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The Role of Innovation Policy in Simultaneously Addressing Economic, Environmental and Governance Challenges

INTRODUCTION¹



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Europe today faces fundamental changes in its external environment as well as internally, giving rise to several daunting policy challenges. Firstly, there is the economic challenge manifest in slow growth or even stagnation in many European countries. Secondly, there is the challenge posed by the climate crisis, which calls for nothing less than a fundamental transformation from carbon-based growth to a new, sustainable economy. A third challenge concerns the governance and policy crisis currently facing Europe and the difficulties that this poses for policy making and implementation. This paper demonstrates how these challenges are closely inter-related, and discusses how they can be dealt with more effectively in order to arrive at an economically secure, environmentally sustainable and well-governed Europe. In particular, a return to classic economic growth cannot come at the expense of a greater risk of irreversible climate change. Instead, what is required is a fundamental transformation of the economy to a new 'green' trajectory based on the rapidly diminishing emission of greenhouse gases. Innovation policy, we argue, must play a key role in this transformation. Following this path would mean turning Europe into a veritable laboratory for sustainable growth, environmentally as well as socially.

THE ECONOMIC CHALLENGES FOR EUROPE

Over the longer term, European economic integration has delivered substantial benefits to Europe's citizens. During the first decades of integration efforts in (Western) Europe, the economy grew very fast, and the gap in productivity and income *vis-à-vis* the world technological and economic leader, the United States, was considerably reduced (Abramovitz 1994). The European Union (and its predecessor institutions) has also been highly successful in supporting transitions from authoritarian regimes to democracy in many parts of Europe, firstly from the mid-1970s onwards when the fascist dictatorships in Southern Europe were swept away, and later – on a larger scale – in the 1990s onwards following the

disintegration of the former Soviet Union. The gradual integration of Eastern European countries, followed by substantial inflows of investment from the rest of Europe, led to very rapid growth in the new member countries, markedly reducing differences in productivity and income across Europe as a whole (Fagerberg and Verspagen 2015).

Around the turn of the millennium, several European initiatives were launched to sustain the positive dynamics of previous decades in the expectation that this would lead to a further narrowing of the gap in GDP per capita between the United States and Europe. At EU summits in Lisbon and Barcelona in 2000 and 2002, member states agreed on the goal of making Europe “the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion” by, among other things, increasing R&D investments (as a share of GDP) to a level above that of the United States by 2010.² Moreover, a common European currency, the euro, was introduced in 2002 as part of the strategy to further deepen European integration and spur economic growth.

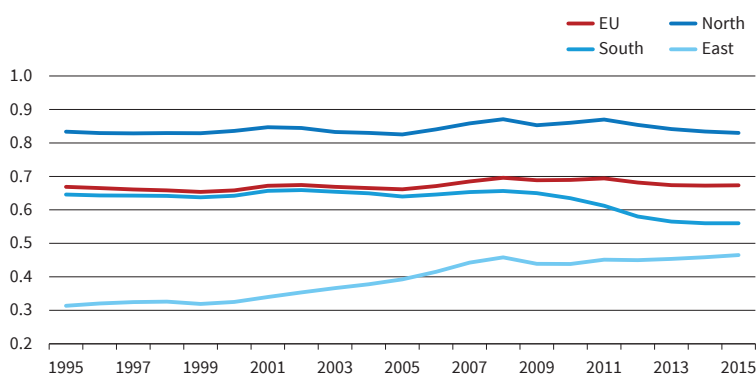
To what extent did European policy makers succeed in their aims? Figure 1 traces the development of GDP per capita from the mid-1990s onwards for three groups of European countries and the EU as whole compared to the United States. Here, there is little evidence of Europe catching up with the US during this period. In fact, in 2015 GDP per capita in the EU was two thirds of the US level, or exactly the same as twenty years earlier. Among European countries, only new members from the East managed to substantially reduce the gap with respect to US productivity, rising from 32 percent to 46 percent of the US level between 2000 and 2008, after which the catch-up by Eastern Europe came to an abrupt halt. In Southern Europe the average GDP per capita relative to the United States was roughly constant and equal to the EU average until the financial crisis. However, between 2008 and 2015 it dropped from 66 percent to 56 percent of the US level. Thus, instead of the convergence in GDP per capita that characterized Europe during the previous decade, the years after 2007/8 witnessed a process of *divergence*, with several countries, particularly in the South, falling behind economically.

Should we be concerned about these developments? Yes – and to see why, consider Figure 2, which shows the change in unemployment rates for young adults aged 20–24 in Europe since the onset of the crisis. Apart from a few countries (and especially Germany), youth unemployment has been on the increase everywhere. The situation is especially severe in Southern Europe (where the level of youth unemployment has more than doubled compared to the situation before the financial crisis) and in parts of Eastern Europe. If this situation is not reversed, large numbers of young

¹ This paper draws heavily on a book edited by the authors (Fagerberg *et al.* 2015) and two earlier articles summarising the message from that volume (Fagerberg *et al.* 2016 and 2017). The authors are grateful to the contributors to the 2015 book, and to various reviewers for their helpful comments.

² See http://ec.europa.eu/invest-in-research/action/history_en.htm.

Figure 1
Europe's GDP per Capita Relative to the US, 1995–2015
 Expressed at constant US Dollars (PPP)



Note: GDP per capita measured in terms of constant US\$ (PPP-adjusted) at 2011 price levels; EU includes all member countries, NORTH consists of Denmark, Sweden, Finland, Germany, the Netherlands and Austria; SOUTH comprises Greece, Italy, Portugal and Spain; while EAST includes the 11 previously socialist countries in the East of Europe (that became members after the collapse of the Soviet Union).

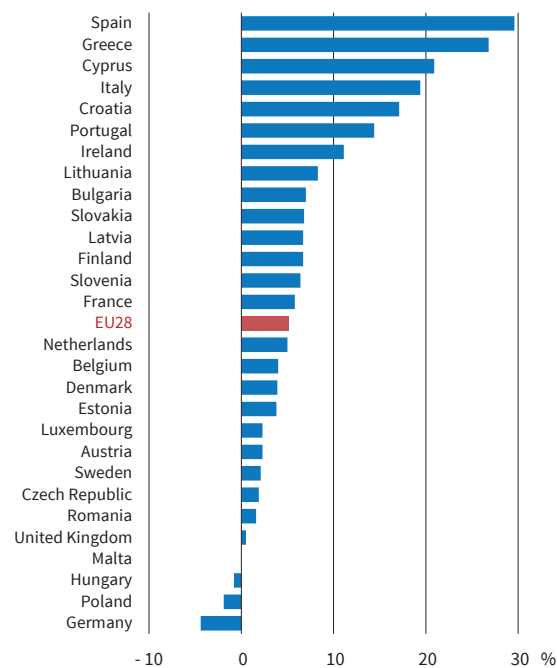
Source: World Bank Database; authors' calculation.

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people in Europe risk being permanently marginalised, the social, economic and political consequences of which are likely to be highly detrimental to Europe's future.

Why is Europe's performance so disappointing? The economic changes that have taken place in the continent during recent decades occurred within an international context characterised by globalization. The gradual inclusion of China in the global capitalist economy, adding hundreds of millions of lower-paid manufacturing workers to the global labour pool,

Figure 2
Changes in Youth Unemployment Rates in Europe, 2007–2015 20–24 years



Source: Eurostat (2017).

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provided a substantial boost to this process, with similar but less spectacular developments taking place in other developing nations. This process also poses a challenge, however, because it tends to undermine the competitive position of established industries throughout the developed world, especially in low skill, labour-intensive manufacturing sectors. The evidence (see e.g. Fagerberg and Verspagen 2015; Landesmann 2015) suggests that the effects of globalization on the growth performance of different parts of Europe have been very uneven. While the advanced economies in the North of Europe have to some extent adapted to the changing

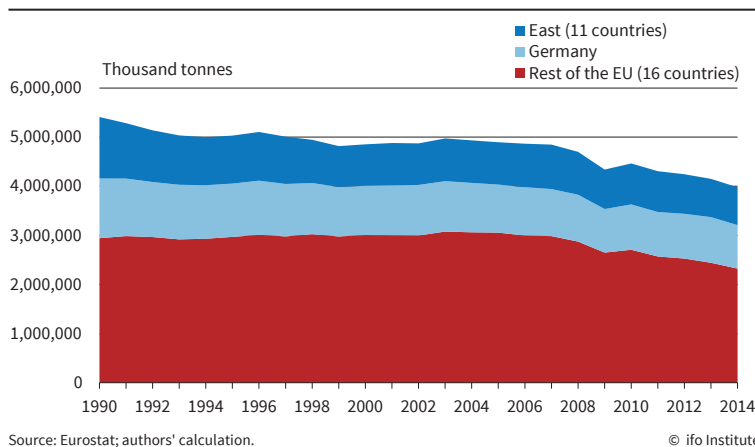
competitive conditions by selling advanced products to customers in emerging markets (substantially increasing their exports as a percentage of GDP), countries in Southern Europe (and some in the East) have generally failed to do so.

However, European integration and EU policies have also had an impact. The introduction of the euro in 2002 made the Eurozone economies more interdependent. A natural consequence of this may have been the greater coordination of economic policies among participating countries, but instead those countries continued to pursue economic policies based largely on domestic considerations, effectively disregarding the consequences for other countries and for the wider Eurozone. Germany, for example, following its costly re-unification with former East Germany, decided to restrain growth in wages and domestic demand in order to boost the competitiveness of its industry and to run a trade surplus with the rest of the world. However, this policy implied that other, less competitive members of the Eurozone, with far less scope for export-based growth, also needed to practice austerity if increased trade deficits were to be avoided. Initially, several Southern countries shied away from austerity, leading to rising deficits and foreign indebtedness (Fagerberg and Verspagen 2015; Landesmann 2015), a situation which was clearly unsustainable. Eventually the financial crisis brought governments in different parts of Europe together under the umbrella of austerity, leading to slow growth, rising unemployment (especially in the South) and increasing divergence in the Union as a whole.

EUROPE FACING THE CLIMATE CHALLENGE

There is near-consensus among climate analysts that the globe is currently heading towards a substantially warmer Earth than a century ago, and that this global warming is primarily caused by greenhouse gas (GHG)

Figure 3
GHG Emissions in the EU28, 1990–2014



emissions from human activities (IPCC 2012; 2013a; 2013b and 2014; World Bank 2012 and 2013). In order to confine temperature rises to less than 2°C, global GHG emissions have to be reduced substantially by 2050, and almost completely eliminated by the end of the century (IPCC 2014). These demanding goals are equivalent to a reduction in GHG emissions by at least 3–4 percent annually for the rest of this century (see Smil 2010).

European politicians pride themselves on having already substantially reduced greenhouse-gas emissions; and hence for being on broadly the right track (European Council 2014). But is this really the case? To explore this, Figure 3 traces the development of European GHG emissions from 1990 onwards for three country groups: Eastern Europe, Germany (including the former GDR) and the rest of Europe.³

What the figure shows is that, for Europe as a whole, there was a reduction in emissions in the early 1990s, but this can be almost entirely explained by the rapid changes that took place (including the closure of inefficient plants) in the previously socialist countries in the East. For the rest of Europe, emissions were essentially stable until the outbreak of the financial crisis. This raises the question of whether the more recent decline in GHG emissions represents a shift towards a new, more sustainable path, or whether it is mainly a consequence of the financial crisis, and hence is likely to be reversed should the economy recover.

To investigate this, Figure 4 includes data on GHG emissions and growth of GDP for the EU as a whole between 1995 and

³ The reason for focusing on these three groups is that prior to the early 1990s, when our analysis starts, there were substantial differences in industrial productivity and energy efficiency between the capitalist west and the socialist east, which influenced subsequent developments.

2014. The GHG intensity (i.e. GHG emissions per unit of output) has declined steadily, as in the United States (Nordhaus 2013). But until shortly before the financial crisis, this decline was not enough to reduce Europe's overall emissions. Moreover, as the figure shows, had growth continued at the same pace as before the crisis, emissions would probably have stayed roughly constant. Thus, the recent decline in emissions does not reflect a fundamental change towards a more sustainable path for the European economy, but is mainly a reflection of continuing

economic stagnation.

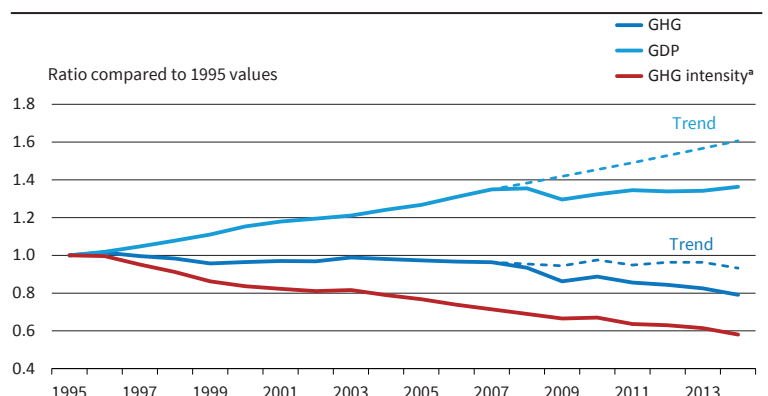
This raises serious questions about Europe's ability to cope with the challenges discussed in this paper. A revival of the economy, which is required to reduce unemployment and increase welfare, appears to be in direct conflict with the need to combat climate change. To realize both objectives, the European economy has to shift to a completely new trajectory when it comes to the emission of greenhouse gases. This is a truly formidable challenge, requiring a fundamental transformation of European economic activities and, arguably, a completely new policy stance.

THE GOVERNANCE CHALLENGE FACING EUROPE

Here, we examine the governance challenge faced by Europe with regard to developing the necessary policies for economic recovery and transformation and for confronting issues related to climate change and sustainability.

A first issue concerns the increasingly global nature of the problems confronting governments, requiring internationally coordinated, multilateral efforts that are hard to bring about, as shown by the failure, at

Figure 4
Development of GDP and GHG Emissions in the EU28, 1995–2015



least until the Paris climate conference in December 2015, to come up with a comprehensive international agreement on how to deal with climate change. Nevertheless, as pointed out by Laestadius (2015), Schmitz and Lema (2015) and Smith (2017), there may be other possibilities for international cooperation related to climate change, such as alliances of like-minded countries (with Europe taking the lead) pioneering new solutions and encouraging others to follow.

Secondly, not only are the current problems large-scale, but they are also more likely to cross-cut organisational boundaries, particularly within governments (Bauer *et al.* 2012) and to interact in an increasingly complex manner. Energy policy, for instance, must give careful consideration to a range of issues, including security, for example (Geels 2015). Therefore, effective policies for transforming the economy towards sustainability may require the development of new forms of governance, characterised by a holistic perspective and close coordination between different parts of government (Fagerberg 2017).

A third issue relates to the increasing involvement of non-government players, not least in Europe (Biermann 2007; Biermann and Pattberg 2008; Biermann and Gupta 2011; Bauer *et al.* 2012). However, while making governance more complex, the involvement of non-governmental actors may also introduce a much needed new dynamics into policy-making, as shown, for example, by the German *Energiewende* – literally energy transition – which had its roots in the environmental and anti-nuclear movements of the 1970s and 1980s. The results of this policy are truly remarkable. Between 1998 and 2015, the share of renewables in German energy consumption increased from below five percent to over 30 percent (Fagerberg *et al.* 2017). At the same time, the cost of producing renewable energy steadily declined, making renewables much more competitive and attractive worldwide. A substantial German capital-goods industry also developed (Lauber and Jacobsson 2015).

Fourthly, there is a heightened sensitivity to risk and uncertainty (Biermann 2007). The fundamentally uncertain nature of technological advance means that policies for transformation should place the emphasis on pursuing a broad portfolio of different energy technologies and on not getting locked into a specific development path that may appear more cost-effective or promising at a given time. The German *Energiewende* is an excellent example of how this can be achieved (Lauber and Jacobsson 2015). The scheme required utilities to purchase renewable power from private sources at a fixed rate (a so-called ‘feed-in tariff’). The feed-in tariff was set at different levels for different technologies (e.g. solar, bio, on-shore wind, off-shore wind etc.) depending on how far these technologies had progressed with respect to becoming commercially viable, allowing different technologies time to deliver on their promise, thus avoiding premature lock-in to a specific technology.

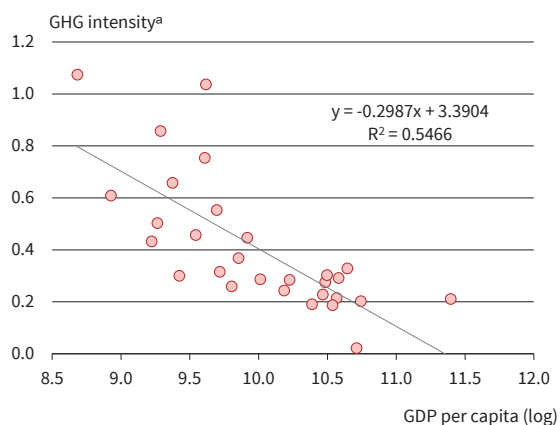
A fifth factor adding to the governance challenges facing the EU is the growing number and diversity of member states. Now with 28 member states, EU countries are quite different in terms of economic, industrial and institutional characteristics, and policies based on the philosophy of ‘one size fits all’ appear less appropriate than ever.

Lastly, and again a factor specific to the governance challenge faced by the EU, is the fact that the scale of resources at the disposal of the EU is, in most cases, very limited compared to those allocated by national governments (Begg 2015). Hence, the ability to influence and coordinate national governments becomes essential.

The declining trust in (and diminishing popular support for) European institutions (Begg 2015) indicates that the failure of EU politicians to deal effectively with the challenges now facing Europe faces is coming back to haunt the entire European project. This underscores the need for a new policy stance (Mowery *et al.* 2010). As noted above, simply pumping up demand would quickly come into conflict with climate concerns and hence prove unsustainable. A policy targeting higher economic growth and reduced unemployment must therefore simultaneously speed up the transformation to a sustainable economy. The best way to achieve this, we argue, is to target innovation, the diffusion of new technology and transformative investments in areas such as energy supply and distribution, increased energy efficiency, public transport, and infrastructure for cars driven by electricity and fuel cells. Many of these investments, in the energy sector for example, will be necessary anyway (ECF 2013), but undertaking them sooner rather than later (and using reduced GHG emissions as a yardstick in the selection process) may accelerate the transformation while simultaneously reviving growth.

As pointed out above, such a policy stance must take into account the fact that the economies of Europe

Figure 5
Relationship between GHG Intensity and GDP per Capita in the EU28, 2014



^a GHG emissions per unit of output.

Source: Eurostat; authors' calculation.

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are very different, so there is no point in just mimicking the same policy (whether patterned on German experience or that of some other country) everywhere. While such transformative investments are needed in all member countries, it is natural to place the emphasis on countries that have further to go with respect to achieving sustainability. As Figure 5 shows, the countries most in need of transforming their economies in the direction of sustainability are poorer member states. Thus, a programme for transformative investment based on these principles would not only be good for climate change and economic growth generally, but would also deliver growth where it is most needed, thereby contributing to improved social cohesion in the Union as a whole.

CONCLUSIONS

Europe (like many parts of the world, but perhaps even more so) is confronted by an intimidating triple challenge comprising of economic stagnation, climate change, and a governance crisis. This paper shows how these three challenges are closely inter-related. In particular, a return to economic growth cannot come at the expense of the increased risk of irreversible climate change. Instead, what is required is a fundamental transformation of the economy to a new ‘green’ trajectory based on the rapidly diminishing emission of greenhouse gases.

Boosting Europe’s economy and its transition to a sustainable ‘green’ economy through transformative investments should be seen as a core element of European policy for innovation and growth (Mazzucato and Perez 2015). Innovation is not primarily about scientific breakthroughs, although these are often very important, but more about continuous experimentation, learning, gradual improvements, cost reductions and increasing the performance of technologies that are, in most cases, already on the table (Mathews 2014). Policymakers can exert a major influence over innovative activities by emphasizing the most pressing challenges or problems that need to be addressed. This type of innovation policy, which provides a sense of direction to the collective innovation journey and rallies potential contributors behind it, would be relevant for a wide range of activities essential for the transition to a sustainable economy, such as energy production, distribution and use, as well as transport and construction. In order to be effective, such a policy will have to link and coordinate different policy arenas (energy, transport, regional development, research, innovation etc.). Thus, sustainable growth requires more than technological innovation; new – innovative – forms of governance and institutions are also required.

The dominant policy approach to dealing with climate change in Europe to date has tended to focus on getting ‘the prices right’, with the Emissions Trading Scheme (ETS) as the central instrument (Begg 2015). Yet this has proven far from successful. The reason is not

that there is something inherently wrong with getting ‘the prices right’, but rather that gaining political support for the necessary adjustments in prices (through increasing taxes or cutting quotas or in other ways) has proven very difficult. Moreover, timing is crucial here. Arguably, acquiring the necessary momentum in the transformation process is critically dependent on mobilising broad segments of society by advocating and experimenting with new solutions. It is significant that successful transformation policies, such as the German *Energiewende*, were not created through top-down initiatives by political leaders, but by pressure from below from green movements and environmental activists, which gradually garnered increasing support for these policies as they acquired momentum.

Some of these initiatives (the German *Energiewende*, for instance) are examples of what economists often call ‘second best policy’ (they reserve the term ‘first best’ for ‘getting the prices right’). Yet it is fallacious (even from an economic theory point of view) to criticize these policies on the argument that they are more expensive than ‘first best’ policies when it is quite obviously illusory to assume the latter will deliver the required outcomes in time. Moreover, if combatting climate change requires considerable innovation, as almost everybody seems to agree, then it is not only the costs of particular policies here and now that matter, but also the effects on innovation.

As pointed out earlier, other parts of the world are also facing varying forms of the triple challenge. Given the global character of the problem, and the many players involved at different levels all round the world who may have a say in what happens, the ability to influence actors in other countries becomes centrally important. One way to achieve this – one for which Europe seems eminently well placed – would be to lead by example, providing solutions for how the climate challenge can be effectively dealt with. Taking the lead may, of course, incur significant costs. Nevertheless, doing nothing will undoubtedly have a major detrimental impact in the years ahead in many areas of life. By taking the lead in addressing the triple challenge, Europe may not only attract followers, thereby ensuring that climate change is kept within manageable bounds; it may also lead to considerable benefits in the longer term in the form of strengthened industrial competitiveness, enhanced exports and new jobs. Moreover, addressing the triple challenge may provide Europe and its citizens with a (much needed) new sense of purpose, revitalizing the EU, ‘the European project’ and Europe’s role in the world over the decades to come.

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