.

Boschma, R. and R. Gianelle (2014), *Regional Branching and Smart Specialisation Policy*, Institute for Prospective Technological Studies & Joint Research Centre, JRC-IPTS Working Papers JRC88242.

Brown, A., R. Fornoni, B. Gardiner, L. Greunz, S. Jestl, N. Rabemiafara, R. Römisch, J. Stenning and T. Ward (2017), *Economic Challenges of Lagging Regions*, Luxembourg: Publications Office of the European Union.

Camagni, R. and R. Capello (2013), "Regional Innovation Patterns and the EU Regional Policy Reform: Toward Smart Innovation Policies", *Growth and Change* 44, 355–389.

Camagni, R. and R. Capello (2014), *Rationale and Design of EU Cohesion Policies in a Period of Crisis with Special Reference to CEECs*, GRINCOH Working Paper Series – Policy Paper 1.

Capello, R. and P. Giovanni (2013), *Globalization and Growth Patterns in Eastern European Regions: From the Transition Period to the Economic Crisis*, GRINCOH Working Paper 1.11.

Clar, G., P. Boekholt, C. Nauwelaers, C. Saublens and M. Tiits (2015), *Perspectives for Research and Innovation Strategies for Smart Specialisation (RIS3) in the Wider Context of the Europe 2020 – Growth Strategy*, Luxembourg: Publications Office of the European Union.

Correa, P. and I. Guceri (2014), *Research and Innovation for Smart Specialization Strategy: Concept, Implementation Challenges and Implications*, Washington DC: World Bank.

Economist Intelligence Unit (2008), *A Time for New Ideas Innovation in Central Eastern Europe and Turkey*, http://graphics.eiu.com/upload/ORACLE_INNOVATION.pdf.

Edler, J. (2009), *Demand Policies for Innovation in EU CEE Countries*, Manchester Business School Research Paper 579.

Estrin, S., J. Korosteleva and T. Mickiewicz (2014), *Entrepreneurial Growth Aspirations, Innovation Propensity and National Knowledge Intensity: Unveiling the Complexity of the Relationship, Using GEM Data*, GRINCOH Working Paper 3.08.2.

European Commission (2016a), *Support to SMEs – Increasing Research and Innovation in SMEs and SME Development, Final Report, Work Package 2 – Ex Post Evaluation of Cohesion Policy Programmes 2007–2013, Focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF)*, Luxembourg: Publications Office of the European Union.

European Commission (2016b), *Ex Post Evaluation of Cohesion Policy Programmes 2007–2013, Focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF): Country Reports (Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia)*, http://ec.europa.eu/regional_policy/en/information/publications/evaluations?title=Work+Package+1+&themeId=0&tObjectiveId=ALL&typeId=4&countryId=0&periodId=2&fundId=0&policyId=5&languageCode=en&search=1.

European Commission (2016c), *Ex Post Evaluation of the ERDF and Cohesion Fund 2007–13*, Commission Staff Working Document, SWD(2016) 318 final, Brussels.

European Commission (2017), *European Structural and Investment Funds 2014–2020: Finances Planned for Research & Innovation (RTDI) and Competitiveness of SMEs (Enterprise)*, https://cohesiondata.ec.europa.eu/themes.

Ferry, M. (2014), *Cohesion Policy Transfer and Institutional Change in Central and Eastern Europe*, GRINCOH Working Paper 8.06.

Ferry, M. and I. McMaster (2013), "Cohesion Policy and the Evolution of Regional Policy in Central and Eastern Europe", *Europe-Asia Studies* 65, 1502–1528.

Foray, D., P.A. David and B.H. Hall (2011), *Smart Specialization: From Academic Idea to Political Instrument, the Surprising Career of a Concept and the Difficulties Involved in Its Implementation*, MTEI Working Paper, https://pdfs.semanticscholar.org/29ad/6773ef30f362d7d3937c483003d974bc91c5.pdf.

Fratesi, U. and G. Perucca (2014), "Territorial Capital and the Effectiveness of Cohesion Policy: An Assessment for CEE Regions", *Investigaciones Regionales* 29, 165–191.

Gauselmann, A., M. Knell and J. Stephan (2011), "What Drives FDI in Central–Eastern Europe? Evidence from the IWH-FDI-Micro Database", *Post Communist Economies* 23, 343–357.

Gorzelak, G. and M. Ferry (2014), *Future Cohesion Policy Suggestions*, GRINCOH Working Paper Series – Policy Paper 4.

Gorzelak, G. (2017), "Cohesion Policy and Regional Development", in: Bachtler. J., P. Berkowitz, S. Hardy and T. Muravska (eds.), *EU Cohesion Policy: Reassessing Performance and Direction*, Abingdon: Routledge, 33–54.

Havas, A. and M. Keenan (2008), "Foresight in CEE Countries", in: Georghiou, L., H.J. Cassingena, M. Keenan, I. Miles and R. Popper (eds.), *The Handbook of Technology Foresight – Concepts and Practices*, Cheltenham: Edward Elgar, 287–316.

Havas, A., K. Izsak, P. Markianidou and S. Radosevis (2015), *Comparative Analysis of Policy-mixes of Research and Innovation Policies in Central and Eastern European Countries*, GRINCOH Working Paper 3.12.

Holm-Pedersen, M., J. Millard and K. Pedersen (2009), *Ex Post Evaluation of Cohesion Policy Programmes 2000–2006 Co-financed by the ERDF (Objectives 1 and 2), Work Package 6a: Enterprise and Innovation*, http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/expost2006/wp6a_report_en.pdf.

Iammarino, S. and P. McCann (2013), *Multinationals and Economic Geography: Location, Technology and Innovation*, Cheltenham: Edward Elgar.

Karo, E. and R. Kattel (2015), "Economic Development and Evolving State Capacities in Central and Eastern Europe: Can "Smart Specialization" Make a Difference?", *Journal of Economic Policy Reform* 18, 172–187.

Karo, E., R. Kattel and A. Cepilovs (2017), "Can Smart Specialization and Entrepreneurial Discovery Be Organized by the Government? Lessons from Central and Eastern Europe", in: Radosevic, S., A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (eds.), *Advances in the Theory and Practice of Smart Specialization*, Amsterdam: Elsevier, 269–292.

Koschatzky, K., U. Bross and P. Stanovnik (2001), "Development and Innovation Potential in the Slovene Manufacturing Industry: Analysis of an Industrial Innovation Survey", *Technovation* 21, 311–324.

KPMG (2016), *EU Funds in Central and Eastern Europe: Progress Report 2007–2015*, https://assets.kpmg.com/content/dam/kpmg/pdf/2016/06/EU-Funds-in-Central-and-Eastern-Europe.pdf.

Krammer, S. (2017), "Science, Technology and Innovation for Economic Competitiveness: The Role of Smart Specialization in Less-developed Countries", *Technological Forecasting and Social Change* 123(C), 95–107.

Kravtsova, V. and S. Radosevic (2012), "Are Systems of Innovation in Eastern Europe Efficient?", *Economic Systems* 36, 109–126.

Kroll, H. (2015), "Efforts to Implement Smart Specialization in Practice – Leading Unlike Horses to the Water", *European Planning Studies* 23, 2079–2098.

Kroll, H. (2017), *The Challenge of Smart Specialisation in Less Favoured Regions*, Working Papers "Firms and Region" R1/2017, Karlsruhe: Fraunhofer ISI.

Leon, L.R., M. Miedzinski and A. Reid (2011), *Cohesion Policy and Regional Research and Innovation Potential: An Analysis of the Effects of Structural*

Funds Support for Research, Technological Development and Innovation 2000–2010, Luxembourg: Publications Office of the European Union.

McCann, P. and R. Ortega-Argilés (2015), "Smart Specialization, Regional Growth and Applications to European Union Cohesion Policy", *Regional Studies* 49, 1291–1302.

McCann, P. and R. Ortega-Argilés (2016), "The Early Experience of Smart Specialization Implementation in EU Cohesion Policy", *European Planning Studies* 24, 1407–1427.

Muscio, A., A. Reid and L. Rivera (2015), "An Empirical Test of the Regional Innovation Paradox: Can Smart Specialisation Overcome the Paradox in Central and Eastern Europe?", *Journal of Economic Policy Reform* 18, 153–171.

Pontarollo, N. (2017), "Does Cohesion Policy Affect Regional Growth? New Evidence from a Semi-parametric Approach", in: Bachtler, J., P. Berkowitz, S. Hardy and T. Muravska (eds.), *EU Cohesion Policy: Reassessing Performance and Direction*, Abingdon: Routledge, 69–84.

Radosevic, S. and B. Lepori (2009), "Public Research Funding Systems in Central and Eastern Europe: Between Excellence and Relevance – Introduction to special section", *Science and Public Policy* 36, 659–666.

Radosevic, S. (2011), "Science-industry Links in Central and Eastern Europe and the Commonwealth of Independent States: Conventional Policy Wisdom Facing Reality", *Science and Public Policy* 38, 365–378.

Radosevic, S. and E. Yoruk (2014), "Are There Global Shifts in the World Science Base? Analysing the Catching Up and Falling Behind of World Regions", *Scientometrics* 101, 1897–1924.

Radosevic, S. and K. Stancova (2015), *External Dimensions of Smart Specialization: Opportunities and Challenges for Trans-regional and Transnational Collaboration in the EU-13*, Luxembourg: Publications Office of the European Union.

Radosevic, S. (2017), *Upgrading Technology in Central and Eastern European Economies*, IZA World of Labor, https://wol.iza.org/uploads/articles/338/pdfs/upgrading-technology-in-central-and-eastern-european-economies.one-pager.pdf?v=1.

Rodriguez-Pose, A. (2015), *Leveraging Research, Science and Innovation to Strengthen Social and Regional Cohesion*, European Commission, Luxembourg: Publications Office of the European Union.

Technopolis (2006), *Strategic Evaluation on Innovation and the Knowledge Based Economy in Relation to the Structural and Cohesion Funds for the Programming Period 2007–2013,* http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/strategic_innov.pdf.

Tiits, M., R. Kattel, T. Kalvet and S. Tamm (2008), "Catching up, Forging Ahead or Falling Behind? Central and Eastern European Development in 1990–2005", *Innovation: The European Journal of Social Science Research* 21, 65–85.

Tiits, M., T. Kalvet and I. Mürk (2015), "Smart Specialisation in Cohesion Economies", *Journal of the Knowledge Economy* 6, 296–319.

Zenka, J., J. Novotny and P. Csank (2014), "Regional Competitiveness in Central European Countries: In Search of a Useful Conceptual Framework", *European Planning Studies* 22, 164–183.

Alina Schoenberg

Regional Disparities in Europe: An Assessment of the Impact of the 2007–2013 Funding Programme on Convergence in Romania and Bulgaria

Alina Schoenberg
IMC Krems University
of Applied Sciences

INTRODUCTION

The common European market requires homogeneity in economic development, a fact that has led to political concern regarding regional disparities across EU member states in recent decades. Such differences between (or within) regions can be observed in long-lasting inequalities in economic growth. In this context, regional development and the reduction of regional disparities towards economic, social and territorial cohesion have become an important priority in the European Union. Since 1975 when the Regional Development Fund was installed, European policy started focusing on the economic development of the poorest regions. The Cohesion Fund, which strongly emphasises the subsidiarity principle, but provides funds based on the additionality principle, was established in 1994; and the Lisbon strategy in the year 2000 shifted funding priorities towards promoting regional growth, employment and innovative performance, initiating a change in paradigm from redistribution to growth orientation. Since cohesion policy funding accounts for one third of the budget of the European Union, it is often the subject of evaluation and of political and scientific debate. Economic literature has been dealing with the impact of different EU programmes on key economic indicators of recipient regions, offering mixed evidence on whether regional growth is being enhanced. Cappelen *et al.* (2003) show that regional policy in the EU has succeeded in improving income and productivity equality among regions, but they also suggest that funding has to facilitate innovation and structural change in poor regions in order to become more successful. Beugelsdijk *et al.* (2005) also find evidence for the positive effect of structural funds between 1995 and 2001 on convergence. Becker *et al.* (2012) state that funding leads to faster growth in the recipient EU regions, but they also suggest that a redistribution of funds from regions with a transfer intensity (as the amount of funds in percent of GDP) above 1.3 percent of GDP to regions below this threshold could benefit the convergence process. For mostly peripheral regions with high unemployment and low productivity, Fagerberg and Verspagen (1996) find a diverging impact of EU investment support on growth. Dall'erba and Le Gallo (2007) also

raise some doubts about the effectiveness of the 1989–1999 funding period after including spatial effects in their analysis and indicating that peripheral regions are more affected by structural funds allocated to core regions than by their own funding. Boldrin and Canova (2001) do not find any evidence of a decrease in regional disparities during the 1980s, suggesting that regional policy serves re-distributional purposes instead of improving regional growth. Even although there is evidence of a positive impact of structural funds on growth rates in poor EU regions in the first programming period, Puigcerver-Penalver (2007) also finds a negative effect on the convergence of those regions after the second programme. Some authors find only conditional effectiveness of the EU regional policy. In this line of argument Ederveen *et al.* (2006) show by using a neoclassical growth framework that cohesion only takes place in receiving counties with a strong institutional framework; and suggest that funds should primarily be allocated to institution building in order to increase the effectiveness of regional policy. Rodirguez-Pose and Fratesi (2004) see the need for better-defined and region-specific development strategies, which could help avoid supporting 'wrong' causes and would prepare regions to face economic challenges by boosting their competitiveness. In general, studies dealing with more recent funding periods indicate larger effects of structural funds. Thus, a learning effect might have led to a more effective ways of allocating the funds (Dall'erba and Fang 2017; Fratesi and Wishlade 2017).

This paper aims to show whether convergence took place in regions of the two newest members of the EU, Bulgaria and Romania, after the first post-accession funding programme between 2007 and 2013 by using a difference-in-difference approach. This approach makes it possible to compare the changes in different variables related to convergence between regions in the two new member countries and other regions not eligible for the convergence objective before and after the funding period, assuming that without the funding, the development in the two groups of regions would have been similar. The paper is structured as follows: the second section provides information on the 2007-2013 programme in Bulgaria and Romania, followed by the third section which shows the key findings of the estimation. The final section concludes by offering an outlook on the current funding period for the two countries.

CONVERGENCE POLICY IN BULGARIA AND ROMANIA IN THE 2007–2013 PROGRAMME

Following enlargement in 2007 whereby Bulgaria and Romania joined the EU, the EU population has grown by 37.8 million (6.5 percent), which reduced average GDP per capita of the EU27 by 4 percent. At the same

Table 1

Allocation of Cohesion Funds (ERDF, SEF and CF) in Bulgaria and Romania during the Funding Period 2007–2013.

	Total funds (billion €)	Funds per capita (€)	GDP per capita (€)	Funds in % of GDP	Funds in % of capital expenditure
Bulgaria	6.67	899.05	3,316.70	2.43	56.01
Romania	19.06	934.09	4,132.84	2.04	36.72
EU average	12.12	1,090.41	25,158.32	1.19	28.14
CEE average	15.94	1,963.58	10,885.72	2.63	52.97

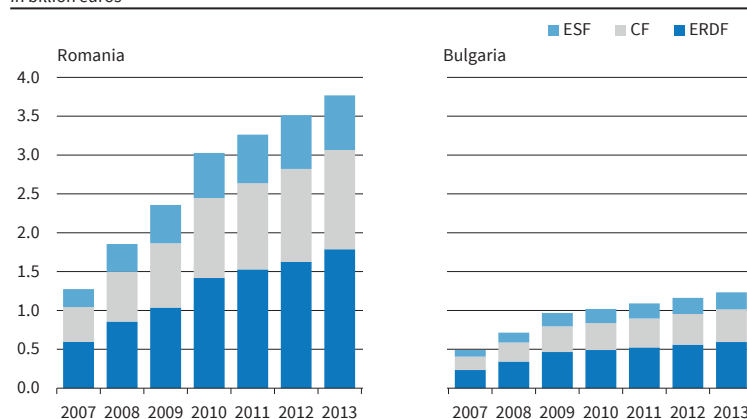Source: European Commission; own calculation.

time this further increased regional disparities, following on from the accession of ten new members in 2004, which had already almost doubled the development gap across the EU. As a result, cohesion efforts shifted from countries in southern Europe like Greece, Spain, Portugal and Italy, but also Ireland and eastern Germany, towards countries in Eastern Europe aimed at helping them to catch up economically and to adjust to open market competition. In the 2007–2013 programme, the cohesion policy amounted to 36 percent (308 billion euros[1]) of the total EU budget and was largely aimed at financing activities linked to the Lisbon Agenda. The programme defined three main objectives for the funding period: convergence (formerly objective 1), competitiveness and employment (formerly objective 2 and objective 3) and territorial co-operation. The first main objective is convergence for regions with GDP per capita below the threshold of 75 percent of the EU average. As opposed to previous programmes that allocated funds mostly to infrastructure and human capital development, the 2007–2013 programme aimed to promote growth-enabling factors in particular. It supported innovation, the knowledge-based society and structural change towards sustainable growth and employment. In addition to the 86 regions eligible for the convergence objective, 16 further 'phasing-out' regions that narrowly missed the threshold due to the statistical effect of the enlargement were included in the convergence objective.[2] For 13 regions covered by objective 1 in the previous funding period and exceeding 75 percent of the average GDP of EU15 average in 2007, a 'phasing-in' system towards the competitiveness objective was granted. This second priority of the 2007–2013 funding period aimed to strengthen competitiveness and to support employment in regions not covered by the convergence objective. Overall, 38.4 billion

euros (financed by the European Regional Development Fund and the European Social Fund) have been allocated to promoting innovation and entrepreneurship and to improving the accessibility and adaptability of labour markets, in order to enhance a smoother transition to the knowledge society. The third objective of the programme was to improve territorial co-operation by facilitating joint actions for local, regional and national actors from different EU members.

Despite Romania and Bulgaria experiencing a considerable strengthening of the economy in recent years, both countries are among the poorest regions in Europe. The funding from the Structural Funds allocated to Bulgaria and Romania in the 2007–2013 programme totalled 25.7 billion euros (6.68 billion euros for Bulgaria and 19.05 billion euros for Romania) representing 14.6 percent of funding for the 12 new member countries (Table 1). However, the funding for both countries remained below the average for Central and East European (CEE) countries. Figure 1 shows the allocation of committed funds from the ERDF, the CF and the ESF for each programming year.

The priorities set by the National Strategic Reference Frameworks (NSRF) regarding the utilisation of financial support from the EU were similar in both countries. They aimed to allocate funds to develop and improve infrastructure, to increase long-term competitiveness and to foster entrepreneurship, to improve the quality of human capital and to support a balanced territorial

[1] Of which 175 billion euros were allocated towards new member states joining the EU in 2004 and 2007.
[2] Due to the EU enlargement this regions had a higher GDP per capita than 75 percent of EU25 average but were still below the 75 percent threshold of the EU15 average.

Figure 1

Committed Structural Funds for Bulgaria and Romania from 2007–2013
In billion euros

Source: European Commission.

© ifo Institute

Figure 2

Funds by Category and Shift among Categories between 2007 and 2016
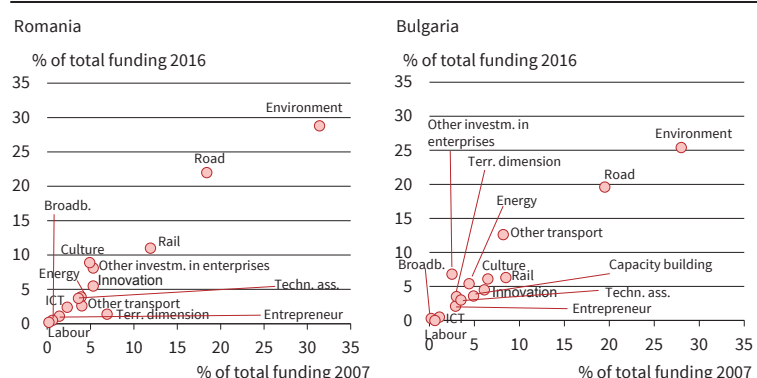
Source: Eurostat.

© ifo Institute

development. In both countries, over one third of total support was directed towards transport programmes and more than 25 percent towards environmental issues (Figure 2). In both countries, no funds were allocated towards human capital formation. Over the course of the programming period, both countries shifted funds between policy areas, mainly due to problems in absorbing the funds. Initial funds related to the labour market accounted 0.6 percent of total funding in Bulgaria at the beginning of the programme, but were completely reallocated towards other priorities by the end of 2016. Around 0.2 percent of total funding in Romania was used to finance labour market activities. To increase the effectiveness of expenditure in Romania, funds were shifted towards cultural projects, almost doubling the initial amount for this priority. This illustrates the institutional and administrative problems in both countries in an exemplary fashion.

The advance funding of projects by local authorities led to temporary financial problems on the part of municipalities. Both countries also experienced difficulties in finding the requisite private and public co-funding at a national level, leading to a reduction in the national co-financing rate that was intended to reduce pressure on national public finances. Romania still had the lowest absorption rate in Europe, claiming only 75 percent of the available funds (ERDF, ESF, CF) by the end of 2015. Although Bulgaria had similar implementation problems up to the year 2012, it managed to absorb all the available funding by the end of 2015.

variables of interest are GDP in PPS per capita as a percentage of the EU average, unemployment rate, gross fixed capital formation and R&D spending per capita. Considering the growth orientation of cohesion policy in this funding period, the effects of the grants in Romania and Bulgaria are expected to induce higher changes in these variables than in more developed regions. The periods considered in the analysis are the pre-funding period between the year 2000 and 2006 and the post-funding period of 2014–2015. The control group consists of 'objective 3 regions' during the 2000–2006 funding period that were not eligible for the convergence objective in the following funding period. To examine the effects of cohesion policy on convergence in Bulgaria and Romania I estimate following model:

$$(1) \quad y = \beta_0 + \beta_1 dCoh + \delta_0 dpost + \delta_1 dpost \cdot dCoh + u$$

where $dCoh$ is a dummy variable taking the value of 1 for NUTS 2 regions in Bulgaria and Romania and 0 for regions not qualifying for the convergence objective. $dpost$ denotes the time dummy and captures factors that would change the dependent variable without the EU funding for the convergence objective. δ_1 is the difference-in-difference coefficient that estimates the average effect of the funding in Romania and Bulgaria after the programming period. I estimate the equations for the economic indicators of interest

[3] The analysis includes all 15 Bulgarian and Romanian NUTS 2 regions and all 163 NUTS 2 regions that do not qualify for the convergence objective, the 'phasing out' system or the 'phasing in' system. The data used is from Eurostat.

Table 2

Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
GDP per capita as % EU average	1,562	18	593	112.64	46.563
Unemployment rate (%)	1,626	1.2	22.8	6.74	3.1537
Gross fixed capital formation (million €)	1,274	124	135,465	10,385.52	11,366.060
R&D expenditure per capita (€)	855	1,800	3,737.30	473.36	495.02

Notes: If available, all variables refer to 2000–2006 and 2014–2016 values for Romania and Bulgaria in the treatment group and for all former objective 3 regions (NUTS 2) that did not qualify for the convergence objective in the 2007–2013 funding period in the control group. Since only the poorest and the richest regions have been included in the analysis the mean for the GDP per capita as % EU average is not 100%.
Source: Eurostat; own calculation.

(GDP in PPS per capita in percentage of EU average, unemployment rate, gross fixed capital formation and R&D spending per capita) as dependent variables.

Table 2 provides the descriptive statistics for the variables used in the analysis and Table 3 provides several estimates of the average effects of Cohesion Policy in Bulgaria in Romania.

The results suggest that the GDP per capita as a percentage of the EU average did increase more in Bulgaria and Romania than in the more developed regions of the EU, implying that convergence did take place after the funding. The coefficient for the difference-in-difference estimator is positive and statistically significant. While in terms of GDP per capita, regions in Bulgaria and Romania managed to converge to the EU average by 19 percent (on average), the developed regions experienced a 4-percent decrease in per capita GDP as a percentage of the EU average. The Bucharest region in Romania managed to achieve a GDP per capita of above 100 percent of the EU average, disqualifying it for the convergence objective in the following funding period. On average, however, Romania achieved 58 percent of the EU average, with only 3 regions below 50 percent; while Bulgaria only converged to 42 percent on average. The results for the unemployment rate are similar and indicate that Romania and Bulgaria experienced a higher average decrease (1.58 percent) in unemployment than the more developed control regions, with the difference between regions being statistically significant. As far as gross fixed capital formation is concerned, the difference-in-difference estimator is negative suggesting that gross fixed capital formation in Bulgaria and Romania increased less on average than in the control group. This result is rather surprising given that one third of funding in Romania and Bulgaria was allocated to infrastructure and transportation projects. Furthermore, investment in enterprises amounted to 6.8 percent of total funding in Bulgaria and 8.1 percent in Romania. However, this result is not statistically significant. The analysis also states a statistically significant lower increase in per capita R&D expenditure in Bulgaria and Romania. Nevertheless, in view of the allocation of funds in Romania and Bulgaria for the funding period, which did not prioritise innovation[4] and long-term endogenous growth as intended by the programme, and given

the lack of expertise in knowledge creation and technology transfer, it is not surprising that Bulgaria and Romania did not manage to catch up to more developed regions. Furthermore, the two main objectives of improving regional competitiveness and achieving economic convergence appear contradictory due to a relatively lower capacity to absorb the funds in poorer countries (compared to more developed regions) and their relatively greater need to promote innovation activities at the same time (Nam et al. 2013).

Although the approach used enables an evaluation of Bulgaria's and Romania's convergence process, it does not account for political and economic changes at a national level; and therefore does not necessarily explain the causality between EU funds and economic growth in these countries. Romania experienced high growth rates until 2008, but was also strongly affected by the financial crises, having to deal with decreases in FDI and macroeconomic imbalances. The European debt crisis has therefore challenged the implementation of the EU programmes in Romania. In addition to EU funding, Romania was one of three non-Eurozone countries to receive further financial assistance (balance-of-payments assistance) in order to overcome macroeconomic and fiscal instabilities and this may also have led to changes in production and labour. Bulgaria has been facing a declining working age and lower productivity. Furthermore, since the absorption of funds from the 2007–2013 funding programme ended in 2015, further effects may be delayed and are not included in this analysis. In other words, both countries deal with administrative inefficiencies and problems in guaranteeing the national contribution, resulting in missing or delayed absorption of funding. While the funding for regions not qualifying for the convergence objective is significantly lower, the impact might be relatively higher due to better implementation strategies in these regions, which in

[4] About 5.5 percent and 4.5 percent of total funds were spent for innovation and R&D in Bulgaria and Romania, respectively. Funds for entrepreneurship amounted to 2.1 percent of total funding in Bulgaria and 1.1 percent in Romania.

Table 3

Estimation Results

	(1) GDP per capita as % EU average	(2) Unemploy- ment rate	(3) Gross fixed capital formation	(4) R&D expenditure per capita
Coefficients (p-values)				
β_1 (BG, RO)	– 88.08***	2.56***	– 9,645.01***	– 434.25***
	0.000	0.000	0.000	0.000
δ_0 (post)	– 4.03	0.841***	2,283.540**	302.57***
	0.116	0.000	0.015	0.000
DiD estimator	22.54**	– 1.58***	– 851.764	– 278.29***
	(0.013)	(0.010)	(0.766)	(0.008)
R^2	0.240	0.045	0.066	0.190
N	1,562	1,626	1,274	855

Notes: Difference-in-difference estimations, including intercepts (not reported). Dependent variables: GDP per capita in % of EU average (PPS), unemployment rate (%), gross fixed capital formation in million € and per capita R&D expenditure in €. P-values in brackets. If available, all variables refer to 2000–2006 and 2014–2016 values.
* significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Own calculation.

fact could relatively slow down the catching-up process of the least developed regions in the EU.

CONCLUSION

11 years after accession to the EU and 4 years into their second post-accession funding period, Bulgaria and Romania are still dealing with problems that delay the convergence process. Firstly, both countries face massive implementation problems that are mainly caused by inefficiencies at the administrative level. The absorption of funds has been a major challenge in both countries, leading to delayed implementation, payment lags and financial irregularities. Furthermore, the pressure to use the allocated funds has led to shifts in NSRF's priorities towards projects that are easier to implement, rather than projects that enhance convergence. Further steps to improve assistance and management skills on the administrative level and to enhance cooperation between central governments and local authorities are therefore necessary in both countries in order to increase the effectiveness of funding in the current programming period.

Secondly, national implementation strategies in both countries have not yet prioritised projects that would help to accelerate endogenous growth. In other words, due to major shortfalls in infrastructure development, a high share of funds has been directed towards transportation and construction projects, marking a failure to focus on innovation and employment too. This analysis has found some evidence in favour of a positive impact of Cohesion Funds on GDP and employment, despite the fact that both countries experienced serious economic setbacks during the crises years. However, the analysis shows divergence with respect to per capita R&D expenditure, confirming that an implementation of the Lisbon strategy in the cohesion strategy was not achieved during the 2007–2013 funding period and indicating that a change in paradigm regarding funding priorities on a national level is necessary to achieve long-term growth and speed up the convergence process.

REFERENCES

Barro, R.J. and X. Sala-i-Martin (1992), "Public Finance in Models of Economic Growth", *The Review of Economic Studies* 59, 645–661.

Becker, S.O., P.H. Egger and M. von Ehrlich (2012), "Too Much of a Good Thing? On the Growth Effects of the EU's Regional Policy", *European Economic Review* 56, 648–668.

Becker, S.O., P.H. Egger and M. von Ehrlich (2013), "Absorptive Capacity and the Growth and Investment Effects of Regional Transfers: A Regression Discontinuity Design with Heterogeneous Treatment Effects", *American Economic Journal: Economic Policy* 5(4), 29–77.

Beugelsdijk, M. and S.C. Eijffinger (2005), "The Effectiveness of Structural Policy in the European Union: An Empirical Analysis for the EU-15 in 1995–2001", *JCMS: Journal of Common Market Studies* 43, 37–51.

Boldrin, M. and F. Canova (2001), "Inequality and Convergence in Europe's Regions: Reconsidering European Regional Policies", *Economic policy* 16, 206–253.

Cappelen, A., F. Castellacci, J. Fagerberg and B. Verspagen (2003), "The Impact of EU Regional Support on Growth and Convergence in the European Union", *JCMS: Journal of Common Market Studies* 41, 621–644.

Dall'erba, S. and F. Fang (2017), "Meta-Analysis of the Impact of European Union Structural Funds on Regional Growth", *Regional Studies* 51, 822–832.

Dall'erba, S. and J. Le Gallo (2007), "Cohesion Policy, the Convergence Process and Employment in the European Union", *Czech Journal of Economics and Finance* 57, 324–340.

Ederveen, S., H.L. Groot and R. Nahuis (2006), "Fertile Soil for Structural Funds? A Panel Data Analysis of the Conditional Effectiveness of European Cohesion Policy", *Kyklos* 59, 17–42.

European Commission (2016a), *Country Report Bulgaria in Ex Post Evaluation of Cohesion Policy Programmes 2007–2013, Focusing on the European Regional Development Fund and the Cohesion Fund*, Brussels.

European Commission (2016b), *Country Report Romania in Ex Post Evaluation of Cohesion Policy Programmes 2007–2013, Focusing on the European Regional Development Fund and the Cohesion Fund*, Brussels.

Fagerberg, J. and B. Verspagen (1996), "Heading for Divergence? Regional Growth in Europe Reconsidered", *JCMS: Journal of Common Market Studies* 34, 431–448.

Fratesi, U. and F.G. Wishlade (2017), "The Impact of European Cohesion Policy in Different Contexts", *Regional Studies* 51, 817–821.

Nam, C.W., A.M. Schoenberg and G. Wamser (2013), "The Lisbon Agenda and Innovation-oriented Cohesion Policy: A New Challenge for Economic Integration among the EU Regions", *Journal of Economic Integration* 28, 37–58.

Puigcerver-Peñalver, M.C. (2007), "The Impact of Structural Funds Policy on European Regions' Growth: A Theoretical and Empirical Approach", *European Journal of Comparative Economics* 4, 179–208.

Rodríguez-Pose, A. and U. Fratesi (2004), "Between Development and Social Policies: The Impact of European Structural Funds in Objective 1 Regions", *Regional Studies* 38, 97–113.

Vanhoudt, P. (1999), "Did the European Unification Induce Economic Growth? In Search of Scale Effects and Persistent Changes", *Weltwirtschaftliches Archiv* 135, 193–220.

Marcus Drometer and Chang Woon Nam
R&D and Innovation Support in the Evolving EU Cohesion Policy

Economic convergence among regions is one of the major political objectives of the European Union. Article 174 of the Treaty on the Functioning of the European Union states that "the Union shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions" (European Union 2012). Consequently, around one third of the EU budget is presently dedicated to the European Structural and Investment Funds that implements the EU's cohesion policy and distributed mainly to regions with a per capita GDP of less than 75 percent of the EU average. While the general idea of fostering economic growth in disadvantaged regions has remained constant over time, the focus and measures of the EU's cohesion policy have changed significantly from one EU budget period to another.

In the following, we provide an overview of how EU cohesion policy has evolved over time, and how the changing economic environment has provoked adjustments of priorities from one EU budget period to another. We then focus on how the EU's expenditure on cohesion policy has changed as a result of adjustments to cohesion policy priorities. We conclude that, apart from some institutional weaknesses related to the steadily changing promotion activities and eligible areas, as well as violation of the subsidiarity principle when developing strategies, a lack of transparency hinders an exact assessment of how much the EU actually spends on cohesion policies in total and makes it rather difficult to compare cohesion policy spending across the different EU budget periods. In order to obtain further insights, we investigate how a particular measure – innovation promotion – changed for a selected group of countries – Italy and Spain – at the NUTS 2 level from 2000 to 2020. The data confirm two objections against the EU's convergence policies that already emerge when strategic changes from one EU budget period to another are more closely examined. Firstly, we find considerable fluctuations in contributions for regions over time, which is difficult to reconcile with the long-term goal of increasing growth *via* innovation and R&D. Secondly, the very aim of the EU cohesion policy seems to be impaired by the recent focus on innovation and R&D, simply because more prosperous regions offer higher potential for innovative projects that are likely to gain support from the EU.

CHANGES IN EU COHESION POLICY PRIORITIES OVER TIME

In the Treaty of Establishing the European Community signed in 1957, economic and social cohesion is defined in terms of reducing regional disparities in the level of development, usually measured by GDP per capita (relative to the EU average) in purchasing power parities (Yin and Zestos 2003). To achieve this aim, the European Structural and Investment Funds (ESIF) were established, which comprise the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF). As already mentioned above, total cohesion policy expenditure in the 2014-2020 period amounts to 351.8 billion euros which constitutes 32.5 percent of the overall EU budget.

The objectives of the European Structural and Investment Funds have been adjusted from time to time in response to changes in the overall strategy of the European Union. The budget period from 2000-2006 was characterised by a redistribution-oriented EU cohesion policy that focused on the economic growth of disadvantaged EU regions to promote convergence within the EU. Financial supports from Structural Funds were mainly concentrated on infrastructure and human capital development (European Commission 2004).

As a timely response to slow economic growth in the EU, the Lisbon Agenda agreed by EU leaders at the Lisbon summit in March 2000 aims to make the EU a more competitive and dynamic knowledge-based economy, capable of sustainable economic growth with more and better jobs and greater social cohesion.[1] In part, this political idea emerged due to a less clear consensus on the impact of 'past, redistribution-oriented' EU cohesion policy on the economic growth of EU regions and convergence in the EU (Leonardi 2006; EEAG 2018). EU regional policymakers have taken into account that regional growth is stimulated by the existence of numerous industries in the rapid-growth phase of the product life-cycle, and is retarded by the strong presence of old declining industries, which is associated with a lower level of new technology introduction (Grossman and Helpman 1991). As a result, the promotion of regional innovation systems has become one of the main EU policy measures for guaranteeing the sustainable economic growth of a region under the Lisbon Agenda. The role of regional

Marcus Drometer
ifo Institute

Chang Woon Nam
ifo Institute and
University of Applied
Management Ismaning

---

[1] In particular, it was agreed that to achieve this goal, an overall strategy should be applied, aimed at (a) preparing the transition to a knowledge-based economy and society *via* better policies for the information society and R&D, as well as by stepping up the process of structural reform for competitiveness and innovation and by completing the internal market; (b) modernising the European social model, investing in people and combating social exclusion; and (c) sustaining the healthy economic outlook and favourable growth prospects by applying an appropriate macro-economic policy mix (http://www.euractiv.com/future-eu/lisbon-agenda/article-117510).

innovation systems in particular was seen as a kind of self-help and learning tool for triggering local, self-sustained growth dynamics, especially targeted at peripheral regions, which would, in turn, help these less-favoured regions to catch up with core regions (De Bruijn and Lagendijk 2005).[2]

According to the overall EU financial budget, the main fields of investment and their relative shares of funding were classified into: (a) knowledge and innovation: almost 83 billion euros (24 percent of total 347 billion euros) were spent on research centers and infrastructure, technology transfer and innovation in firms, and the development and diffusion of information and communication technologies; (b) transport: about 76 billion euros (22 percent) had been allocated to improving the accessibility of regions, supporting trans-European networks, and investing in environmentally sustainable transport facilities in urban areas in particular; (c) environmental protection and risk prevention: investments of around 51 billion euros (19 percent) finance water and waste-treatment infrastructures, the decontamination of land in order to prepare it for new economic use, and protection against environmental risks; and (d) human resources: around 76 billion euros (22 percent) were spent on education, training, employment and social inclusion schemes. Other interventions concern the promotion of entrepreneurship, energy networks and efficiency, urban and rural regeneration, tourism, culture and strengthening the institutional capacity of public administrations (European Commission 2008).

Compared to the cohesion policy budget for the 2000-2006 period, with a total amount of 234 billion euros, Table 1 indicates that in the period of 2007–2013: (i) the share of funding spent on promoting less-favorable EU regions increased from 75 percent to 82 percent in the course of EU expansion from 15 to 27 countries; (ii) infrastructure support also gained importance and was increased from 32 percent to 37 percent; (iii) yet the share of funds spent on promoting education and training has been reduced remarkably from 31 percent to 22 percent; and (iv) a movement of financial priority took place from the promotion of firms' production and cooperation activities, including the establishment and innovation (EU budget 2000–2006) to knowledge-innovation (EU budget 2007–2013).

Since 2008, the EU has faced the global financial crisis and the Eurozone debt crisis, which has created persistent economic and social imbalances, for example, the high unemployment widespread in Southern European countries.[3] As a result, the EU cohesion policy for the 2014-2020 aims to promote job creation and business competitiveness, stimulate economic growth and sustainable development and, finally, enhance inhabitants' quality of life. In response to the crisis, cohesion policy now targets 'all' regions and cities in the European Union – in contrast to previous periods. Internally, the funds aim to simplify the rules and improve accountability by clear and measurable targets (European Commission 2014).

In order to achieve these goals in all EU regions in this budget period the cohesion policy (funded to the tune of 351.8 billion euros) is designed to provide the necessary 'investment framework to achieve the smart, sustainable and inclusive growth in the EU' set out in the Europe 2020 strategy.[4] The five main targets of this strategy include:

1. Employment: 75 percent of the 20-64 year-olds to be employed
2. Research & development: 3 percent of the EU's GDP to be invested in R&D
3. Climate change and energy sustainability: (a) greenhouse gas emissions to be reduced by 20 percent (or even by 30 percent, if the conditions are right); (b) the share of renewable energy in final energy consumption to be increased to

---

[2] The EU policy measures shall include the "generation, dissemination and use of knowledge [are] critical to the way in which businesses operate and grow. Facilitating access to finance and markets, promoting business support services, reinforcing links between enterprises and the scientific base, equipping people with the right skills through education and training, encouraging the take-up of new technologies and increasing investment in R&D are all crucial to improving the business environment and stimulating innovation [as well as economic growth and job creation in the lagging EU regions]" (European Commission 2004, 114).

[3] There is a widespread view that these developments aggravated divergence within the EU and destroyed part of the progress of cohesion policy achieved until then.
[4] See also http://ec.europa.eu/regional_policy/en/policy/what/investment-policy/.

Table 1

EU Budgets for Cohesion Policy for the Periods 2000–2006 and 2007–2013

	EU budget 2000–2006 EU15 (+ EU10 later)	EU budget 2007–2013 EU27
Total amount	234 billion € (100%)	347 billion € (100%)
Promotion of objective 1 (or cohesion) region	175 billion € (75%)	283 billion € (82%)
Infrastructure (mainly transport & environment)	76 billion € (32%)	127 billion € (37%)
Firms' production & cooperation activities (incl. also establishment & innovation)	73 billion € (31%)	
Human resources	73 billion € (31%)	76 billion € (22%)
Knowledge-innovation		*83 billion € (24%)*
Cross-border cooperation & others	12 billion € (5%)	61 billion € (18%)

Source: European Commission, Wamser et al. (2013).

20 percent; and (c) increases in energy efficiency by 20 percent

4. Education: (a) reducing the rates of early school leavers below 10 percent; while (b) increasing the share of the population aged 30–34 having completed tertiary to 40 percent

5. Fighting poverty and social exclusion: at least 20 million fewer people in or at risk of poverty and social exclusion.[5]

The types of eligible EU regions are also newly defined: (a) 'Less developed' regions in which GDP per capita is below 75 percent of the EU average, will continue to be the top priority for the policy. The maximum co-financing rate is set at 75–85 percent in the less-developed regions and the outermost regions;[6] (b) 'Transition' regions, whose GDP per capita is between 75 percent and 90 percent of the EU average, will have a co-financing rate of 60 percent; and (c) 'More developed' regions, whose GDP per capita is above 90 percent of the average. The co-financing rate will be 50 percent (European Commission 2014). The concentration of financial supports on the so-called cohesion regions, both less-developed regions and transition regions (former objective 1 regions), for the period 2014–2020 amounts to 'only' 62 percent of the total

351.8 billion euros (European Commission 2014; Nam 2017).

A more detailed assessment of how much the EU actually spends on cohesion policies under the Structural and Investment Funds and its classification according to the promotion activities, regions, etc. is highly difficult given the data available. The EU has defined eleven themes ranging from 'Research & Innovation' to 'Efficient Public Administration' and lists the share of their budgets currently spent in each member country. However, no information on which part of the budget is related to cohesion policies is provided. Additionally, the structure of five funds decreases transparency further. More specifically, this structure comprises of the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF), which are not linked to cohesion policy. As the classification of budget positions have changed from one EU budget period to another, it is very hard to compare the development of spending on cohesion policies over time, which is surprising given the European Commission's attempts to improve accountability.

R&D AND INNOVATION PROMOTION PRACTICES IN ITALIAN AND SPANISH REGIONS AMONG DIFFERENT EU COHESION PRIORITIES

To gain further insights, we study how particular policies – innovation promotion – have changed for regions in Italy and Spain from 2000 to 2020. The policy priority of promoting regional innovation systems was reflected

---

[5] See https://ec.europa.eu/info/strategy/european-semester_en.
[6] Basically, the EU only provides financial support for regional projects if national authorities are also financially involved. Such a 'matching co-finance principle' (or the so-called 'additionality principle') aims to ensure the complementary relationship between the fund providers in the context of the EU cohesion policy (Nam and Wamser 2011).

Table 2

R&D and Innovation Promotion in Italian NUTS 2 Regions in the Context of EU Cohesion Policy

Italian NUTS 2 regions	Budget year 2000–2006	Budget year 2007–2013	Budget year 2014–2020
	Innovation promotion as a %-share of total public contributions [d]	Innovation promotion as a %-share of total public contributions [d]	Innovation promotion as a %-share of total public contributions [d]
Abruzzo [a,c]	30.5	39.4	19.4
Aosta Valley	0.0	30.6	21.0
Apulia [a,b]	0.0	11.1	na
Basilicata [a,b]	0.0	22.3	na
Calabria [a,b]	0.0	10.0	8.8
Campania [a,b]	0.0	17.7	12.5
Emilia-Romagna	38.6	53.0	29.2
Friuli-Venezia Giulia	43.5	45.5	na
Lazio	0.0	34.3	19.7
Liguria	33.0	27.0	20.4
Lombardy	31.6	49.4	36.0
Marche	38.0	41.5	33.8
Molise [a,c]	0.0	39.4	na
Piedmont	50.3	46.2	36.7
Province of Bolzano-Bozen	0.0	36.0	24.0
Province of Trento	0.0	0.0	50.5
Sardinia [a,c]	0.0	27.0	13.8
Sicily [a,b]	0.0	5.0	na
Tuscany	39.9	35.6	31.9
Umbria	36.5	46.0	28.6
Veneto	0.0	41.9	19.0

Notes: [a] = Objective 1 regions defined in the framework of the EU Regional Development Programs 2000-2006; [b] = Less developed regions defined in the framework of the EU cohesion policy 2014–2020; [c] = Transition regions defined in the framework of the EU cohesion policy 2014–2020; [d] = EU contribution + national contribution; na = not available.
Source: European Commission.

Table 3

R&D and Innovation Promotion in Spanish NUTS 2 Regions in the Context of EU Cohesion Policy

Spanish NUTS 2 regions	Budget year 2000–2006	Budget year 2007–2013	Budget year 2014–2020
	Innovation promotion as a %-share of total public contributions [d]	Innovation promotion as a %-share of total public contributions [d]	Innovation promotion as a %-share of total public contributions [d]
Castile-La Mancha [a,c]	1.9	25.7	39.5
Canary Islands [a,c]	4.2	16.3	24.2
Castile and Léon [a]	2.7	36.3	na
Extremadura [a,b]	4.4	23.5	34.0
Murcia [a,c]	3.4	30.8	30.6
Asturias [a]	2.2	35.2	25.3
Ceuta [a]	0.0	16.9	0.0
Melilla [a,c]	0.0	20.3	0.0
La Rioja	26.7	80.0	na
Andalusia [a,c]	3.0	27.2	15.0
Valencia [a]	9.3	41.0	53.0
Galicia [a]	14.7	24.7	na
Basque Country	32.7	72.0	44.6
Catalonia	29.5	51.6	40.9
Navarre	42.1	90.4	na
Aragon	33.9	81.0	na
Balearic Islands	26.9	56.2	16.0
Madrid	36.9	61.7	na
Cantabria	6.6	79.8	20.0

Notes: [a] = Objective 1 regions defined in the framework of the EU Regional Development Programs 2000–2006; [b] = Less developed regions defined in the framework of the EU cohesion policy 2014–2020; [c] = Transition regions defined in the framework of the EU cohesion policy 2014–2020; [d] = EU contribution + national contribution; na = not available.
Source: European Commission; Nam (2017).

for the first time in the cohesion policy programme for the period 2007–2013, and has since been enforced by targeting 'all' regions, as already mentioned above. The R&D and innovation promotion scheme implemented in the EU cohesion policy framework basically comprises and compounds the following measures: (a) financial support for the innovation activities of firms (in particular SMEs); (b) promotion of public R&D capacity expansion (universities and technology centers); and (c) support for projects aimed at the creation and (better) establishment of regional innovation system (i.e. cluster formation, networking and knowledge transfers).

The EU reports the total cost of regional programmes and the respective EU contribution at the NUTS 2 level for operational programmes officially adopted by the European Commission at the beginning of the budget years.[7] These programmes were prepared by each EU member state and present the weights of financial priorities (e.g. infrastructure, innovation, human capital, environment, etc.) set by the national and regional authorities for the corresponding budget period. Tables 2 and 3 compare the share of R&D and innovation promotion grants aimed at all three aforementioned categories – measured in terms of the national and EU sum of innovation support divided by the total cost of the regional programme – for the individual Italian and Spanish NUTS 2 regions in different EU budget periods.

The descriptive evidence of R&D and innovation promotion in Italy and Spain confirms two objections against the EU's convergence policies that already emerged in discussions of the strategic changes from one budget period to another. As evident from Tables 2 and 3, the share of total public contributions dedicated to the promotion of innovation fluctuates considerably over time for most regions. An immediate explanation for this pattern is the continuous revision of the EU cohesion policy's priorities due to changing macroeconomic circumstances and the subsequent, most immediate economic problems (e.g. the Lisbon treaty as a reaction to the EU's stagnating economic growth; the negative impact of the 2009 financial crisis on the EU regions). While such flexibility in policy design and implementation may certainly be deemed appropriate for addressing current needs, it is difficult to reconcile with the long-term goal of increasing growth *via* innovation and R&D. Thus the EU regional policy does not seem to be coherent over time in the field of innovation promotion in the Italian and Spanish NUT 2 regions considered here.

In Figures 1, we plot the average per capita income of a region (in Italy and Spain) during an EU budget period against the share of total public contributions, which is dedicated to the promotion of innovation.[8] The evidence suggests that prosperous regions obtain a higher share of public contributions than before due to the focus on innovation and R&D following the Lisbon strategy. The integration of the Lisbon strategy in the EU regional policy appears to have created some tensions between competitiveness aims and cohesion aspirations. These tensions have become even more

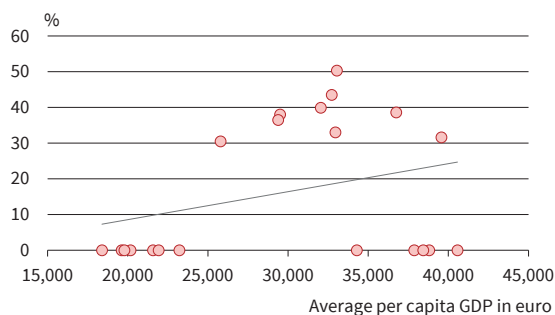[7] See http://ec.europa.eu/regional_policy/en/atlas/programmes/.

[8] We only consider the periods 2000 to 2006 and 2007 to 2013, as too much data is missing for the current period.
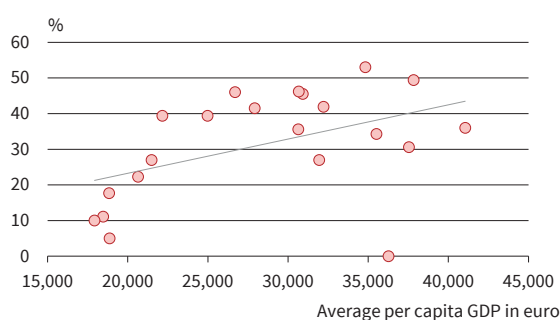
Figure 1

Innovation Promotion in Selected European Regions Under Different EU Budget Periods

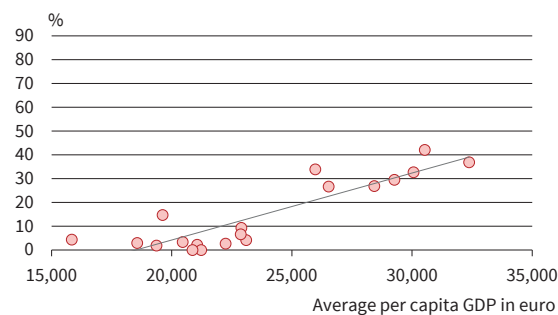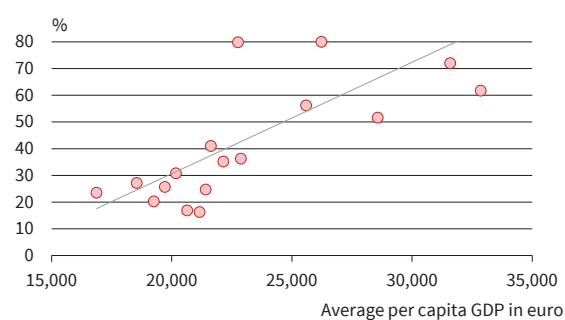Innovation promotion as a share of total public support for Italy

Innovation promotion as a share of total public support for Spain

Source: European Commission; own calculations.

© ifo Institute

prevalent in the current budget period, as cohesion policy now targets 'all' regions and cities in the European Union in response to widespread economic problems as a result of the recent crisis in Europe. According to Lawton-Smith (2003), the twin goals of increasing competitiveness in the global economy and economic and social convergence are contradictory and inherently comprise different policy options: the former is generally about 'winners and losers', while the other is about 'redistribution'. First of all, there is a trade-off between growth and cohesion, as different core and periphery growth trends tend to increase regional disparities at low levels of development. Secondly, while cohesion policy primarily aims to enable low performing regions to catch up to the core regions in the EU, the promotion of competitiveness triggered since the Lisbon Agenda seems to strengthen the competitiveness of the best performing regions. While this effect was already observed in the 2007–2013 period, the new priorities of the current EU budget period seems to have enforced this development, which works against the goal of reducing the economic, social and territorial disparities that still exist.

CONCLUSION

EU cohesion policy has been continuously revised under consideration of changing macroeconomic circumstances and the subsequent, most immediate economic problems (e.g. the Lisbon treaty as a reaction

to the EU's stagnating economic growth; the negative impact of the 2009 financial crisis on the EU regions). Such flexibility in policy design and implementation may certainly be deemed appropriate and necessary. Yet the EU regional policy and its emphasis in different budget periods do not appear to have been coherent. While cohesion policy originally aimed at enabling poorly performing regions to catch up to core regions in the EU, the R&D and innovation promotion triggered by the Lisbon Agenda and Europe 2020 seems to have strengthened the competitiveness of strongly-performing regions in the EU. Innovation efforts in the less affluent EU regions with a traditional socio-economic structure have remained in vain to date, mainly due to the limited vision of firms caused by their concentration on local markets, their weak capacity to absorb new ideas and technologies, limited levels of entrepreneurship, their lack of access to local research and knowledge transfer networks, etc. (see also Wamser *et al.* 2013)

In addition, the design and implementation of EU cohesion policy should ideally have a stronger regional (i.e. 'bottom-up') dimension, endowed with a multi-level governance structure to accommodate it. While all projects are planned and implemented at the regional or local level, the EU only co-finances policy projects that are in line with the pre-defined priorities. The Lisbon Agenda and Europe 2020 were imposed top-down on EU members with targets that are more macro- than micro-economic, and therefore

have an overriding national dimension – a fact that clearly violates the subsidiarity principle (see also De Propris 2007).

REFERENCES

De Bruijn, P. and A. Lagendijk (2005), "Regional Innovation Systems in the Lisbon Strategy", *European Planning Studies* 13, 1153–1172.

De Propris, L. (2007), "EU Clusters and Competitiveness Policy", *Policy Studies* 28, 327–345.

European Commission (2004), *Working for the Regions: EU Regional Policy 2000–2006*, Luxembourg: Office for Official Publication of the European Communities.

European Commission (2008), *Working for the Regions, EU Regional Policy 2007–2013*, http://ec.europa.eu/regional_policy/sources/docgener/presenta/working2008/work_en.pdf.

European Commission (2014), *An Introduction to EU Cohesion Policy 2014–2020*, http://ec.europa.eu/regional_policy/sources/docgener/informat/basic/basic_2014_en.pdf.

European Economic Advisory Group (2018), *EEAG Report on the European Economy 2018*, Munich: CESifo.

Grossman, G. and E. Helpman (1991), *Innovation and Growth in the Global Economy*, Cambridge: MIT Press.

Lawton-Smith, H. (2003), "Knowledge Organizations and Local Economic Development: The Case of Oxford and Grenoble", *Regional Studies* 37, 899–909.

Leonardi, R (2006), "The Impact and Added Value of Cohesion Policy", *Regional Studies* 40, 155-166.

Nam, C.W. (2017), "R&D and Innovation Promotion in the Context of EU Cohesion Policy: The Case of the Spanish Regions", *CESifo Forum* 18(3), 25–26.

Nam, C.W. and G. Wamser (2011), "Application of Regionally Varying Co-financing Degrees in the Practice of EU Cohesion Policy", *CESifo Forum* 12(4), 57–67.

Wamser, G., C.W. Nam and A. Schoenberg (2013), "The Lisbon Agenda and Innovation-oriented Cohesion Policy: A New Challenge for Economic Integration among the EU Regions", *Journal of Economic Integration* 28, 37–58.

Yin, L. and G.K. Zestos (2003), "Economic Convergence in the European Union", *Journal of Economic Integration* 18, 188–213.

Marcel Thum

The Economic Cost of Bitcoin Mining

Marcel Thum
ifo Institute and
Technical University
Dresden

Until recently, Bitcoins were mostly a topic for computer nerds. This has changed dramatically. Nowadays, Bitcoins and other crypto currencies are widely discussed as part of general payment systems and as speculative investments. The economic literature on crypto currencies has grown substantially. Yermack (2013), for instance, investigates the extent to which Bitcoins fulfill the usual criteria of monetary currencies. Another important research topic is the need for the regulation of crypto currencies (ifo Schnelldienst 2017). The exponential growth and subsequent crash of Bitcoin prices has led to greater debate over speculative bubbles in crypto currencies. However, the social costs of crypto currencies have been largely neglected in the academic and public debate. Some proponents of crypto currencies still paint an idyllic scene of a decentralized currency created by 'volunteers' as if Bitcoin mining was done for the common good only. Nothing could be more misleading. While central banks can create cash at almost no cost – printing a bank note uses up very few resources – this is not true of a virtual currency like Bitcoins. Although Bitcoins have only been in existence for a few years, they have cost society over 5 billion US dollars.

To understand their social cost, a brief and admittedly sketchy description of the process of Bitcoin mining might be helpful.[1] In the following, all aspects regarding the trading of Bitcoins – for purposes of payment or speculation – are completely ignored, as the social costs of crypto currencies are generated in the mining process, i.e. in the production of new Bitcoins. How do new Bitcoins enter the world? Ultimately Bitcoins are just a text file or a chain of linked text files. Every transfer of a Bitcoin from one person to another is irrevocably written into this text file ('blockchain'). To safeguard the text file against manipulation, a checksum ('hash') has to be generated. Calculating this

checksum is a complex task requiring significant computing resources. Nowadays thousands of highly specialized server farms, distributed across the world, compete to be the first to come up with the next valid checksum. The Bitcoin system is designed in a way that the complexity of calculating the checksum increases when the global computing capacity increases. On average, the blockchain is amended every ten minutes; hence, Bitcoin miners around the globe have to generate six new checksums per hour.[2]

What are the incentives for miners – i.e. all those who try to find a new checksum – to invest time, energy and capital (high-powered server farms) into this stochastic search process? The first miner, who succeeds in generating a new valid checksum and therefore in amending the blockchain, is remunerated with Bitcoins. All other miners who also invested resources in the search for the new checksum go away empty-handed. The remuneration of successful miners falls over time. For the first 210,000 blocks the remuneration was 50 Bitcoins per new block, then it fell to 25 Bitcoins per block for the next 210,000 blocks and so on. Whenever 210,000 blocks have been added, the remuneration is halved.

The social costs of global Bitcoin mining can be estimated by employing standard economic theory. The competitive process among the miners resembles a rent-seeking contest.[3] In a rent-seeking contest, all competitors have to invest real resources to stand a chance of obtaining a prize. (In standard market competition, by contrast, only those firms who stay in business have to incur costs in production.) Ultimately, rent seeking is a wasteful process as the efforts made by the losing parties were in vain. Tullock's model of rent seeking shows that total efforts increase with the number of competitors and that – with free entry – the
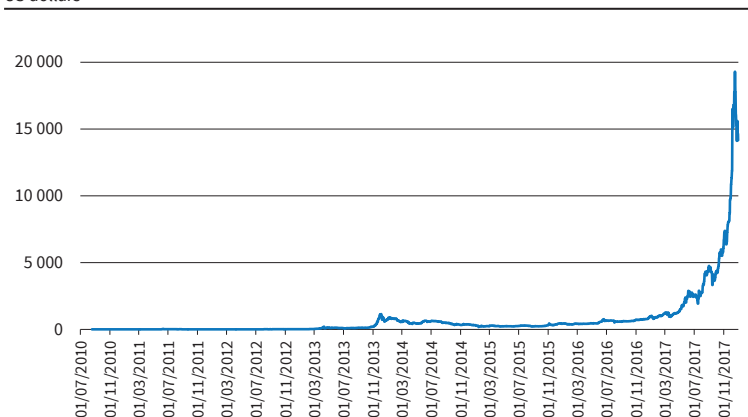
---

[1] A more detailed description can be found in Velde (2013) and Kroll *et al.* (2013), where topics like the security of crypto currencies and fraud are also discussed.

[2] The checksum for the new blockchain will only be valid if the checksum is under a certain threshold. This threshold is regularly adjusted so that – given the global computing capacity of all Bitcoin miners – six blocks are added per hour on average.

[3] The seminal paper is Tullock (1967). For a survey of rent seeking, see Nitzan (1994).

Figure 1

Bitcoin Prices
US dollars

Source: https://blockchain.info.

© ifo Institute

Table 1

Present Value Costs of Bitcoin Mining (in billions of US dollars)

Discount factor	2%	4%	6%
Present value of mining costs	5.123	5.267	5.417

Source: Author's own calculations.

total expenditure equals the prize. The prize, which the miners are competing for, is the current value of the Bitcoins that are paid out as remuneration for the successful discovery of a new checksum. The Tullock model implies that the costs of Bitcoin mining can be approximated through the value of newly minted Bitcoins. Whatever the development of Bitcoin prices, at each point in time the costs of mining correspond to the value of new Bitcoins, which are paid out as remuneration for successful mining. Each single miner can try to reduce his or her costs, for example, by locating the server farms in regions with low energy costs like Iceland. However, this does not affect the overall outcome, as lower energy costs are completely offset by additional computer operations and the entry of new competitors. (A sketch of the formal model is provided in the Box 1.)

To establish the total costs of Bitcoin mining, we calculate the value of newly minted Bitcoins for each day. This value is obtained by multiplying the daily Bitcoin price (in US dollars) with the number of newly minted Bitcoins. Figure 1 shows the price development of Bitcoins since August 2010. The Bitcoin system was already in place in January 2009. Consistent price data, however, are not available for the initial phase of Bitcoin trading.[4] For days without quotes, the last available price is held constant. Figure 1 shows that the Bitcoin price remained fairly low for a long time and did not start to increase significantly until mid-2016.

As mentioned earlier, miners received 50 Bitcoins for each new block for the first 210,000 blocks that were added to the blockchain. On 28 November 2012, the remuneration fell to 25 Bitcoins. As of 10 July 2016, only 12.5 Bitcoins are paid for the first valid checksum of a new block. Combining remuneration and Bitcoin prices allows us to calculate the value of newly minted Bitcoins for each day up to 31 December

---

[4] Due to the low Bitcoin prices in the first years of its existence, the starting date for the calculations is almost irrelevant to the outcome.

Box 1

The remuneration of a miner who is successful at time t amounts to $R(t)$ Bitcoins. At time t, this remuneration has a market value of $p(t) \cdot R(t)$ where p is the Bitcoin price in US dollars. The efforts of a single miner can be expressed by the number of computer operations, with which the miner tries to win the race for the first valid checksum. Let m_i be the number of computer operations of miner i in a given period. The probability of successful mining can then be written as $\frac{m_i}{m_i + \sum_{j \neq i} m_j}$ where $\sum_{j \neq i} m_j$ is the total effort of all other miners. The expected profit of miner i is

(1) $\quad E\pi_i = \frac{m_i}{m_i + \sum_{j \neq i} m_j} \cdot p \cdot R - c \cdot m_i - C$

where c stands for the variable cost per computer operation (e.g. energy cost) and C for the fixed cost of mining.
Maximising miner i's profit for a given effort of all other miners yields

(2) $\quad \frac{\partial E\pi_i}{\partial m_i} = \frac{\sum_{j \neq i} m_j}{\left(m_i + \sum_{j \neq i} m_j\right)^2} \cdot p \cdot R - c = 0$

With a total number of n miners in the market, each miner exerts an effort of

(3) $\quad m_i^* = \frac{n-1}{n^2} \cdot \frac{p \cdot R}{c}$

in the symmetric equilibrium ($m_i = m_j$). Hence, the expected profit of a representative miner can be written as

(4) $\quad E\pi_i^* = \frac{p \cdot R}{n^2} - C$

With free market entry, miners should enter up to the point where all profits are dissipated ($E\pi_i^* = 0$). The number of miners amounts to

(5) $\quad n^* = \sqrt{\frac{p \cdot R}{C}}$

It increases in the remuneration and decreases with the fixed cost. The key point here is that as each miner earns zero profits in expectation, the costs of mining have to match the value of newly minted Bitcoins at each point in time.

2017.[5] These values are then discounted to 1 January 2018 and added up. Table 1 shows the present value of the costs of Bitcoin mining at alternative discount rates. At a discount factor of 4 percent, the total costs of Bitcoin mining (in present value terms) amount to 5.3 billion US dollars. As a matter of course, some miners make a profit as they were lucky to be the first with new hashes and the value of remuneration exceeded their costs. These profits, however, are mirrored by the losses of other miners who unsuccessfully installed computing capacity and wasted time, energy and natural resources. The energy consumption alone, which is only one element of total costs, currently amounts to 259 KWh for a single Bitcoin transaction – more than one US household's weekly energy consumption (https://digiconomist. net/bitcoin-sustainability-report-12-2017). Table 1 also shows that the precise level of the discount factor is almost irrelevant to the outcome as the bulk of the social costs of Bitcoin mining were generated last year (2017). In all scenarios, the total costs of Bitcoin mining are in the range of 5 billion US dollars. In addition to the recently debated challenges of a Bitcoin system, like the cyber attacks on Bitcoin exchanges and the risk of a bursting bubble, the Bitcoin system also suffers from a massive waste of resources.

REFERENCES

ifo Schnelldienst (2017), "Kryptowährung Bitcoin: Währungswettbewerb oder Spekulationsobjekt: Welche Konsequenzen sind für das aktuelle Geldsystem zu erwarten?", *ifo Schnelldienst* 22, 3-20.

Kroll, J.A., I.C. Davey and E.W Felten (2013), *The Economics of Bitcoin Mining or, Bitcoin in the Presence of Adversaries*, The Twelfth Workshop on the Economics of Information Security, Washington DC, 11-12 June 2013.

Nitzan, S. (1994), "Modelling Rent-Seeking Contests", *Public Choice* 10, 41-60.

Tullock, G. (1967), "The Welfare Costs of Tariffs, Monopolies, and Theft", *Western Economic Journal* 5, 224-232.

Velde, F.R. (2013), *Bitcoin: A Primer*, Chicago Fed Letter 317, December.

Yermack, D. (2013), *Is Bitcoin a Real Currency? An Economic Appraisal*, NBER Working Paper 19747.

---

[5] In addition to the remuneration for valid checksums, miners also receive transaction fees. These transaction fees are ignored in the present calculation.

Christian Grimme and Marc Stöckli

Measuring Macroeconomic Uncertainty in Germany[1]

Christian Grimme
ifo Institute

Marc Stöckli
ifo Institute

INTRODUCTION

As a result of the financial crisis in 2008/09, academic research on economic uncertainty has experienced a surge in interest. A large body of this literature finds that uncertainty has a negative impact on economic activity and that it was partly responsible for the slow recovery after the crisis.[2] Uncertain times are associated with the growing difficulty of predicting the future accurately. When the future becomes less predictable, firms are more reluctant to make new investments and postpone decisions into the future. Similarly, consumers' demand for durable goods decreases. However, economic uncertainty is not observable and has to be inferred. The literature on this topic to date predominantly relies on proxies based on stock market volatility, forecaster disagreement and newspaper coverage. This article presents a novel measurement method based on Jurado *et al.* (2015), which is adopted for Germany. Comparing the new measure to the existing proxies, we find that our measure is significantly less volatile and tended to fall over the course of the euro crisis. Furthermore, we show that macroeconomic uncertainty can explain up to 11 percent of the fluctuations in investment activity in Germany.

MEASURING MACROECONOMIC UNCERTAINTY

Jurado *et al.* (2015), JLN thereafter, propose a measure of macroeconomic uncertainty for the United States. We adopt their method and construct a corresponding index for Germany.[3] JLN start from the premise that

what matters to economic decision-making is whether the economy has become more or less predictable. Their aim is to estimate an indicator that is as free as possible from theoretical models and from dependence on a single observable economic indicator. In the spirit of JLN, we employ a macroeconomic forecasting model and define economic uncertainty as the volatility of the expected forecast errors. The intuition behind this is that uncertainty is high when decision-makers believe that they are worse at predicting the future. It is worth noting that the emphasis is on the *expected* volatility of the forecast errors, which does not necessarily imply that the *realised* volatility changes due to uncertainty. In practice, this poses an empirical issue, since *ex-ante* expected errors are not observable in historic data. We follow JLN and estimate the *ex-ante* errors from observable *ex-post* errors with a stochastic volatility model.[4]

Our estimation is conducted in two steps: firstly, the respective uncertainty is estimated for a large number of variables. In this context, large means around 100 variables. We consider indicators that are typically of interest for macroeconomic forecasters, such as industrial production, the unemployment rate, or stock market indices. More formally, the uncertainty of a variable y_t over the forecast horizon h is defined as the conditional volatility of the purely unforecastable component of the future value of that variable:

$$(1) \quad U_{jt}^{y}(h) = \sqrt{E\left[\left(y_{jt+h} - E[y_{jt+h}|I_t]\right)^2 \Big| I_t\right]}$$

where y_{jt+h} denotes the realised value of variable j at time $t+h$, and $E[y_{jt+h}|I_t]$ is the expectation of the future value of that variable at time t. I_t denotes the information set at time t, that is, all available information about the economy at a given point in time. The difference between the realised and expected value, $y_{jt+h} - E[y_{jt+h}|I_t]$, represents the 'purely unforecastable component'. The equation captures the intuition that decision-makers form an expectation about how precisely they will forecast an indicator variable. When they expect forecasting error to be more volatile, or forecasting to be less precise, uncertainty increases. In a second step, these individual estimates are aggregated to a single index to reflect uncertainty at the macro level. This step ensures that the index only measures economy-wide uncertainty instead of uncertainty specific to an individual variable, which may not have an impact on the economy as a whole.

To construct the index, we rely on a set of 102 monthly indicator variables.[5] The time period

---

[1] This article is an updated and shortened version of Grimme and Stöckli (2017).

[2] See, for example, Baker *et al.* (2016), Born *et al.* (forthcoming), Bloom (2009), Bloom *et al.* (2012), Henzel and Rengel (2017), and Jurado *et al.* (2015). There is also a series of studies which estimates the effects of uncertainty on Germany, e.g. the impact on production and investment (von Kalckreuth 2003; Popescu and Smets 2010; Bachmann *et al.* 2013; Grimme *et al.* 2015; Buchholz *et al.* 2016; Klepsch 2016; Grimme and Henzel 2018), on interest rates (Grimme 2017), on prices and the effectiveness of monetary policy (Bachmann *et al.* 2013), and on the effectiveness of fiscal policy (Berg 2015 and forthcoming).

[3] Meinen and Röhe (2017) also adopt the method by JLN and construct a measure of macroeconomic uncertainty for Germany.

While we use a different set of input variables, our results are surprisingly similar (correlation = 0.88).

[4] Stochastic volatility models are also used to measure inflation uncertainty (see Dovern *et al.* 2012; Grimme *et al.* 2014).

[5] JLN additionally use a set of financial variables that go beyond stock market indices. We omit the inclusion of corresponding variables for two reasons. Firstly, there are no comparable variables available for Germany, and we would have to use data on the

ranges from January 1991 to November 2017. The variables can be clustered into nine groups: (i) production and business situation; (ii) employment and wages; (iii) real estate; (iv) consumption, orders and inventory; (v) money supply; (vi) bonds and exchange rates; (vii) prices; (viii) stock market indices; and (ix) international trade.[6] All variables are seasonally adjusted and, if necessary, transformed to stationarity.

MACROECONOMIC UNCERTAINTY IN GERMANY 1991 – 2017

Figure 1 shows the macroeconomic uncertainty index for Germany.[7] The horizontal red line represents values that are 1.65 standard deviations above the sample mean, indicating exceptionally high values of the index. The shaded grey areas denote recessions in Germany.[8] It is clearly visible that the highest level of the index occurs during the financial crisis in 2008/09, and peaks in December 2008. Beginning with the liquidity problems of the British bank Northern Rock and fuelled by the collapse of Lehman Brothers in September 2008, there is an unprecedented surge in uncertainty. Other periods that are associated with an exceptionally high level of uncertainty include Black Wednesday in 1992 and the German parliamentary elections in 1994. Further increases in the indicator, albeit to a lesser extent, can be attributed to the Russian financial crisis in 1998, the burst of the dotcom bubble in 2000, the September 11 attacks in 2001, and the Baghdad bombings in 2003.

These findings are largely in line with previous results in the literature on this topic to date. However, we also find that there is a general downward trend

European level instead. Secondly, we have re-estimated JLN without the financial variables and find that their impact on macroeconomic uncertainty is negligibly small.
[6] A list of all the variables can be found on the webpage: https://sites.google.com/site/econgrimme.
[7] We present estimates of macro uncertainty for the one-month horizon, that is of $v_{jt}^y(1)$.
[8] Recessions are dated by the Economic Cycle Research Institute (ECRI).

Figure 1

Macroeconomic Uncertainty in Germany
1991–2017

Notes: The shaded grey areas denote recessions in Germany. The horizontal red line represents values that are 1.65 standard deviations above the sample mean, indicating exceptionally high values of the index. The series is standardized.

Source: Datastreaming; own calcultions.   © ifo Institute

in macroeconomic uncertainty in the aftermath of the financial crisis and until the end of 2013, despite the Eurozone crisis and Greece potentially leaving the Eurozone. Afterwards, uncertainty moves more or less laterally, despite the Britain's decision to leave the European Union in June 2016 and the election of Donald Trump as US President in December 2016. Currently, macroeconomic uncertainty is nearly at an all-time low.

In the following, we compare our uncertainty indicator to the most commonly used alternatives. Panel 1 in Figure 2 shows the *VDAX*, a measure of expected volatility of the DAX stock market index. Bloom (2009) popularised the use of stock market indices as a proxy for uncertainty. The *VDAX* is calculated on the basis of traded options on the DAX, where option prices are used to infer expected volatility. An increase in the *VDAX* indicates that the market expects the DAY to be more volatile. Stock market indices are a viable choice of proxy due to data availability for most countries. In accordance with the results of our measure, there are sharp increases in expected stock market volatility after the Russian financial crisis, the September 11 attacks, and the 2008 financial crisis. There is an additional increase in 2011, which might be related to the debt crisis in Italy and Spain during the Eurozone crisis. The *VDAX* is clearly countercyclical; two of the three recessions in our sample are associated with high index values. In contrast to our measure, the *VDAX* is more volatile and reacts quicker to bad news events. For example, the Russian financial crisis and the September 11 attacks are associated with an immediate increase, whereas macroeconomic uncertainty rises more slowly and to a lesser degree in terms of magnitude. It is worth noting that proxies based on stock market volatility do not remove the 'forecastable component' of the time series, as the index by JLN does. This suggests that some of the variation in stock market volatility is, in fact, forecastable, and we erroneously attribute this variation to increases in uncertainty. An additional issue is that higher uncertainty in the financial market may not have an impact on the real economy. This is especially important for Germany, where many firms are not publicly listed.

A measure of firm-level uncertainty, *FDISP*, is proposed by Bachmann *et al.* (2013). They use micro data from the ifo Business Climate Survey, a monthly German business confidence survey. Firm-level uncertainty is identified as the cross-sectional variation of individual survey participants' responses to a question on expected domestic production.[9]

[9] The question is: "Expectations for the next three months: our domestic production activities with respect to product X will (with-
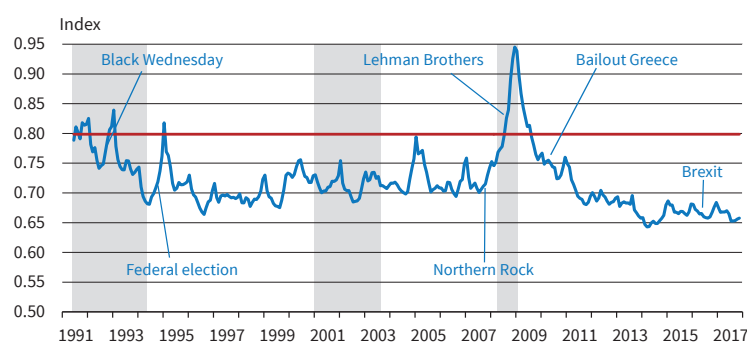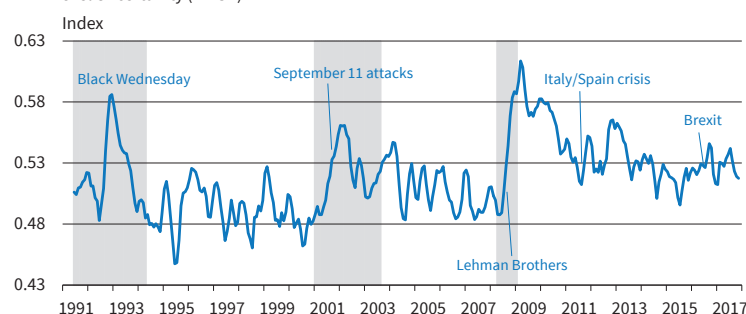
Figure 2

Economic Uncertainty in Germany
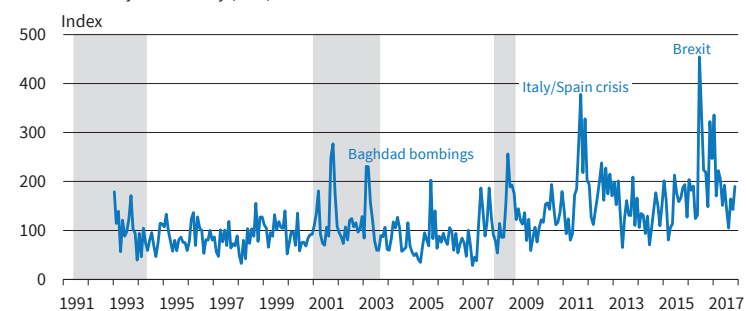Measured by VDAX, FDISP and EPU

Expected Stock Market Volatility (VDAX)
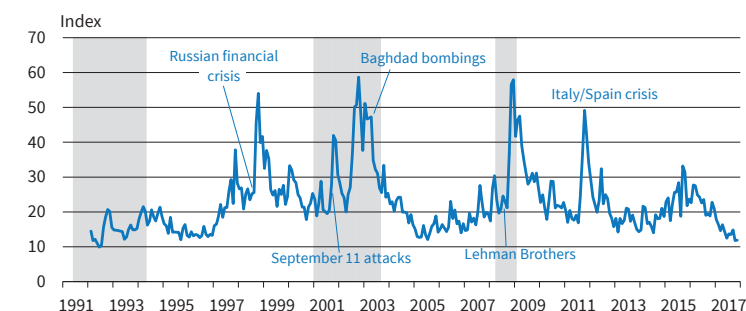
Firm-Level Uncertainty (FDISP)

Economic Policy Uncertainty (EPU)

Note: The shaded grey areas denote recessions in Germany.

Sources: Deutsche Börse; Economic Policy Uncertainty; own calculations.

© ifo Institute

vote are also marked by visible surges in uncertainty.

Panel 3 finally shows a measure for economic policy uncertainty, *EPU*, proposed by Baker *et al.* (2016). *EPU* measures the frequency of articles in daily newspapers in which keywords related to economic uncertainty are used. The index increases when there are more reports on economic policy uncertainty. By construction, *EPU* strongly reacts to news events. The Brexit vote and the debt crisis in Italy and in Spain are the two periods with the highest policy uncertainty. A drawback of the *EPU* index is that it is not immediately obvious whether the choice of newspapers, which are used to construct the index, is representative for the German media market. In fact, the index only considers two newspapers for Germany (*Frankfurter Allgemeine Zeitung* and *Handelsblatt*). It is also unclear whether the index, with its focus on media coverage, has an impact on firm activity. *EPU* is typically based on a wide range of (national) economic policies, whereas firms are mostly concerned with policy measures that have a direct effect on their activity.

IMPACT OF MACROECONOMIC UNCERTAINTY ON THE GERMAN ECONOMY

The higher the dispersion of expected production, the higher is uncertainty. Thus, the measure implies that uncertainty is associated with heterogeneous expectations. However, this link does not necessarily always hold. Imagine a situation in which a larger share of firms lowers their expectations due to an increase in unobserved uncertainty. Firms' expectations become less dispersed and *FDISP* falls, despite the fact that firms are actually more uncertain.[10] The advantage of this indicator is that it is generated from survey data and is therefore based on the expectations of real decision-makers. Panel 2 in Figure 2 shows that uncertainty as measured by *FDISP* is high after Black Wednesday in 1992, the September 11 attacks and the 2008 financial crisis. The Eurozone crisis and the Brexit

out taking into account differences in the length of months or seasonal fluctuations) increase, roughly stay the same, or decrease".

[10] Bachmann *et al.* (2013) show that the dispersion of the expectations is highly correlated with alternative uncertainty measures at the firm-level and conclude that FDISP reliably measures firm-level uncertainty.

Ultimately, we are interested in the impact of uncertainty on economic activity. Empirically, we have an identification problem: uncertainty can have an impact on the business cycle, but uncertainty can also be influenced by the business cycle. If, for example, an increase in our measure is observed and we want to measure the effect of this change on economic activity, we must control for the fact that part of this increase may have resulted from changes in production. Therefore, we have to identify changes in uncertainty, which are independent of activity. This can be achieved by using a vector autoregressive (VAR) model. The model contains six variables: our measure for macroeconomic uncertainty, the DAX stock market index, the EONIA interest rate as a measure for monetary policy, an index for consumer prices (CPI), and two variables for economic activity. These two variables are industrial production of

Figure 3
Impulse Responses of an Exogenous Increase in Macroeconomic Uncertainty
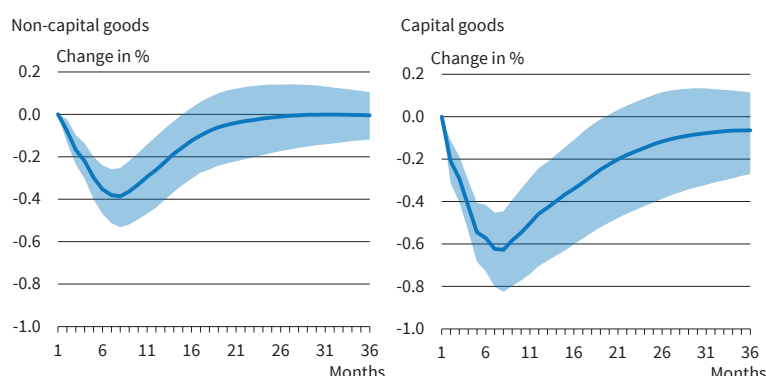
The thick line represents the median response to an uncertainty shock of one standard deviation, while the shaded area shows the 68% error band. The impulse responses are generated from 5,000 draws.

Source: Calculations of the ifo Institute.   © ifo Institute

capital goods, a measure of investment activity, and industrial production of non-capital goods; the latter is included to investigate whether other industrial sectors react differently to uncertainty.[11]

In the following, we analyse the impact of an exogenous increase of macroeconomic uncertainty on the two activity variables.[12] Figure 3 demonstrates the results. The thick line indicates the median response, while the shaded area shows the 68-percent error band. Our results show that the production of both capital and non-capital goods declines steadily for seven months. The return to the previous path is completed after about two years, respectively. Quantitatively, the maximum reduction in the production of capital goods (0.6 percent) is stronger than that of non-capital goods (0.4 percent).

To further show the quantitative importance of macroeconomic uncertainty, we perform a forecast error variance decomposition of investment activity

for various forecast horizons. The results are shown in Table 1. Macro uncertainty explains 7 percent of the fluctuations in investment within the first six months. At larger horizons it contributes to 11 percent of the variance in investment activity. Uncertainty therefore has a non-negligible effect on the German business cycle.

CONCLUSION

In this study, we present a new measure of macroeconomic uncertainty in Germany, based on the method by Jurado *et al.* (2015). We show that there was a strong increase in uncertainty during the 2008 financial crisis. In contrast to alternative measures, we find a declining trend during the Eurozone crisis. In addition, we demonstrate that macroeconomic uncertainty can explain part of the volatility in German investment activity. Overall, our measure extends the number of uncertainty measures that are available for Germany.

REFERENCES

Bachmann, R., B. Born, S. Elstner and C. Grimme (2013), *Time-Varying Business Volatility and the Price Setting of Firms,* NBER Working Paper 19180.

Bachmann, R., S. Elstner and E.R. Sims (2013), "Uncertainty and Economic Activity: Evidence from Business Survey", *American Economic Journal: Macroeconomics* 5, 217–249.

Baker, S., N. Bloom and S. Davis (2016), "Measuring Economic Policy Uncertainty", *Quarterly Journal of Economics* 131, 1593–1636.

Banbura, M., D. Giannone and L. Reichlin (2010), "Large Bayesian Vector Auto Regressions", *Journal of Applied Econometrics* 25, 71–92.

Berg, T. (2015), "Time Varying Fiscal Multipliers in Germany", *Review of Economics* 66, 13–46.

Berg, T. (forthcoming), "Business Uncertainty and the Effectiveness of Fiscal Policy in Germany", *Macroeconomic Dynamics.*

Bloom, N. (2009), "The Impact of Uncertainty Shocks", *Econometrica* 77, 623–685.

Bloom N., M. Floetotto, N. Jaimovich, I. Saporta-Eksten and S.J. Terry (2012), *Really Uncertain Business Cycles,* NBER Working Paper 18245.

Born, B., S. Breuer and S. Elstner (forthcoming), "Uncertainty and the Great Recession", *Oxford Bulletin of Economics and Statistics*.

Buchholz, M., L. Tonzer and J. Berner (2016), *Asymmetric Investment Responses to Firm-specific Uncertainty,* IWH Discussion Papers 7/2016.

Dovern, J., U. Fritsche and J. Slacalek (2012), "Disagreement among Forecasters in G7 Countries", *Review of Economics and Statistics* 94, 1081–1096.

European Commission (2013), "Highlight: Using Survey Data for Measuring Uncertainty", *European Business Cycle Indicators – 3rd Quarter 2013, 7–18,* http://ec.europa.eu/economy_finance/publications/cycle_indicators/2013/pdf/3_en.pdf.

Grimme, C. (2017), *Uncertainty and the Cost of Bank vs. Bond Finance,* MPRA Working Paper 79852.

---

[11] All of the variables, except for uncertainty and EONIA, enter in logarithms. The model is estimated with twelve lags for the period June 1991 to November 2017 with Bayesian methods. The prior for uncertainty is white noise, the prior for the rest of the variables is a random walk. The uncertainty shock is identified recursively (Cholesky-Decomposition). The order of the variables is: production of non-capital goods, production of capital goods, consumer prices, EONIA, DAX, and uncertainty. This implies that all of the variables do not react contemporaneously to an uncertainty shock.
[12] The size of this shock is equal to an increase of 1.6 percent compared to the mean value of the uncertainty series. By comparison, macroeconomic uncertainty increased between its trough just before the start of the financial crisis in July 2007 and its peak in December 2008 by over 30 percent. However, it is worth noting that a considerable part of this rise can be explained by other factors, which are unrelated to uncertainty (see Born *et al.* forthcoming).

Table 1
Contribution of Macroeconomic Uncertainty to Fluctuations in Investment (in %)

Forecast horizons				
1 month	3 months	6 months	12 months	36 months
0	2.0	7.2	11.0	11.2

Note: The table presents the share of the total forecast error variance of the production of capital goods that are explained by exogenous changes in macroeconomic uncertainty. We show the median contribution for different forecast horizons.

Source: Calculation of the ifo Institute.

Grimme, C. and S. Henzel (2018), *The Macroeconomic Effects of Uncertainty in Times of Low and High Uncertainty*, ifo Institute, mimeo.

Grimme, C., S. Henzel and S. Bonakdar (2015), "Zum Einfluss von Unsicherheit auf die deutsche und österreichische Konjunktur", *Wirtschaftspolitische Blätter* 62, 655–667.

Grimme, C., S. Henzel and E. Wieland (2014), "Inflation Uncertainty Revisited: A Proposal for Robust Measurement", *Empirical Economics* 47, 1497–1523.

Grimme, C. and M. Stöckli (2017), "Makroökonomische Unsicherheit in Deutschland", *ifo Schnelldienst* 70(6), 41–50.

Henzel, S. and M. Rengel (2017), "Dimensions of Macroeconomic Uncertainty: A Common Factor Analysis", *Economic Inquiry* 55, 843–877.

Jurado, K., S.C. Ludvigson and S. Ng (2015), "Measuring Uncertainty", *American Economic Review* 105, 1177–1216.

Klepsch, C. (2016), *How Asset Irreversibility Influences the Investment-Uncertainty Relationship,* Working Paper LMU Munich.

Meinen, P. and O. Röhe (2017), "On Measuring Uncertainty and Its Impact on Investment: Cross-country Evidence from the Euro Area", *European Economic Review* 92, 161–179.

Popescu, A. and F. Smets (2010), "Uncertainty, Risk-taking, and the Business Cycle in Germany", *CESifo Economic Studies* 56, 596–626.

Von Kalckreuth, U. (2003), "Exploring the Role of Uncertainty for Corporate Investment Decisions in Germany", *Swiss Journal of Economics* 139, 173–206.

Chang Woon Nam*

World Economic Outlook for 2018 and 2019

According to the latest IMF world economic outlook,[1] global output is estimated to have grown by 3.7 percent in 2017, thus falling short of more optimistic growth forecasts of 3.9 percent in both 2018 and 2019. The anticipated growth rate for advanced economies is 2.3 percent and 2.2 percent for 2018 and 2019 respectively. More specifically, changes in US tax policy tend to promote economic activity, with the short-term impact in the United States mostly

triggered by the investment response to corporate income tax cuts. Yet the primary force that will boost the overall global outlook over the period of 2018/19 is the rapid growth expected in emerging market and developing economies – see Table 1. This area's growth is estimated to be 4.7 percent in 2017 and is forecast to reach 4.9 percent for 2018, while the IMF projects a further increase in growth to 5.0 percent in 2019.

The IMF sees the current cyclical upswing as a unique chance to implement structural and governance reforms for advanced, emerging and developing economies. Firstly, structural reforms will significantly contribute to productivity improvement and enhance labour force participation rates, especially in advanced economies with ageing populations; and will further raise potential output growth. Secondly, financial stability and resilience can be better guaranteed through proactive financial regulation and, where needed, balance sheet repair and strengthening fiscal buffers.

Table 1

Overview of World Economic Outlook Projections (%)

	2016[a]	2017[a]	2018[b]	2019[b]
World output	3.2	3.7	3.9	3.9
Advanced economies	1.7	2.3	2.3	2.2
US	1.5	2.3	2.7	2.5
Euro area	1.8	2.4	2.2	2.0
Germany	1.9	2.5	2.3	2.0
France	1.2	1.8	1.9	1.9
Italy	0.9	1.6	1.4	1.1
Spain	3.3	3.1	2.4	2.1
Japan	0.9	1.8	1.2	0.9
UK	1.9	1.7	1.5	1.5
Canada	1.4	3.0	2.3	2.0
Other advanced economies	2.3	2.7	2.6	2.6
Emerging market and developing economies	4.4	4.7	4.9	5.0
Commonwealth of Independent States	0.4	2.2	2.2	2.1
Russia	– 0.2	1.8	1.7	1.5
Excluding Russia	1.9	3.1	3.4	3.5
Emerging and developing Asia	6.4	6.5	6.5	6.6
China	6.7	6.8	6.6	6.4
India	7.1	6.7	7.4	7.8
ASEAN5[c]	4.9	5.3	5.3	5.3
Emerging and developing Europe	3.2	5.2	4.0	3.8
Latin America and the Caribbean	– 0.7	1.3	1.9	2.6
Brazil	– 3.5	1.1	1.9	2.1
Mexico	2.9	2.0	2.3	3.0
Middle East, North Africa, Afghanistan and Pakistan	4.9	2.5	3.6	3.5
Saudi Arabia	1.7	– 0.7	1.6	2.2
Sub-Saharan Africa	1.4	2.7	3.3	3.5
Nigeria	– 1.6	0.8	2.1	1.9
South Africa	0.3	0.9	0.9	0.9

Note: [a] Estimates; [b] Projections; [c] Indonesia, Malaysia, Philippines, Thailand and Vietnam.

Source: IMF.

Financial Conditions in the Euro Area

## Nominal Interest Rates[a]
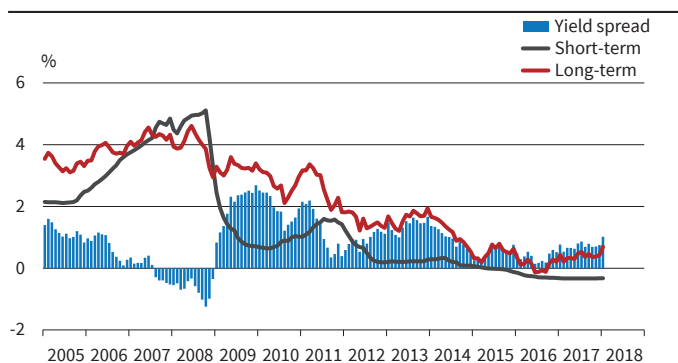
ᵃ Weighted average (GDP weights).
Source: European Central Bank.   © ifo Institute

In the three-month period from November 2017 to January 2018 short-term interest rates remained unchanged: the three-month EURIBOR rate amounted to – 0.33% in November 2017 and also in January 2018. In addition the ten-year bond yields grew from 0.38% in November 2017 to 0.69 in January 2018, whereas the yield spread also increased from 0.71% in November 2017 to 1.02% in January 2018.

Stock Market Indices
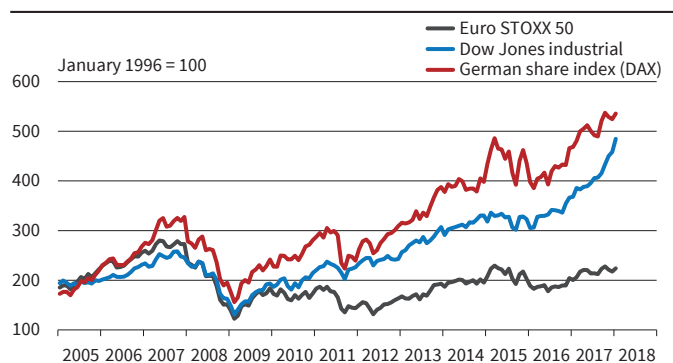

Source: Deutsche Börse; Dow Jones; STOXX.   © ifo Institute

The German stock index DAX increased in January 2018, averaging 13,189 points compared to 12,918 points in December 2017. The Euro STOXX also increased from 3,504 to 3,609 in the same period of time. Furthermore the Dow Jones International grew, averaging 26,149 points in January 2018, compared to 24,719 points in December 2017.
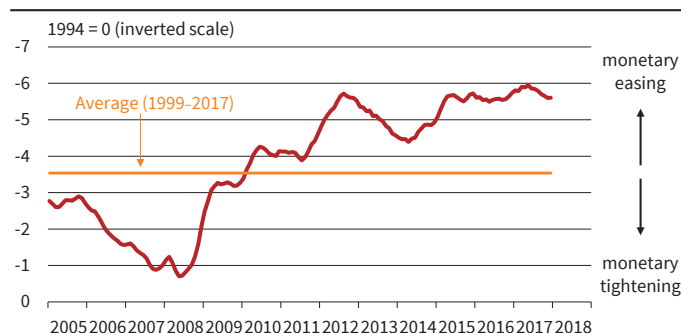
Change in M3[a]
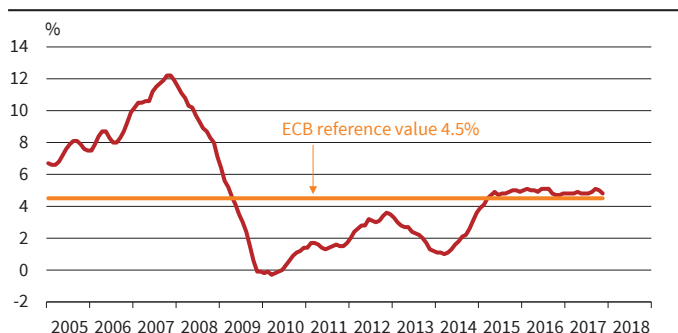
ᵃ Annual percentage change (3-month moving average).
Source: European Central Bank.   © ifo Institute

The annual growth rate of M3 decreased to 4.6% in December 2017, from 4.9% in November 2017. The three-month average of the annual growth rate of M3 over the period from October 2017 to December 2017 reached 4.8%.

Monetary Conditions Index

Note: MCI index is calculated as a (smoothed) weighted average of real short-term interest rates (nominal rate minus core inflation rate HCPI) and the real effective exchange rate of the euro.
Source: European Central Bank; calculations by the ifo Institute.   © ifo Institute

Between April 2010 and July 2011 the monetary conditions index remained rather stable. This index then continued its fast upward trend since August 2011 and reached its first peak in July 2012, signalling greater monetary easing. In particular, this was the result of decreasing real short-term interest rates. In May 2017 the index reached the highest level in the investigated period since 2004, but its downward trend thereafter continued also in December 2017.

EU Survey Results

Gross Domestic Product in Constant 2010 Prices
Percentage change over previous year

Source: Eurostat.   © ifo Institute
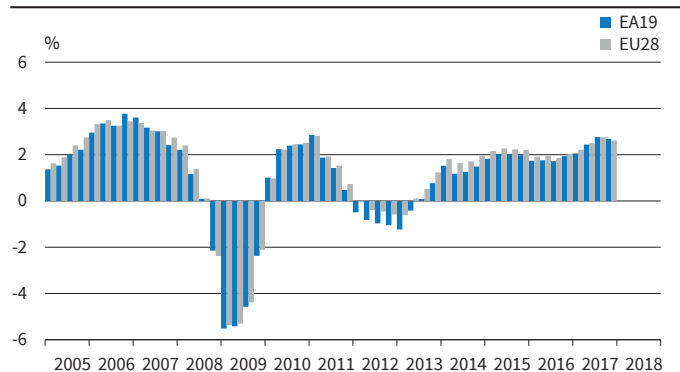
According to the Eurostat estimates, GDP grew by 0.6% in both the euro area (EA19) and the EU28 during the fourth quarter of 2017, compared to the previous quarter. In the third quarter of 2017 the GDP grew by 0.7% in both zones. Compared to the fourth quarter of 2016, i.e. year over year, seasonally adjusted GDP rose by 2.7% in the EA19 and by 2.6% in the EU28 in the fourth quarter of 2017.

EU28 Economic Sentiment Indicator
Seasonally adjusted

Source: European Commission.   © ifo Institute

In January 2018 the Economic Sentiment Indicator (ESI) decreased in both the euro area (by 0.9 points to 114.7) and the EU28 (by 0.4 points to 114.7). In both zones the ESI stands above its long-term average.

EU28 Industrial and Consumer Confidence Indicators
Percentage balance, seasonally adjusted

Source: European Commision.   © ifo Institute
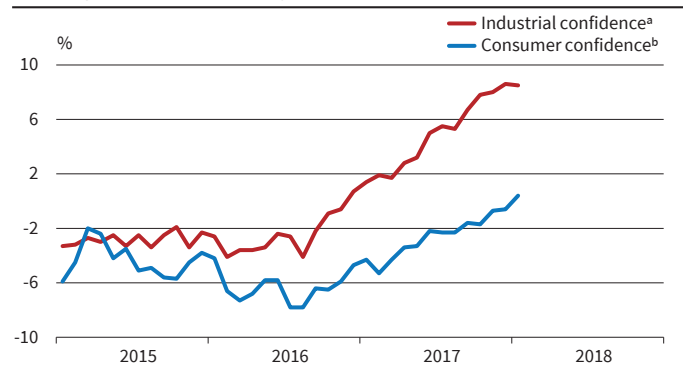
In January 2018, the *industrial confidence indicator* decreased by 0.1 in the EU28 but remained unchanged in the euro area (EA19). The *consumer confidence indicator* increased by 0.8 in both zones.

a   The industrial confidence indicator is an average of responses (balances) to the questions on production expectations, order-books and stocks (the latter with inverted sign).
b   New consumer confidence indicators, calculated as an arithmetic average of the following questions: financial and general economic situation (over the next 12 months), unemploy-ment expectations (over the next 12 months) and savings (over the next 12 months). Sea-sonally adjusted data.
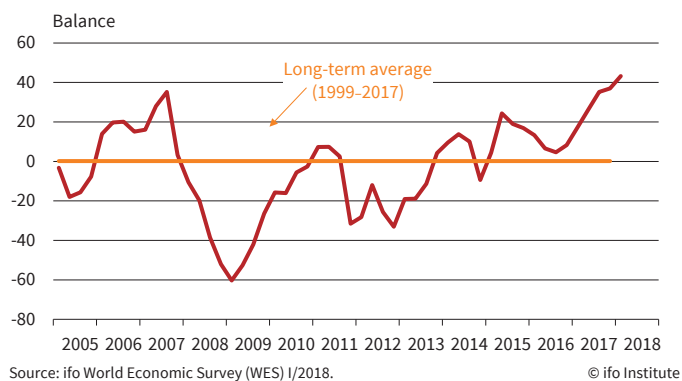
EU28 Capacity Utilisation and Order Books in the Manufacturing Industry

Source: European Commission.   © ifo Institute
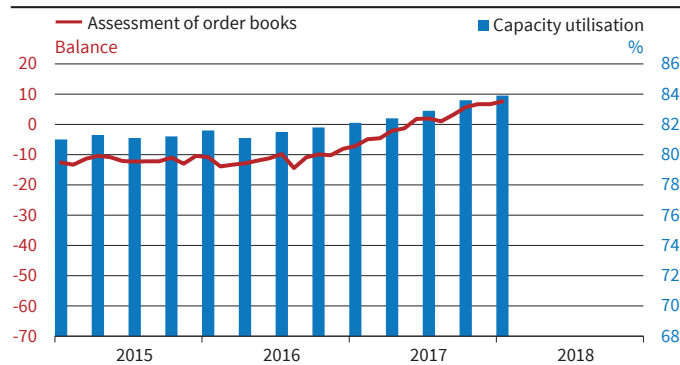
Managers' assessment of *order books* reached 7.6 in January 2018, compared to 6.7 in December 2017. In November 2017 the indicator had also amounted to 6.7.
Capacity utilisation reached 83.9 in the first quarter of 2018, up from 83.6 in the fourth quarter of 2017.
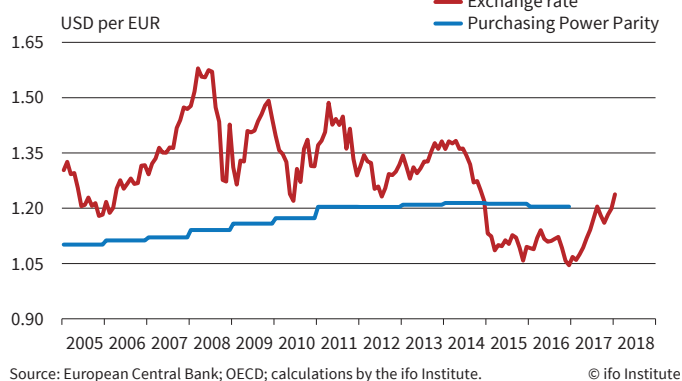
Euro Area Indicators

ifo Economic Climate for the Euro Area

Balance

Long-term average
(1999–2017)

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

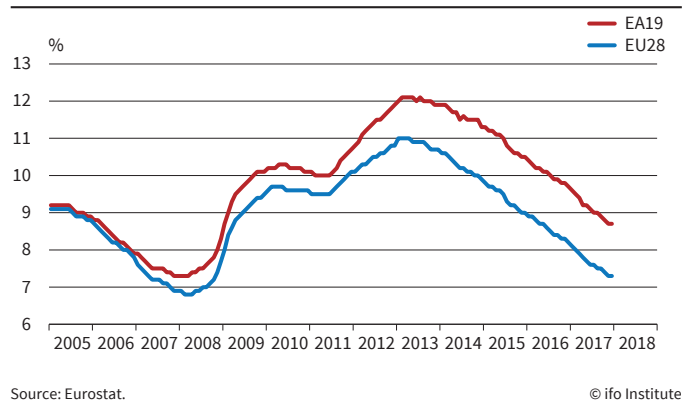Source: ifo World Economic Survey (WES) I/2018. © ifo Institute

The ifo Economic Climate Indicator for the euro area (EA19) reached in the first quarter of 2018 its highest level since summer 2000, rising sharply to 43.2 points, from 37.0 balance points in the fourth quarter of 2017. In the first quarter of 2018 the current economic situation was assessed to continuously improve, while economic expectations also brightened slightly. The dynamic upswing is expected to continue.

Exchange Rate of the Euro and Purchasing Power Parity

USD per EUR

— Exchange rate
— Purchasing Power Parity

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

Source: European Central Bank; OECD; calculations by the ifo Institute. © ifo Institute

The exchange rate of the euro against the US dollar averaged approximately 1.21 $/€ between November 2017 and January 2018. (In October 2017 the rate had amounted to around 1.16 $/€.)
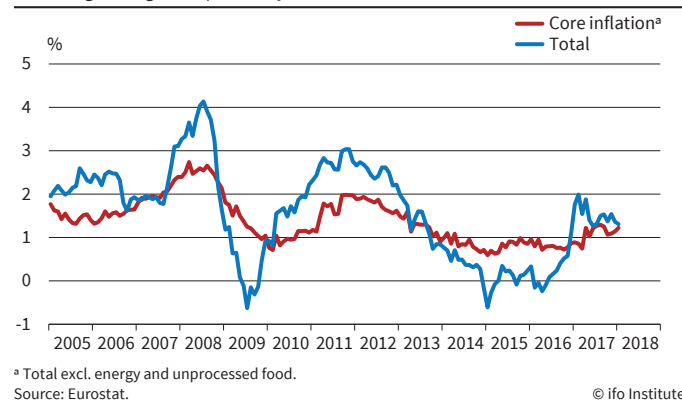
Unemployment Rate

%

— EA19
— EU28

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

Source: Eurostat. © ifo Institute

Euro area (EA19) unemployment (seasonally adjusted) amounted to 8.7% in December 2017, stable compared to November 2017. EU28 unemployment rate was 7.3% in December 2017, stable compared to November 2017. In December 2017 the lowest unemployment rate was recorded in the Czech Republic (2.3%), and Malta and Germany (both 3.6%), while the rate was highest in Greece (20.7%) and Spain (16.4%).

Inflation Rate (HICP)
Percentage change over previous year

%

— Core inflation[a]
— Total

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

[a] Total excl. energy and unprocessed food.

Source: Eurostat. © ifo Institute

Euro area annual inflation (HICP) was 1.3% in January 2018, down from 1.4% in December 2017. Year-on-year EA19 core inflation (excluding energy and unprocessed foods) amounted to 1.2% in January 2018, up from 1.1% in December 2017.

Free
Online Information Services
Offered by the CESifo Group

ifo Newsletter

The ifo Newsletter offers monthly reports in German on ifo's latest research results, key publications, selected events, personnel matters, forthcoming dates and much more.

CESifo FORUM

The **CESifo FORUM Newsletter** provides quarterly information in English on the latest issue of the CESifo Forum.

CESifo

The **CESifo Newsletter** provides brief summaries of the most recently published CESifo Working Papers, as well as reporting on all CESifo events, news from the ifo Institute and the CESifo Group's most recent guests.

ifo DICE REPORT

The **ifo DICE REPORT** Newsletter publishes quarterly information on the latest issue of the ifo DICE Report.

ifo WORLD ECONOMIC SURVEY

The **ifo WORLD ECONOMIC SURVEY Newsletter** provides quarterly information on the latest issue of the ifo World Economic Survey.

ifo INSTITUT
Niederlassung Dresden

The **ifo Dresden Newsletter** is a service offered by the Dresden Branch of the ifo Institute, which regularly reports on the branch's current publications and events. It is dispatched every two months around the publication date of the journal "ifo Dresden berichtet".

You can subscribe to the newsletters described above via our homepage at www.cesifo-group.de.