

Introduction

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The European Union is the world's largest economic entity, yet its ability to design and implement effective economic policies is not commensurate with its size. It is lagging, for example, in terms of effective policies promoting productivity, growth, scientific research or technological innovation. The Eurozone debt crisis has provided a sharp and painful reminder that the European Union must adopt a new approach to designing its economic policies and coordinating them with the policies of its Member States.

At the same time, while the field of economics in Europe has seen impressive growth in terms of global impact, and in the number of researchers and funding, Europe still lags behind the US in terms of research productivity, and European research remains fragmented across its Member States. According to recent research, the share of articles in the top economics journals published by European researchers represents 34 per cent of the total production of articles in the world, while the US amounts to 53.5 per cent.¹ The contrast is even sharper when the citation impact of these publications is taken into account. In terms of share of citations, the US represents 70.8 per cent while the EU share is 28.4 per cent, which illustrates the considerably higher impact of US research in economics.

Developing a competitive and open European research area is essential for growth and to the progress of European integration, because research is a key factor of growth, and competition among researchers provide them with incentives for cooperating across borders. However, different languages, a diversity of academic traditions and a variety of informal barriers often inhibit the free flow of research funding, the mobility of academic talent and, as a result, the efficient allocation of research and development funding. In times of financial restraint the latter becomes particularly important. In this context, research grants, especially if they are allocated across national borders (e.g., by the European Research Council, ERC), can provide valuable tools to circumvent limits to integration and consequently to enhance the exchange of ideas. In fact, the relationship between openness and successful research funding is reciprocal and internationalization can benefit national and regional funding, by, for example, permitting the inflow of foreign resources. On the other hand, if not

designed correctly, research funding can exacerbate existing fragmentation, for example by conditioning grants on nationalities and/or local use or by failing to retain and attract the most able researchers.

The COEURE Project

The COEURE (Cooperation for European Research in Economics) network brings together the key stakeholders in the European economic research space – scientists from the different strands of economic research in Europe, users of research in the policy community and the private sector, statistical offices and other data providers and funders of research. It has been financed by the European Commission within the Seventh Framework Programme. COEURE is based on a process of stocktaking, consultation and stakeholder collaboration that aims at the formulation of an ‘Agenda for Research Funding for Economics in Europe’.²

This involves taking stock of the current state of research in key fields in economics. The fields cover the entire spectrum of economics, while addressing the most relevant thematic issues identified in Europe. The stock taking exercise is centred on a survey of each by distinguished scholars. Each survey has mapped out the policy issues with which Europe is currently dealing, the research frontier in the given field and the activities of European researchers working at the frontier. It identifies the key open research questions and suggests ways in which research on these issues should evolve over the medium term, notably to better address the policy challenges that Europe is currently facing and likely to be presented in the future.

The COEURE network originates from an initiative of the European Economic Association (EEA). Fondation Jean-Jacques Laffont – Toulouse School of Economics – is leading the network assembling a group of academic institutions, with the support of the EEA. The partner institutions are: Bocconi University, Université Libre de Bruxelles, Dortmund University, the European University Institute, Central European University, the Norwegian School of Economics and the Centre for Economic Policy Research.

Advances in Economic Research: Foundations for European Policies

Five clusters of European economic policy challenges have been identified as being of paramount importance:

1. Economics of research, education and innovation in a European and global context, including economics of smart specialization (Europe 2020, European Research Agenda).

2. Knowledge-based growth and employment; prioritization of policies in Europe, in particular, the need for short-term consolidation, long-term growth policies like fiscal consolidation and smart / sustainable growth (i.e., addressing poverty, gender, employment and environmental issues).
3. The link between monetary and fiscal policy in Europe and between fiscal and private debts; efficient use of unconventional monetary policies; insolvency problems and the management of rescue funds (addressing asset inflation, housing prices and market bubbles).
4. Cross-border spillovers, interdependencies and coordination of European policies across borders (addressing the questions of externalities, economies of scale, etc.).
5. Institutional and structural reforms in the Member States and associated countries concerning issues like ageing, health systems, energy and resources efficiency, transport or environment in the context of Europe 2020 and their budgetary and macroeconomic consequences.

In light of these challenges, twelve specific topics have been selected to address the current state of research and its relationship with policy:

1. R&D, innovation and growth;
2. Labour markets;
3. Population, migration, ageing and health;
4. Human capital and education;
5. Competition and regulation in markets for goods and services;
6. Trade, globalization and development;
7. Energy, environment and sustainability;
8. Cities, regional development and transport;
9. Fiscal and monetary policy;
10. Financial markets;
11. Inequality and welfare; and
12. Data and methods, a topic which cuts across most areas and policy issues, and covers current developments in data and research methods in economics.

For each of these topics, a survey was solicited and a workshop organized that brought together key researchers in the field, as well as leading European policy-makers. The workshops served as forums to discuss recent advances in our understanding of policy issues, open questions, developments in methods and challenges facing research in a given area.

The main objective of the surveys has been to identify the key research challenges pertaining to one broad area of policy and demonstrate how economic research contributes (or not) to the policy issues related to that area. Its originality lies in synthesizing insights from different fields of economics, rather than summarizing the results from the literature in a single field, as is often the case with surveys in the academic literature.

The surveys have been designed to address the following questions:

1. Why is the topic important, both in general and in the European economic policy context?
2. How can economics contribute to our understanding and analysis of this political and societal topic?
3. What are the key questions (both novel and long-standing) in the area? What do we know and not know about them? Do we need to better understand the facts or develop better theories?
4. What are the key points of agreement and disagreement in the academic literature on the subject? Where is the research frontier?
5. What are the key open questions, that is to say, new questions or old questions that have not been addressed in economic research but are of vital importance for policy-making in Europe?
6. Where does Europe stand in terms of research and expertise in this area compared to other contributors to research, in particular the US?
7. What is the role of scientific advice in EU policy decision-making (see, for example, the European Commission's 2001 White Paper on European governance)? How does it compare to US economic policy-making governance?
8. What is the research methodology currently used to address questions in this area?
9. What specific challenges do Europe-based researchers working in this area face (including data access, its availability or quality, methods, funding and any other relevant issue)?

This volume is the outcome of this process. As we will see, European researchers address most key European economic policy issues and challenges. The policy recommendations are plentiful, although not always politically correct or easily acceptable. Economic research is firmly grounded on facts, although data, while more and more developed, are not always accessible or available. The theoretical challenges and methodological difficulties that current research is facing begs for inter-European cooperation and cooperation with other fields and disciplines, while given its actual state or art, its own logic and approach should and can be preserved.

About the Chapters

The *first chapter* of the volume deals with innovation and growth, which have been central to European policy-making since at least the Lisbon Agenda. The chapter argues that the Schumpeterian paradigm provides a unifying framework to organize existing empirical evidence and think about R&D, innovation and growth policies. The authors show how the Schumpeterian framework sheds new light on ongoing policy debates such as the role of competition

for innovation or the consequence of innovation on inequality, and they discuss the policy implications of recent advances in our understanding of these phenomena.

The Schumpeterian growth paradigm relies on three fundamental ideas. First, innovation (rather than simply the growth of capital or labour as in the classic growth models) drives long-term growth. These can be process innovations, which increase the productivity of existing assets or labour, product innovations or organizational innovations. Second, innovations result from investments by firms and entrepreneurs. This raises the question of the incentives for innovation, including the ability of firms and entrepreneurs to reap the benefits of their innovations. Third, new innovations tend to make old innovations, old technologies or old skills obsolete (creative destruction). Thus growth intrinsically involves a conflict between ‘the old’ and ‘the new’: the innovators of yesterday will tend to resist new innovations that render their activities obsolete. Creative destruction also explains why, in the data, higher productivity growth is associated with higher rates of firm and labour turnover.

Because firms and entrepreneurs are at its core, the Schumpeterian paradigm provides a natural link between micro phenomena, such as firm entry and exit, firm heterogeneity, firm organization, or job turnover, and macro phenomena, such as growth and inequality. In fact, the authors show how the Schumpeterian framework is able to explain a number of existing stylized facts about firm and job turnover, the size distribution of firms and the correlation between firm size and firm age, to name a few. They also show how the framework has been used to develop new predictions that have then been tested, using new micro datasets. The scope of applications is very large and this is an active field of research. For example, recent research has shown how the level of competition differentially impacts the incentives for innovation of firms that are close to the technology frontier of the economy and those that are furthest away. Other research has looked at the impact of market protection on innovation as a function of a country’s distance to the world technology frontier.

A central message of the chapter is that institutions and policies that foster growth depend on where a country lies with respect to the world technology frontier. There is no one-size-fits-all. In advanced economies, competitive product markets, flexible labour markets, quality graduate education and developed equity-based financial markets form the four pillars of innovation-led growth: competition in product markets encourages innovation by firms seeking to escape the low margins of neck-to-neck competition; flexible labour markets ease the process of creative destruction; quality graduate education produces the research skills necessary for innovation; and equity-based financing is more receptive to the risk intrinsic to innovation. The chapter revisits the rationale and design of competition policy, the welfare state, macroeconomic policy and R&D policy in this light. It ends with a call for a new Growth Pact in

Europe, one that relies on structural reforms aimed at liberalizing product and labour markets, a renewed industrial policy and more flexible macroeconomic policies.

Chapter 2 focuses on the prevalence of ‘dual labour markets’ in the European Union. In the 1960s unemployment in Europe was no higher than in the US, but by the end of the twentieth century the ‘European unemployment problem’ was the code name for a widespread problem of inefficient allocation of human resources in Europe and in Continental Europe in particular. At the beginning of the twenty-first century the problem seemed to recede, with some countries undertaking critical labour reforms (e.g., Germany) and some of the ‘high unemployment’ countries showing very high rates of net job creation (e.g., Spain). Although still lower than in the US, European employment rates were not only higher on average but also less dispersed than in the recent past. However, with the financial and euro crises the problem took on a different dimension, that of a divided Europe (and Euro Area), with some countries exhibiting once again very high unemployment rates (mostly Southern EU), as a reflection of their deeply entrenched structural problems.

Chapter 2 provides an overview of the research – most of it by European labour economists – that focuses on this new version of the ‘European unemployment problem’. The theoretical and empirical research provides a consensus view on who the culprit is: the ‘duality’ induced in labour markets by the existence of labour contracts with large differences in their implied employment protection legislation. In particular, this chapter describes the highly asymmetric employment protection that distinguishes permanent from temporary contracts, tracing their historical origins and institutional arrangements. In line with the most advanced literature, the chapter takes a general equilibrium perspective. The historical perspective explains why different European countries have followed different paths and why ‘changing paths’ has proven difficult. The theoretical, general equilibrium perspective reveals the side effects of such ‘dualism’ and why it cannot simply be identified with the coexistence of temporary and permanent contracts, which are used in all countries.

After World War I and up to the mid 1970s, many European countries experienced a significant increase in employment protection legislation. Spain, Italy, France and Portugal regulated their labour markets by imposing severance payments and restrictions on dismissals, among other measures. These laws made it costly for firms to adjust in response to a changing environment and once the oil crises hit in the 1970s, the need for higher flexibility became a more pressing priority on political agendas.

Nevertheless, dismantling the benefits that workers were entitled to was not politically feasible due to the large political influence of highly protected workers. Thus reforms were made at the margin, affecting new employees only. Specifically, the emergence of temporary contracts with a lower regulatory

burden was the policy response to the quest for flexibility in labour markets. These reforms thus created a dual labour market by allowing for two types of contracts: temporary and permanent (open-ended). The former was designed to facilitate turnover and fast adjustments, while the latter represented the remains of stringent policies targeted at guaranteeing job and income stability.

The chapter describes how economic research – in particular, ‘insider-outsider’ theories – has helped to explain why dual labour markets have been a longstanding feature of many European economies. Insider-outsider models have set the framework for the analysis of the tensions between workers with permanent contracts (insiders) and the rest of the labour force (outsiders) when it comes to deciding on a reform. Beyond rationalizing the observed pattern in the creation of a dual labour market and its political sustainability, these models have extended our understanding of the interplay between the political decision-making process and real business-cycle (RBC) effects – e.g., why employment is so volatile in economies with ‘dual markets’ and how these RBC effects reinforce the lack of effective political support for labour market reforms.

Nevertheless, as the chapter emphasizes, the coexistence of temporary and permanent contracts is a desirable feature, as firms might have temporary or seasonal needs. Furthermore, a temporary contractual relationship can help workers gain experience or acquire human capital. In fact, in countries like Austria, Denmark or Sweden, temporary jobs are the first step into the labour market and are followed by a permanent contract. On the other hand, in southern European countries, temporary jobs have become ‘dead-end’ jobs. Workers tend to experience a sequence of fixed-term contracts and the dream of a transition to a permanent contract rarely comes true. The chapter documents this difference and reviews relevant research, showing that market dualism is due to the existence of large gaps in redundancy costs among permanent and temporary workers, combined with wage rigidity.

The general equilibrium formulations have helped to explain the pervasive effects of ‘labour market duality’ beyond its direct effects on the level and volatility of employment: First, its composition effect, in particular the high levels of youth unemployment and NEET (‘not in education, employment or training’), second, the lower human capital accumulation, and third, how these labour supply effects have also shaped firms’ demand for low-productivity jobs, low levels of innovation and, in particular, investment in sectors of low growth potential (e.g., construction) in times of low interest rates.

The chapter closes with a review and evaluation of the reforms that have been undertaken, or proposed, in different countries to overcome ‘the duality disease’, demonstrating how both empirical and theoretical research reveal the need for overall reforms of labour market regulations. In particular, the chapter discusses the possibility of a single/unified contract, both from a theoretical

and a practical perspective. Finally, the survey identifies three main directions in which economic research can enrich the policy debate: (i) empirical work on the differential incentives and responses induced by the two types of contracts; (ii) analysis of the political feasibility of reforms within the current scheme and (iii) the role of labour market dualism in technology adoption by firms.

Chapter 3 deals with the problems of population, migration, ageing and health. World migration, and in particular net migration in the European Union, has been an extremely hot topic in the last few years, debated in the media as much as in the political arenas of each EU Member State and in the European Commission. A large part of the debate has, however, focused on how to deal with the current emergency inflow of undocumented migrants that are fleeing from war zones and natural disasters.

Not much is known and discussed about medium and long-run causes and effects of migration. For instance, one of the recognized structural motivations of migration is the contrast between the ageing population in most destination countries and the young, more fertile population of the countries of origin. Migrants are typically younger than the host country population when they arrive, and, as a result they contribute to rejuvenating the host country's labour supply in the short run. However, migrants age as well as natives, and it has also been shown that their fertility behaviour, and that of their descendants, tends to adapt in time to the pattern of behaviour of the host country. Is then migration a long-term solution to the ageing population problem of most Western European countries? Similarly, what are the long-run economic benefits and costs of migrant workers in the destination countries? Do the tax revenues and benefits to the economic activity due to changes in the composition of the working population exceed the welfare costs over the entire lifecycle of a cohort of immigrants? What determines exactly these benefits and costs? Which migration policies are more effective in fostering welfare enhancing migration patterns?

Looking instead at the countries of origin, can the 'brain drain' phenomenon be a problem? Is their growth potential impaired by the out-migration they experience? The chapter addresses these questions from an economics standpoint, with the explicit aim of suggesting clear migration policies and indications for future research.

The main message put forward by the authors is the need for a dynamic approach to simultaneously describe migration plans, human capital acquisition and labour supply, that evolve in time and that both affect and are affected by the social, economic and demographic structure of the host countries. The key issue, in this context, is the analysis of the choice between temporary and permanent migration. Data shows that the percentage of temporary migrants is much higher in Europe than in Anglo-America, Australia and New Zealand. Why is that? What are the determinants of return migration to the countries of origin? The literature is as yet only able to provide partial answers. It is,

however, quite clear that the demographic, social and economic impacts of immigration vary depending on how long migrants stay in the destination countries.

As for the fiscal effects of migration, there is consensus on the finding that host countries experience a net gain from highly skilled, young, possibly temporary, workers; but effects are less clear-cut in the presence of low-skilled workers. In particular, the evidence collected in Norway by Bernt Bratsberg clearly outlines the tendency of low-skilled migrants to exit the labour force early and become social security dependents. In addition, migrant workers are more likely to suffer from macroeconomic downturns than natives. Nevertheless, there exists significant heterogeneity across destination countries and migrants' behaviour responds to incentives provided by the local welfare state, as well as to the local implementation of migration policies. Expanding on the latter issue, the effect of any migration policy depends strongly on the institutional setting: the evidence on the relative efficacy of immigrant driven versus employer driven policies in attracting the 'best' migrants is ambiguous. In both cases what makes the difference is the credibility of the State and the efficiency of local labour markets.

To conclude, the authors also emphasize the lack of data for certain types of studies. Analysis on the long-run causes and effects of migration require as yet unavailable long panels of information on migrants and their descendants. Even more relevant is the need to standardize and guarantee access to data across EU member states and to link EU Member States' Immigration Registries.

Moving to the next chapter, it is well understood that the process of globalization has reinforced the basic tenet of human capital theory, namely that the economic well-being of a society is determined not only by its stocks of financial capital, labour and natural resources but also – and ever increasingly so – the knowledge and skills of its individual members. Accordingly, already the 2000 Lisbon Agenda of the European Union set out the aim to turn Europe into 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.

Indeed, research results in the economics of education show that education has a considerable impact on economic growth. Simple qualitative measures for education such as indicators based on cognitive achievement of students turn out to be extremely good predictors for the long-run economic growth of nations. Plainly, enhancing the EU's average student performance using a test like PISA would yield substantial returns in the form of EU Member States' long-term economic growth.

From this economic perspective it appears that education systems 'produce' the human capital embodied in the workforce of a society. They are hence prime subjects for economic investigation. At the same time, educational attainment is

an important determinant of equity and social cohesion in a society. This makes the search for educational policies and forms of political governance that influence the formation of human capital in a most favourable way, a particularly important one.

Chapter 4 surveys and organizes a huge body of mainly empirical work that addresses the question of how education policies can advance student attainment. To understand which policies work, education economists employ advanced micro-econometric methods to perform carefully designed quasi-experimental evaluations. The main emphasis is on the identification of *causal effects* from the data; these methods and set-ups may require new types of datasets which are not yet uniformly available across Europe. Consequently, the survey also draws heavily on studies and evaluations of the US educational system.

The chapter is organized around the economic paradigm of a more or less competitive ‘market for education’. More precisely, this market takes the special form of a matching or assignment market as students and pupils on the demand side have to be ‘matched’ with schools and other institutions of the educational system on the supply side. How can such matching be accomplished as efficiently as possible if efficiency is measured by educational attainment? And what assignment methods are beneficial to what groups? The answers to these questions can be very surprising, if one also takes into account the reactions of the actors in this market, parents, pupils, schools, teachers etc. to the assignment mechanism chosen by society. The identification and assessment of such incentive effects is a hallmark of economic inquiry. The chapter performs this task for the most common assignment mechanisms: neighbourhood schooling (each pupil goes to the local school), tracking or elite schooling (schools are allocated on the basis of a test score), choice-based schooling (parental choice of school subject to a rationing mechanism) and income-based schooling (admission to private schools).

Another central concern is how the political governance of education systems affects educational success and equity. What makes an effective education system with good schools given an assignment mechanism? School accountability, i.e., the provision of rewards or sanctions for ‘good’ and ‘bad’ schools, is the key issue here, which – economically speaking – determines the degree of competition between schools. It can only be effective, if schools also have some autonomy and hence decision-making in the governance structure becomes decentralized. As a consequence, individual school leadership and management become more important. Indeed, the evidence shows that all three components – accountability, autonomy and management, each of which can take many forms – exert an influence on school and pupil achievements.

Knowledge of the patterns of *causal* dependencies between student attainment and these market *design* features of an educational system should be

extremely useful for progressing along the strategic framework 'Education and Training 2020' adopted by the European Commission. It provides for some common ground to improve cooperation between the European Commission and its Members on educational matters while fully respecting Member States' competencies in the field of education and training.

Chapter 5 deals with the issues of competition and regulation in markets for goods and services. Competition policy has become an important tool in Europe's common work towards a more efficient and innovative economy. The major topics in competition policy and regulation are organized around four areas: collusion and cartels, abuse of dominance, merger controls and state aid. Policy and regulation have been guided by growing research in Industrial Organization (IO), both theoretically and empirically. The EU has built national and European structures to manage competition issues both through law and regulation and by strengthening regulative institutions' scope and capacity for governing competition and efficiency within- and across national markets.

A major new concern within both research and the implementation of policy is how markets work in the 'digitalized' economy and electronic trade. The efficient functioning of digital and online markets is crucial to welfare and is expected to become even more important in the near future. Already by 2020, more than half of total European retail sales are anticipated to be web-impacted.³ The digitalization of the economy challenges traditional competition and regulation tools as well as theory. Several issues distinguish digitalized markets; often such markets are two sided; search and transaction costs are different and significantly lower compared to traditional offline markets; the cost structure is tilted heavily towards the fixed cost component and not the marginal ones; there are challenges on how to protect intellectual property rights; and new privacy issues are in focus due to the increased availability of private information on market participants. For instance, a significant part of traditional competition regulation, and partly theory, relates to firm size, dominance and market definition. In the online economy, market borders are fluid, at best, and the competition is geared towards competition for the market, rather than competition in the market. The latter implies in its most liberal consequence that even monopolized online markets are not necessarily a problem as long as they are contestable and are exposed to continuous competitive pressure. The regulation and competition problem transfers to entry barrier questions rather than dominance as such.

The challenges we are facing can be seen through the policy questions and decisions that have been relevant in recent and ongoing competition cases. From these cases several questions emerge; the existence and the challenges with most favoured national (MFN) clauses (e.g., Amazon e-books and online travel agents), selective distribution (Adidas, ASICS and Casio), the usage of selective non-neutral price comparison algorithms (Google), cross-border rules

on fees (MasterCard) and resale price maintenance (RPM) rules (Swedish sport nutrition products), to name a few.

This chapter shows that the policy-makers and courts take different stances due to different views on how to solve these issues: motivating a discussion on the difficult choices policy-makers now face between *ex ante* regulation (per se prohibition) and *ex post* regulation (rule of reason). It discusses the EU's digital single market initiative and some of the economic challenges we are facing on vertical relations and pricing. The IO literature offers both 'old' and new "wisdom" as regards how we can deal with these issues, still the chapter shows that there are both coexisting theories suggesting different outcomes with regards to efficiency and welfare, and several open questions that need answers. For instance, the way in which we are to deal with RPM rules are not obvious, neither in the offline, nor in the digitalized economy. Although RPM rules offer vertical related firms to facilitate pricing and increase competition, they also sometimes facilitate collusion. Likewise, it is unclear that not allowing any restrictions on cross-border online sales are enhancing welfare always and in all cases.

The chapter surveys the new literature on competition and digitalized markets, and clearly advocates more work. In particular, it shows that despite the increased data availability from the online economy, very few empirical studies exist. This is surprising since the theory typically generates ambiguous predictions that depend on the size of the effects at play when it comes to show how pricing arrangements affect equilibrium prices, profits and welfare.

Many of the issues that surface as important in 'digitalized' markets are also evident in more traditional markets. However, the systematic presence of some key new features like two-sidedness, cost structure and vertical pricing structures, significantly modifies the nature of the models that should be used. Overall, new research on this topic needs to balance the important central results from the existing IO literature, even if reorganized and reinterpreted, against new approaches required by the new features of the digitalized economy.

Chapter 6 deals with the problems of trade, globalization and development. It is well understood that the fortune of workers, consumers, firms, regions and countries increasingly depends on other regions and countries. This global interdependence is driven by the flow of goods, capital, information, ideas and people across them. An almost tautological conclusion of theory is that if countries choose to interact with one another, they have to be better off than being in isolation. While there are many quantifiable models to evaluate the gains from trade, the welfare gains from global production sharing, either via arm's length global value chains or via multinational production, are less clearly quantifiable. Better understanding how multinational firms operate is central to comprehend and estimate their contribution to the costs and benefits of globalization.

An overarching theme is that globalization benefits some more than others. In fact, some may even become worse off as their country becomes more open to the flow of goods, ideas and people. For example, workers in import-competing industries stand to lose when countries open up to trade. There is a need for better understanding the redistributive effects of globalization and to develop policies to mitigate the negative effects. Economists find it difficult to give definite answers to trade policy challenges, partly because the remaining policy barriers to cross-border transactions are difficult to quantify. There is broad-based evidence that these frictions are large, but many of them cannot be captured by taxes and quotas, which are the standard tools to model them for policy analysis. We need to better understand not only protectionist, but also precautionary motives for trade policy.

There are also important challenges in measurement. Recent initiatives to match data from various national sources are very promising, but the national fragmentation of data collection remains the primary data challenge facing analysts of globalization. To be more specific, the most relevant tasks in this area are to:

1. harmonize firm-level trade and balance sheet data across countries;
2. develop statistical methods and computational tools to work with multidimensional data;
3. develop new datasets on workers within firms, while ensuring privacy and consistency across studies;
4. build harmonized firm-level data on services trade;
5. collect data on buyer-supplier links within the EU;
6. link national administrative data, harmonize data collection and reporting;
7. synthesize research based on ad-hoc proprietary data; and
8. construct international input-output accounts from the ground up.

There are some important challenges for theory as well. We need to:

1. reconcile model-based and reduced-form estimates of gains from trade;
2. identify losers from globalization and quantify their losses;
3. understand and quantify nontax, nonquota frictions in trade;
4. develop a toolbox for quantitative analysis of redistribution;
5. understand and quantify the effects of standards and harmonization on trade and welfare; and
6. develop a quantitative theory of supply-chain trade and of multinationals.

Chapter 7 deals with the economic approaches to energy, environment and sustainability. Different schools of economic theory hold differing views on the basic characteristics of the relationship between the economy and the environment. The two principal schools are ‘environmental and resource economics’, which considers environmental concerns as an aspect of broader economic issues to which the approaches of rationality, marginalism and efficiency may be suitably applied, and ‘ecological economics’, which considers the

economy as a component of the global ecosystem, and employs ‘methodological pluralism’ to assess different aspects of what proponents view as a highly complex, multifaceted human–economy–environment interaction. These two opposing viewpoints produce different concepts of ‘sustainability’ and ‘sustainable development’, and different ways of measuring whether progress towards such states is being achieved. Environmental and resource economics takes the position of ‘weak’ sustainability, which advocates that as long as the total economic value of all capital stock (natural, human and man-made) can be maintained in real terms, regardless of the distribution, sustainability is achieved. The monetary valuation of natural capital and ecosystem services is a central tool in such analysis.

Ecological economics instead takes the position of ‘strong’ sustainability, which considers some natural capital to be ‘critical’ in that it makes a unique contribution to welfare or has intrinsic value, and cannot be substituted by manufactured or other forms of capital. The insights of institutional/evolutionary economics, and behavioural economics, are also important to our conception of the economy/environment relationship, and challenge the core tenets of neo-classical economics (upon which environmental and resource economics is based), including assumptions of rational, maximizing behaviour by all economic agents (individuals and firms) according to exogenous preferences, the absence of chronic information problems, the complexity and limits to cognitive capacity, and a theoretical focus on movements towards or attained equilibrium states of rest.

Although sometimes contradictory, these schools of thought are complementary in many respects, and bring different insights to bear on both the issues of sustainability (such as the ‘wicked problem’ of the ‘Energy Trilemma’; decarbonizing the energy system whilst maintaining both energy security and energy access and affordability) and policy approaches to tackle issues that threaten it. Whilst the application of economic thought and methodological approaches has advanced our understanding of interactions within and between the human and natural world, many important areas of further theoretical, empirical and methodological research remain. These areas may be broadly delineated into four interrelated themes.

Basic characteristics of the economy–environment relationship. This concerns the notions of weak and strong sustainability, central to which is valuation of natural capital and ecosystem services. Particular areas of research should show how to include or mitigate the impact of behavioural and cognitive complexities on values elucidated, how nonmonetary valuation approaches may be integrated or made complementary to monetary valuation, whether monetary valuation, by framing the good or service in such terms, crowds out other forms of valuation, and the extent to and nature in which monetary valuation can and does impact decision- and policy-making (including the drivers and barriers

involved). Another ongoing area for research should be the refinement of robust approaches to identifying ‘critical’ natural capital, in order to further define our ‘safe operating space’ within ‘planetary boundaries’ that are not open to meaningful monetary valuation.

‘Natural’ (nonpolicy) drivers of changes to this relationship. This contains two principal longstanding questions. The first concerns the validity of the Environmental Kuznets Curve hypothesis, which suggests that the relationship between resource depletion and pollution levels and income follows an inverted ‘U’-shaped parabola; resource depletion and pollution levels increase with income until a given level of income is reached, after which environmental pressures decrease (driven by, rather than simply inversely correlated to, increasing income). Further research using structural equation models, along with an increased focus on the influence of economic and demographic structures and the political economy, is required. The second question surrounds approaches to the robust calculation of marginal social costs of pollution, and of CO₂ in particular. Alongside valuation of natural capital and ecosystem services (in addition to valuation of human health and comfort etc.), debates about appropriate social discount rates are central in this field.

The design and impact of policy interventions. Four principal, interrelated topics for further research are dominant. The first concerns the cost for firms of environmental policy of different designs (both individually and in a policy ‘mix’), and the effect this has on competitiveness (and in particular ‘carbon leakage’). The second surrounds the process, drivers and barriers to innovation and diffusion of innovations, and the development of innovation ‘indicators’. The third topic concerns the role, nature and impact of institutions and behaviour in policy choice, design and impact. In terms of the ‘energy trilemma’, continued research into the availability of ‘win-win’ options, and options for reducing the risks surrounding the inherent uncertainty of future developments, would also be of substantial benefit. The fourth topic concerns issues of environmental justice and distributional impacts. Uncertainty surrounds whether instruments utilizing monetary valuation of natural capital and ecosystem services reduces or exacerbates preexisting economic and social inequalities, particularly at the local level. Further research is required to determine the distributional impacts of policy instruments, instrument mixes and their specific design.

Modelling approaches and techniques. Most models employed to assess the impact of environmental policy tend to focus on a particular component of the environmental-economic system. Although numerous Integrated Assessment Models (IAMs) attempt to link different components of the environment and economy, such dynamic links are usually relatively basic. Further research should be directed at improving such links. However, improvements to the individual components of such models are also required. For example, integration

of the insights provided by behavioural and institutional economics in macroeconomic models is often poor, meaning that such models mischaracterize critical, 'real-life' dynamics. The improved incorporation of such insights into economic-environmental models should hold a high priority on the research agenda.

Chapter 8 provides a detailed account of the general economic principles governing regional growth. It starts from the very basics of spatial economics to progress to advanced econometric testing of predictions following from models based on New Economic Geography and New Trade Theory, both of which attach prominent roles to increasing returns and network effects occurring through complex 'linkages'. Mostly publicly provided infrastructure and transport networks are key drivers of these linkages.

The chapter provides sobering insights for advocates of clear, politically well-intentioned goals such as regional cohesion and (income) equalization in Europe. As shown, the authors' conclusions hold in particular against the background of decreasing transport and communication costs, which has recently given rise to popular catch-words like 'the death of distance' or 'the flat world'. The insinuated quasi-irrelevance of distance and location in space and markets and the intuition that this should foster more equal development across different regions *have no economic foundation*.

It appears that regional disparities are inevitable due to the economic forces of agglomeration and dispersion at work, and the complex ways they are reinforced or dampened by transport costs. Moreover, decreasing transport costs as well as the new transport infrastructure, which better links lagging regions to thriving markets in urban agglomerations, may work *against* the aimed convergence of income and living standards, if agglomeration forces become *relatively* stronger. There is ample evidence that this occurs at a European level. The crucial point to assess is economic agents' reaction to these changes, that is, how *firm and labour* mobility are affected. Results indicate that differences between regions matter less than differences between people living there. As a consequence, helping poor regions need not help poor people in that region. Thus, investments into training and human capital may be a better development strategy than additional transport infrastructure.

What are the consequences of these findings for the transport and infrastructure policy of the European Union? Firstly, the selection and assessment of large transport infrastructure projects must be improved. Standard piecemeal cost-benefit analysis does not suffice as system-wide consequences have to be accounted for. Secondly, the present use of the existing transport infrastructure in Europe has to be put to much better use. The EU does not do well in comparison to the US in using its rail and air transportation systems. Both suffer from the national fragmentation of regulations and operation standards as well as the 'protectionist' interests of large domestic firms. In particular, the

proportion of rail transport of goods in the EU is very low compared to the US, as most goods are transported by trucks across Europe. Simple fuel taxes have given way to new distance-based ‘truck taxes’ imposed by countries with a high share in transit traffic, such as Germany or Austria. This instrument for more efficient pricing is very promising. The present implementation of distance charges, however, is suboptimal as distance-based charges for trucks have considerably lowered diesel taxes due to tax competition initiated by neighbouring countries. Moreover, distance is not necessarily a good proxy for the external costs of a road trip, which also depend on local conditions such as congestion, air pollution and accidents. Taking account of these factors in more sophisticated formulas for road pricing of trucks cannot ignore the impact of traffic by passenger cars. Already today the diesel tax is likely to be too low for passenger cars and too high (combined with distance charges) for trucks. The political shift in road pricing for trucks must also pave the way to a new system of road pricing for cars.

The treatment of urban development and spatial planning within the social sciences underplays the importance of economics in a serious way. This is mostly self-inflicted by the field, as Urban Economics has never formed a central part of mainstream economics. Originally, the development of spatial economic theory was almost exclusively driven by German contributors: Heinrich von Thünen, Wilhelm Launhardt, Alfred Weber, Walter Christaller and August Lösch. As there are no counterparts to them in the Anglo-Saxon tradition of economic theorizing, initially spatial economics was completely absent from neoclassical economics. Even today it is much less central to mainstream economics than it should be, because the introduction of space and land use into economic analysis brings about important ramifications. Space cannot be incorporated into the competitive general equilibrium model in a frictionless way as changing location incurs costs, especially *transport* costs. This fact lies at the heart of the phenomenon of agglomeration.

Chapter 9 convincingly argues that agglomeration drives economic growth and the social cohesion of a society in a fundamental way. This insight holds important lessons for policy-makers in the European Union: the single most important insight perhaps is that wealth is *increasingly* created in cities and metropolitan areas.

What are the economic driving forces behind this development? For consumers as well as firms, agglomeration produces increasing returns due to improved learning, sharing and matching opportunities in productive and social processes. Given consumers’ preferences for affordable housing and dislike of commuting, cities emerge as the outcome of a trade-off between the gains and costs of agglomeration. The simultaneous spatial treatment of land use for housing and business and transportation in spatial theory is not easy. There are many externalities at work; for example, any person’s decision to use a car

or occupy a certain flat yields consequences for others who are deprived from using this particular space. Taking account of these externalities theoretically and estimating them empirically leads to another remarkable result: cities, in particular European cities, are likely to be too *small* rather than too large to reap the full benefits of agglomeration. The success of cities – much more so than that of regions – is instrumental for future growth in the European Union.

Improvements to the organization of metropolitan areas and big cities should hence focus on a reduction of agglomeration costs. Traffic and the transport of *people* as a main source of congestion in urban areas are prime targets in this regard. For example, the single most important external cost of car use in urban areas is congestion, *rather than* climate damage. However, much more public and political attention is paid to climate change than to congestions. The economic answer to the problem of congestion is the politically unpopular device of road pricing. Nevertheless, efficient pricing of congestion will bring about time and productivity gains, as well as generate valuable revenues. The need for congestion pricing is reinforced by the finding that *in the absence of road pricing* the public provision of expensive new infrastructure and transportation links will not alleviate the congestion problem. The authors present impressive evidence of the scope and implementation of smart pricing schemes that have consequences not only for the cost-benefit analysis of large transportation projects but also for public finance in general; for example, they suggest spending the revenues from congestion pricing on a reduction in labour taxes.

The bottom line is simple: the European Union needs the design of urban policies (on behalf of the European Commission and its Member States) similar in standing, importance and funding to its present design of regional policies.

Chapter 10 focuses on ‘Fiscal and Monetary Policies after the Crises’. Historically, macroeconomic policy and research have always been intertwined, main policy and institutional designs have been rooted in economic analysis (price stability, Central Bank Independence, etc.) and, likewise, economic research has always been stimulated by macroeconomic events; especially negative ones. The financial and euro crises (2008–2013) – the Great Recession for many countries – have been no exception.

These have also been crises of confidence: for advanced societies, who viewed themselves in a sustainable growth path supported by the ‘great macroeconomic moderation’; for policy-makers, who entertained similar self-views to those of Jean-Claude Trichet, president of the ECB, who wrote on the occasion of that Institution’s 10th anniversary: ‘The achievements of the past decade are due to the vision and determination of the Governing Council members, past and present, and due to the energy and efforts of all staff of the Eurosystem’,⁴ and also for the macroeconomic academic profession who, in the words of Nobel Laureate Robert E. Lucas Jr. at the dawn of this century, thought that

‘macroeconomics in this original sense has succeeded: its central problem of depression prevention has been solved’.⁵

The chapter provides an overview of the up-growth of research in macroeconomics, in response to these severe shocks of the early twenty-first century. The debate about which instruments to use to stimulate economies in recession, and which stabilization policies should be pursued when traditional interest rate policies prove to be ineffective, have become the centre of attention in both academia and policy-making. The chapter shows how new research has contributed to clarify issues, assess new and old policies, and raise new questions.

The authors present the landscape that policy-makers and researchers faced after the recession by highlighting the trends observed in three economic aggregates: output, unemployment and inflation. Their attention then turns to analysing policy design in economies with low or negative output growth, low inflation, high unemployment and a binding zero lower-bound (ZLB) for interest rates. Part of the economics literature indicates that the driver leading an economy to hit the ZLB is a fall in the natural rate of interest. Taking this literature as a starting point, the chapter discusses both monetary and fiscal policy alternatives. In particular, three alternative monetary policies are discussed: forward guidance, quantitative easing and credit easing. On the fiscal side, the discussion focuses on research that has investigated the effectiveness of fiscal stimulus when the economy is near the ZLB, as well as on what the most effective instruments to be used are: labour taxes, consumption taxes and government expenditures, among others.

The scientific method has prevailed over the ‘crisis of confidence’. That is, new theories and methods have been developed *which build on* the existing ones (not throwing them away as ‘culprits of the crises’, as it was often put in the media). For example, the authors show how different new contributions can be mapped into a key ingredient of dynamic macroeconomic models; how policies and frictions distort the intertemporal choices that households, and societies, make sense through *the Euler equation*. From how the fall in the natural rate is modelled, to how the different proposed policies provide incentives to escape from a recession at the ZLB, is better understood through the lens of the *Euler equation*. The results of this analysis indicate that most of the suggested policies work through ‘the expectations channel’. More precisely, policies are effective if they increase expectations of future inflation and consequently lower the real interest rates. As the authors note, it remains a theoretical and empirical challenge to effectively assess the size and validity of ‘the expectations channel’ as the pivotal policy transmission mechanism at the ZLB.

In economic models, a fall in the natural interest rate is commonly modelled as an exogenous increase in the discount factor: consumers become more patient and want to save more. This is just a convenient modelling strategy

rather than a fundamental explanation for the fall in the natural interest rate. One of the main concerns raised by the analysis is that most of the theories based on standard business cycle shocks only account for a short permanence of the economy at the ZLB. Contrary to this prediction, Europe has been experiencing this situation for over six years, and Japan for over 20 years. This has motivated the search for theories that can sustain the ZLB as a 'persistent' situation. The chapter discusses two such theories: secular stagnation and self-fulfilling recessions. As an alternative, it also illustrates how the seemingly temporary effects of business-cycle shocks could be highly persistent due to labour market frictions.

Some features of the financial crisis and recession are common to most of the advanced economies that have experienced them, but the euro crisis and its 'South recession' has some specific elements. For the European Monetary Union (EMU) the 'crisis of confidence' was the collapse of 'the convergence view' – that is, that the expectation that due to the common currency and the established fiscal and monetary policies, convergence among EMU countries would be relatively fast. The debt and banking crises and the divergence among Euro Area countries has added new challenges to EMU fiscal and monetary policies, and the chapter also discusses these issues, and some of the research that they have stimulated (most of it undertaken by researchers based in Europe). For instance, the chapter concludes with a section on risk-sharing and fiscal policy within a monetary union. The aim is to analyse how a system of conditional transfers can strengthen EMU, beyond what can be achieved through private insurance and ECB interventions, without needing a large 'federal budget' or becoming a 'transfer union'.

Chapter 11 deals with financial regulation in Europe. It has often been said that the recent economic crisis was mainly caused by worldwide interdependence and the excessively risky and apparently out-of-control behaviour of financial markets. This not entirely correct statement has once again brought to the forefront the debate on the need for coordinated intervention policies among European countries, and on the optimal degree of regulation in this vital and already highly regulated sector of the economy.

It is a known fact that it is extremely difficult to keep a balance between free market forces and regulation in order to both preserve the stability of the overall financial system and of the banking sector in particular, and enhance financial innovation, hence the efficiency of financial intermediation and ultimately the smooth working of real economic activity. Moreover, there exists a seemingly endless cycle, between regulators, reacting to the last crisis by imposing more and more sophisticated rules and financial intermediaries always finding new loopholes and side paths to avoid the regulating constraints.

The debate has been particularly intense in Europe, where economies are strongly bank-based and where some segments of financial markets, the

private equity market for example, are not as developed as in other advanced economies. This implies that the efforts of both policy-makers and regulators have mainly been directed towards ensuring the stability of the banking sector using both micro and macro prudential regulation and enforcing the European Banking Union, a successful endeavour that still needs some finishing touches. The more recent focus of the financial community, which includes operators in the field as well as the European Commission, the European Central Bank, National Central Banks and Regulating Authorities, has also been the design and implementation of the Capital Markets Union.

This chapter is a comprehensive, clear and detailed review of what has happened and what was done during and after the crisis in Europe and what still needs to be done. It may well be considered a reference text to be kept very close and to be used by policy-makers, practitioners and students interested in understanding regulation and how it has been applied to European financial markets, in particular to the European Banking System.

The authors trace the struggle of ‘complexity against simplicity’ in regulation, they discuss the risks attached to financial crises, describe the rules that have been implemented and review the opinions of economists, both European and non-European, on the pros and cons of alternative policies. They show that further economic research is strongly needed. While the risks of a fragile financial system are well known and have been thoroughly studied by economists, there exists very little recent theoretical work on how to map basic failures into regulatory reforms. Most of the published contributions in the last decade are indeed applied *ex post* analyses of the effects of the enacted regulatory reforms, often with ambiguous results, maybe because of the restricted access to data that Central Banks and regulators in fact collect but are not as yet published.

This state of affairs may partially be the consequence of the particularly strong and productive interaction between economists, regulators and practitioners: most regulators are themselves economists, while economists that work in academia are often consultants to policy-makers and regulators. This implies not only that there is no overwhelming ‘language problem’, but also that regulators and policy-makers may request relatively quick operative answers to their questions, not leaving enough time for in-depth theoretical assessments by researchers. Nevertheless, the involvement of academics in policy-making, specific to this branch of economics, is extremely welcome and has been the main driver of the research on financial markets in the last few decades.

Chapter 12 deals with inequality and welfare, and asks whether Europe is special. Historically economists and politicians alike have been concerned with inequality and welfare. Recently the topic has regained focus, most notably due to the work by Thomas Piketty in his book, *Capital in the twenty-first*, where he shows that inequality, if anything, has increased in the last decades. It is not presumptuous to say that the question how inequality affects major topics such

as education, health, migration, growth, technical progress and innovation and social security, to name a few, are at the very essence of how the European welfare state will develop.

Why is this regained focus both important, but also so difficult? First, the concept of both inequality and welfare have proven difficult to define and measure in a coherent and agreeable manner. Second, when considering the present empirics on inequality, most measures show a stark increase in inequality since the 1970–80s. Third, research has uncovered strong hysteresis effects in inequality development in the sense that the next generation will inherit much of the present pattern, suggesting that the situation will take many years to mend.

The situation in Europe seems to be less critical, at least at the average level. Whereas the US has experienced a 20 per cent-points increase in the top 10 per cent income share since 1970 (from an already high 30%+ level), Europe started on its own inequality-trip ten years later in the 1980s, increasing their top 10 per cent income share from 30 to 35 per cent from 1980 to 2010. However, when treating Europe as a unified country, inequality in Europe is as high as the inequality in the US.

Focusing on the country level, several patterns are visible. First, the Northern countries have very different inequality levels (lower) than the other countries. The UK defines the other side of the coin, with the highest inequality levels in Europe. Second, this heterogeneity is, however, decreasing over time. There is a clear pattern of convergence in inequality since 1985. Whereas the Northern countries, starting from a significantly lower inequality level, increase inequality over time, and more than all others (e.g., more than 25% in Sweden), the other countries have considerably flatter developments. Even in the UK, we find a flattening of the upward trend in inequality since 2000. Seen in the light of a common labour market with open borders and new migration streams, this suggests several potential explanations, one is a revealed preferences argument that points towards a more integrated Europe when it comes to the redistributive preferences across Europe.

A major challenge addressed also in other parts of this volume is migration. Partly migration seems to change political fundamental views, and partly it challenges the foundations of traditional welfare states. An example of how this challenge remains unresolved is Belgium. Two-thirds of the increase in poverty in Belgium in recent years is attributed to migrants, and at the same time Belgium is struggling with minority groups that are willing to engage in terror acts. This picture is not very different from several other EU countries. Some have even argued that this new development changes the fundamental political preferences, from earlier being one-dimensional (more or less welfare state) to a bi-dimensional political agenda where the second political axis is how open the society should be to people originating from other ethnicities. The choice along the second dimension interferes with the choice over the redistributive dimension and changes the equilibrium of the entire political game. Obviously,

such changes bear consequences when it comes to future inequality acceptance and the welfare state's and not states political and economic fundaments.

At present, we do not know enough about peoples' acceptance towards inequality, though surveys show a large heterogeneity in views across Europe. For instance, on questions on why people are 'living in need', only around 20 per cent in countries such as Belgium, Netherlands and Sweden attribute this to 'laziness or lack of willpower', this in contrast to more than 50 per cent of Finnish and Austrian citizens. People from Finland and Austria, however, share views with many outside Europe and are quite representative of people living in countries such as the US, Canada and Japan. This heterogeneity partly implies that people seem to have very different acceptance towards *ex ante* and *ex post* inequality. *Ex post* inequality that is a direct result of people's own choices is generally much more accepted than *ex ante* inequality resulting from inherited economic situation and birth. Both new and comparable data on people's perceived welfare and happiness, as well as a new focus on research on fairness and preferences through experimental studies provide, and will continue to provide, new insight on these issues.

The European welfare state has other challenges related to these questions. Tax rules seem to change towards more favourable tax rates for firms in several countries, resembling a race to the bottom across countries, resulting in large corporations and firms moving to the most attractive locations. This in turn has consequences for where the smartest people move to work, and obviously also for inequality and how the welfare state is to be financed in the future.

Most of the above and several other questions are raised and discussed in this comprehensive chapter. It concludes with several areas where it is of vital importance for Europe to gain new knowledge. In particular, it has five clear research policy recommendations for Europe. It needs to:

1. build a network of researchers in economics and social sciences to understand the fabric of equality of opportunity: *ex ante* inequality is a major challenge for the foundations of the future welfare state;
2. build up a large panel of data specific to studying the dynamics of poverty, how people get in, how people get out;
3. undertake research to prepare the ground for a standing-up policy to fight poverty and promote equal opportunities;
4. look at the sustainability of national welfare states in an environment where capital and labour are mobile; and
5. further strengthen the research on the issues that lead to convergence of Southern societies to the social model of the Nordic societies.

The Relevance of Data and Methods

The last two chapters of this volume deal with developments in data and methods that cut across policy areas and fields. The past 20–30 years have witnessed

a steady rise in empirical research in economics. In fact, the majority of articles published by leading journals these days are empirical. This evolution was made possible by improved computing power but, more importantly, thanks to an increase in the *quantity*, *quality* and *variety* of data used in economics.

This data revolution has led to significant intellectual breakthroughs in economics. Several chapters in this volume allude to the role that better data played in recent advances of our understanding in important economic issues, such as innovation and growth (Chapter 1), human capital and education (Chapter 4) or inequality and welfare (Chapter 12), among others. More and better data are sometimes even credited for changing the research paradigm in some fields, where data are no longer used as means for testing theory but as a *central* input to theory development, as in trade and globalization (Chapter 6 and Eaton and Kortum, 2010).⁶

Equally important, most chapters conclude that our ability to satisfactorily address the *remaining* open questions in key policy areas will hinge upon the availability of better, more comparable (i.e., across countries), or more accessible data.

Data do not, however, come for free: they need to be collected, checked, harmonized, and organized for easy retrieval and analysis. When they contain confidential information, access needs to be organized in a way that preserves the legitimate privacy concerns of data subjects. More fundamentally, data for economic research come from many different sources and involve many different producers: not only statistical agencies, but also public administrations and agencies, central banks, private firms, data vendors and, last but not least, researchers.

Chapter 13 brings together several actors and stakeholders of recent developments in data for economic research to discuss their drivers, their implications and the remaining challenges. The chapter starts with microdata, i.e., data at the individual, household, firm or establishment level, produced from surveys or collected for administrative reasons. Such data have been at the forefront of important new research insights. Administrative data in particular is now the new Eldorado for empirical work. The big issue here is access to these data for research purposes. Nordic countries are world leaders on this front. They combine some of the best and most comprehensive statistical systems in the world with some of the highest level of access. Access is often more difficult in other European countries. However, things are improving and the chapter outlines recent developments towards greater and easier access in the UK and Catalonia which are illustrative of the ways stakeholders can foster greater access despite less favourable contexts than those of the Nordic countries.

Another big issue for administrative data, especially when it comes to business data, is cross-country data harmonization and data linking (i.e., the ability to link data from different sources but corresponding to the same firm or statistical unit). Harmonized cross-country data are essential, as several chapters have

outlined, to draw sound comparisons between countries and assess the scope for replicability across borders (e.g., whether the experience of one country is relevant for another). Moreover, we are living in a globalized world where firms operate across borders and we need statistical systems that reflect this reality. Until recently this was not the case. The 2008 economic crisis cast a crude light on the mismatch between existing data structures in official statistics (mostly organized along national lines) and the reality of global financial and economic markets. Two developments are taking place in reaction. At the international level, the G20 Data Gaps Initiative is bringing together Eurostat and other international organizations such as the Bank for International Settlements, the World Bank and the OECD to coordinate statistical issues and strengthen data collection to improve its alignment with economic realities. At the same time, a number of initiatives are under way among national statistical offices to improve data harmonization and data linking across national borders. Eventually, this is likely to contribute to improving access to harmonized cross-country datasets for researchers, even if the impetus for the current changes is mostly political and access to researchers is not a priority.

Of course, statistical offices are not the only producers of data. Private data firms have long been involved in harmonizing and linking firm data across borders. Their data are often used by researchers as a complement or a substitute to administrative data. A number of researchers are also involved in large-scale data collection or production efforts. The chapter describes three such researcher-led data initiatives that illustrate their advantages. First, the data are typically immediately and easily made accessible to researchers. Second, not being subject to the same operational constraints as statistical offices, the databases produced by these researchers often use innovative designs (such as internet surveys or automated reporting from handheld devices) that reduce costs and improve reliability. Third, unlike official data that are collected because there is a policy or administrative need, data collection can be more forward-looking and focus on issues and topics that might not yet be recognized as a policy issue. The Survey of Health, Ageing and Retirement in Europe is a perfect example. Funding, however, is a critical challenge that all such initiatives face.

Another type of data produced by researchers is data generated from economic experiments, either in the lab or in the context of randomized controlled trials. Both types of data have led to major advances in our understanding of human behaviour and the robustness of economic institutions, for the first one, and in our understanding of the impact of policies and the mechanisms underlying them, for the second. Both approaches are now well-established and registries have been set up to archive the data produced and ensure that it is accessible for researchers interested in replicating the results. The chapter describes recent developments, remaining challenges and outlook for each type of approach.

An emerging trend in economic research is the development of new forms of collaborations between researchers and private- and public-sector organizations. One form that such collaborations have taken is closer relationships with private firms for access to their proprietary data. A complementary form has been collaborations between researchers and policy-makers where the focus is not only on data, but also on helping design and recalibrating policy interventions. In both cases, these collaborations are providing researchers with unmatched data access and data quality, as well as opportunities to investigate novel research questions or existing research questions in new ways. The chapter illustrates the potential of these collaborations but also discusses their risks and their implications for how research is organized, evaluated and funded.

The chapter concludes that there is no single type of data that is superior to all others. Each type of data is unique and has advantages over the others for a given research question. It is important for economic research to acknowledge the benefits of variety and the potential complementarity among data producers, and for stakeholders to support – politically, legally, technically and financially – this diversity.

A benefit of the data revolution in economics is that researchers now have access to unprecedented amounts of data, a phenomenon that has been popularized under the name of ‘Big Data’. The term itself is used to cover a variety of data-driven phenomena that have very different implications for empirical methods. Chapter 14 deals with some of these methods-related issues.

In the simplest case, ‘Big Data’ simply means a large dataset that otherwise has a standard structure. Administrative data, which cover *entire populations* rather than population samples, belong to this category. The large size of these datasets allows for better controls and more precise estimates and is a bonus for researchers. It may raise challenges for data storage and handling, but it does not raise any particularly heavy methodological issues.

But ‘Big Data’ often means more than just standard datasets of large sizes. First, large numbers of units of observation often come with large numbers of variables. To continue with the same example, the possibility of linking different administrative datasets increases the number of variables attached to each statistical unit. Likewise, business records typically contain all interactions of the customers with the business. This ‘curse of dimensionality’ challenges traditional econometric approaches because coefficients on explanatory variables may no longer be identified or only poorly so. Second, the term also covers new datasets that have a very different structure from the structures we are used to in economics. This includes web search queries, real-time geolocational data or social media, to name a few. This type of data raises questions about how to structure and possibly re-aggregate them. If economists want to be able to take advantage of the data revolution, they will need to be equipped with appropriate methods to deal with these new datasets and data structures.

Chapter 14 starts by describing standard approaches in statistics and computer science to overcome the curse of dimensionality. Such approaches usually take an agnostic stance on the data generation process when seeking to balance the goal of ‘letting the data speak’ with the need to generate stable estimators.

Economic problems and economic data have specificities, however, to which it is worthwhile to tailor solutions. One specificity of economic problems is that we are often interested in measuring a (causal) relationship between some variable of interest (for example, a policy) and its effects. In other words, there might be many variables, but one of them (the policy) is of special interest to the researcher. Recent research efforts seek to combine the power of ‘standard approaches’ in statistics and computer science with the ability to give, within the algorithms, a special status to one variable – the policy variable – which we are interested in identifying precisely.

Economic data also have their own specificities, which vary by context. For example, macroeconomic indicators tend to be serially correlated, are released nonsynchronously and with different frequencies. Recent research has shown that estimators that take these specificities into account outperform standard approaches in statistics and computer science for dealing with the curse of dimensionality. We are only at the beginning of these efforts, however, and much still needs to be done.

Another methodological challenge raised by ‘Big Data’ is the development of estimators that are computationally tractable for very large datasets (e.g., high-frequency trading data, browsing data, etc.). Indeed, despite recent progress in computing power and storage, these can be a constraint for such datasets. Estimation methods that take advantage of parallel computing offer a promising route.

In short, ‘Big Data’ is not only exciting for economics because of all the things we can learn from these new data, but it is also essential to make sure economists are equipped to take advantage of these opportunities. On this front, economists can learn a lot from recent and current research in statistics and computer science. It is, nevertheless, essential that methods be developed that account for the specificities of economic problems and data.

Overall, it can clearly be seen from all chapters that a large number of new results are based on new datasets across all fields of economics. An immense body of new knowledge has emerged from the analyses of newly collected/assembled datasets; and from new methods of using existing data. New questions have surfaced, and new answers have been given to long-standing questions. Europe could become the leader in the collection and linkage of new types of big data and related methods. There also seems to be a genuine need for the economics and policy interface to be strengthened. Unfortunately, few economic policy decisions are based on known and established economics results, and vice versa, not enough economics research is motivated

by direct policy questions. Finally, it is also easy to spot that many new useful insights have been provided by the generalization of local (country-related and/or regional) knowledge into a more general EU-wise understanding, and vice versa, by the analysis of how general knowledge is interpreted or translated at the local level. It is fair to say that the critical mass of talented European-based researchers is available, and it clearly transpires through the chapters of this volume that they tend to work on problems, challenges and data covering Europe.

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Notes

1. <http://core.ac.uk/download/files/153/6369012.pdf> or <http://www.eco.uc3m.es/temp/09-55-34.pdf>.
2. For more details, see www.coeure.eu.
3. According to Forrester Research (July 2015), 'Cross-channel' retail sales in Europe (i.e., purchases consumers begin using a digital channel, but do not complete online) are expected to reach € 704 billion by 2020, up from € 457 in 2015. Combined with online sales, total sales related to the web are expected to reach € 947 billion, or 53 per cent of total European sales by 2020.
4. '10th Anniversary of the ECB', European Central Bank Monthly Bulletin, 2008.
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