

Introduction

Bohr: You know why Allied scientists worked on the bomb.

Heisenberg: Of course. Fear.

Bohr: The same fear that was consuming you. Because they were afraid that *you* were working on it.

Michael Frayn (1998), *Copenhagen*. London, Methuen Drama.

SCIENCE, TECHNOLOGY AND EUROPEAN INTEGRATION

Science and technology have always been at the heart of the European political construction. In the 1950s, Euratom institutionalized six European states' commitment to produce advanced knowledge in the sensitive area of nuclear energy, mainly for security reasons. However, Europe's technofederalist ambitions floundered in the 1960s and 1970s, when the Franco-German differences caused a stalemate and put a stop to the efforts to achieve a common design for nuclear reactors. Euratom's troubles during these two decades showed that the path towards integration was to be a bumpy one.

Science and technology again attracted much political attention in the early 1980s. This was the time of the Euroforia and of Delors' new integrationist agenda, but it was also the time of deep industrial restructuring in the aftermath of the 1970s oil crises. The rapid internationalization of production structures and their concomitant division of labour pushed governments to focus on technological development as an instrument of growth. Moreover, the failure of most national public initiatives to redress the industrial crises made politicians turn their eyes to Europe. Jacques Delors successfully grasped this momentum by putting forward a whole package of initiatives, among them the large technology programme (the so-called Framework Programme (FP)). This had two effects. One was that of enshrining further the EU involvement in scientific technological matters (the new programme extended well beyond the Euratom field of nuclear energy, making a serious commitment to 'Europeanize' the production of advanced knowledge). The second effect was that of enshrining the pursuit of competitiveness, which has since become a major 'raison d'être' of the Union.

Since the mid-1990s, a new approach to public action in this field has gained a firm foothold. Not that science and technology have vanished, but

innovation is understood as a broader and more flexible term that embraces other issues such as intellectual property rights, education and training, organizational change, institutional framework, standards, and so on. 'Innovation' has expanded the agenda of EU action, at a time when the member states want the EU to be the 'most competitive knowledge-based economy in the world by 2010' (following the Presidency conclusions of the Lisbon Summit, 2000). The innovation agenda has broadened substantially the goals of political action at EU level. Concerns now are not just security, as in the old days of Euratom, nor technological development for industrial advance, as during the establishment of the framework programme in the 1980s. The major concern today is how to shape an institutional context that enhances the innovation process as a whole, and that responds to the emerging risks and social consequences of scientific advances. This requires an entire reconceptualization of the functional borders of already existing policy areas, and the development of new ones at EU level.

The goal of this book is to analyse the major transformations and dynamics of EU innovation policy over recent years, and to critically address the emerging issues that policy-makers have to face to generate a positive context for innovation in the EU. Throughout the last two decades, the European Union has gradually been perceived as a key authoritative figure, which should address these matters. The transfer of powers from national to supra-national level that came along with the EU research programmes in the mid-1980s has expanded rapidly in the 1990s into the innovation areas mentioned. Far from being an automatic process, the notorious re-focusing, re-packaging and expansion of European Union involvement in this field ushers in a change of political strategy. Most importantly, it exhibits a novel understanding of the relationship between public action and the innovation process, and between national and supra-national domains. Rather than going over the factors and causes of this transformation of policy goals, this book aims at analysing the complexity and fluidity of governing innovation policy in the European Union. It addresses the strategic choices that are facing the EU in this rapid process of reshuffling policy competences between the national, supra-national and global levels, and of revamping the relationship between public and private spheres.

INNOVATION POLICY IN THE KNOWLEDGE-BASED ECONOMY

The transition from a science and technology policy towards an innovation policy at EU level has been taking place in a context of accelerated change, not just of EU politics but, most notably, of the modes of economic dynamics,

namely the so-called 'knowledge-based economy'. This notion rests on the view that in the last two decades the role of knowledge has acquired a central position in the dynamics of the advanced capitalist economies. It has been asserted that the modern capitalist economies are based less on capital and labour, and more on knowledge, which has already become the key factor of production (Druckner 1998). Yet, looking back into the annals of history, we can see that knowledge has always had a prominent role in the economy, and in the historical transformations of the modes of production. What is new about knowledge in the contemporary economy? Why is there so much fuss about knowledge today?

One of the first arguments supporting the idea that we live in a 'knowledge-based economy' is the acceleration of the production, appropriation, exploitation and consumption of new knowledge. The life cycles of nearly all manufacturing products have become notoriously shortened, irrespective of whether they are high-, medium- or low-tech. This means that the knowledge input these products embody is one of the driving forces behind this acceleration. A second argument has to do with the rapid expansion of the frontiers of knowledge. In previous times, substantial production of knowledge in just one area of science and technology was enough for a whole new wave of products or modes of production. Today, we witness the simultaneous rapid expansion of knowledge in many areas, such as information and communication technologies, biotechnology, new materials, nanotechnology and so on, all of them having a significant impact on the dynamics of the economy. Last, but not least, a third argument supporting the idea of a shift to a 'knowledge-based economy' has to do with the expansion of the 'non-manufacturing' sector. The growing importance of the service sector, the increase in the stock of intangible assets, and the relationship between education and employment, all of which point to the economic relevance of competence-building and learning abilities beyond the world of manufacturing.

Another, slightly different, vision of the change in the economic structure is the so-called 'learning economy'. The emphasis here is not so much on the advancement of knowledge per se, or on its increasingly central position in the modes of economic production, but on the social dynamics related to it (Lundvall 1998; Lundvall and Borrás 1998). Learning relates not to the acquisition of new knowledge, but essentially to the organizational adaptation that it accompanies. Therefore, the learning economy stresses the organizational changes concomitant to the expansion of new knowledge, and concludes normatively that the clue to economic success rests on the ability to adapt to the rapidly changing context. Learning combines the acquisition of new capabilities and competences, with organizational adaptation. Regardless of the differences, proponents of both the 'knowledge-based economy' and the

'learning economy' point to the centrality of the production, appropriation, exploitation and consumption of knowledge in the contemporary advanced economies, and its concomitant social-organizational dynamics. We can see this knowledge production-appropriation-exploitation-consumption chain as the innovation process, which is essentially a social process.

What is the role of public action in all this? The centrality of knowledge and the acceleration of the innovation process in economic dynamics are a challenge to public action. The pervasiveness of innovation and the broadness of knowledge require a new mode of thinking about policy. Public action can no longer be a reduced set of instruments, generally involving the transfer of public monies or specific regulatory areas, for fostering technology. Policy needs to redress its role in a more contextual form, where the objective is to generate a positive framework for innovators. Most European countries undertook the transition from the technology policy to the innovation policy paradigm in the mid- and late-1990s (Shapira et al. 2001; Biegelbauer and Borrás 2003; OECD 2000). This is not to affirm that these countries are unidirectionally converging, since there are important differences as to how this transition has been undertaken, and how innovation policy instruments and goals are defined. The diversity of policy solutions is relevant, valid, and desirable. Nevertheless, the innovation agenda has emerged in almost all of them, along with the awareness that innovation is a complex social phenomenon. This understanding brings with it a partial reconsideration of public action, no longer focused on research and technological development alone, but increasingly paying attention to the larger picture of structural reform and the institutional set-up that fosters innovation. As we will see in the next chapter, this conceptual expansion poses some problems regarding the precise delimitation of what is, and what is not, innovation policy.

INNOVATION IN EUROPE: COMPETITIVENESS AND SOCIAL DYNAMICS

One could study the innovation policy of the European Union as if it was one more among other innovation policies at national level. But the question of level is analytically too significant to be discarded. Quite the contrary, 'level' represents a whole analytical dimension. This is so because innovation policy is inserted within a complex and ambitious political project of economic integration at international and regional level. European integration is essentially a process of institutionalizing a new political and economic order, which means that all policies aim at addressing their functional goals as much as at 'building' this new political and economic order. In other words, all the

economic policies are instruments for this macro goal of system-building, which earmarks any political initiative.

The process of European integration has breathtakingly accelerated over the last two decades, and its political system today has a special nature, having state-like functions in the regulation of the economy. When economic development became the dominant issue of the EU agenda in the 1980s, the rationale for economic integration was not just the opening of markets to gain economies of scale or reduce transaction costs. It was also the creation of a common economic space for stimulating growth and job creation. In other words, the logic of EU action was not just the breaking down of trade barriers among its member states. The EU was paying just as much attention to the creation of incentives and the development of competences in the European economy in order to keep up with the growing pressures of competition coming from the world economy.

Competitiveness is the driving leitmotif of EU innovation policy. Time and again economists have argued that the European economy is losing ground to the more dynamic US and Japan. This was the case in the 1980s, and still is in the 'new economy' (Fagerberg et al. 1999; Soete 2001). Such statements have powerful effects on policy-makers. The intensification of EU efforts in the innovation field, and its notorious centrality in the Prodi agenda of the late 1990s, is the result of this fear of being 'left behind' in the technology race. Unemployment has been a related issue in this regard. European countries face the paradox of enduring high unemployment ratios at the time that some productive sectors, most notably the ICT (information and communication technologies) sector, lack qualified labour. New technologies are a source of job creation, but this has to be tuned with a more flexible and job-oriented educational and training system. Innovation policy looks systematically at the elements that shape the institutional set-up for innovators; namely, the educational system, research facilities, business and patent law, and more. The barriers in Europe are not so much between states and between legal and economic systems, but are found in an institutional set-up that is still not as sufficiently innovation-friendly as it could be.

Beyond the concerns of competitiveness, the EU innovation policy has gradually introduced another important focal point in recent years. This is the question of social trust and social values in relation to science. The dramatic cases of BSE (or 'mad cow disease'), dioxine and GMOs (genetically modified organisms) put on the table the question of food security. Something similar took place in relation to bioethics, where the dust of the fierce debates about biological patents and cloning has not yet settled. These examples are the tip of the iceberg of a much deeper social dynamics, the so-called 'risk society' (Beck 1992). Today there is widespread public concern about what scientific progress brings. And in contrast with some previous decades, there

is a much more critical attitude from the people towards scientific advancements. Scientific and technical progress are not accepted with complacency, especially when they touch on sensitive issues such as the limits of human life or the unknown effects of some substances in the human body. This affects the design of innovation policy, which can no longer assume naïvely that all scientific and technological progress is automatically accepted by society. The recent social backlashes have opened up a new era in the governance of science and innovation at EU level.

THE SCOPE OF THIS BOOK

This book wants to provide a clear and concise picture of the development, dynamics and nature of EU innovation policy in recent years. There are two main reasons why this is needed. The first is that so far the studies of EU policy in this field have concentrated on the RTD (research and technological development) aspect and hence have partly failed to address the ‘innovation turn’ that EU policy has recently experienced. The overwhelming attention that the RTD framework programme has received has tended to obscure a whole set of other innovation-related areas where the EU has been extremely active lately. I refer to, among others, the areas of intellectual property rights regulation, standardization, the information society, education and training, regional policy, bioethics and environmental/consumer protection, all of which affect the institutional context for innovation. Consequently, there is a need to broaden the analysis of the innovation policy to these areas, at a time when the innovation policy agenda is so doing.

The second argument is that such a broad perspective will support the policy considerations developed in more specific economic studies. Admittedly, there is today an endless amount of literature about the EU’s innovation and economic performance. Studies have focused on different industrial and technological sectors, or on specific geographical areas. Almost invariably this literature has tended to develop a normative approach to public action in the form of ‘policy implications’ and ‘policy options’ stemming from empirical findings. However, this has typically been done without a parallel analysis of the public initiatives already in place. This book aims at providing a succinct but critical analysis of the rapid development of EU innovation policy over recent years, by giving a background analysis for anyone working in innovation studies.

It is important to remember that this book has a ‘top-down’ analytical perspective, in so far as it looks at the political processes and their effects on building an innovation-friendly context for firms and innovators. This contrasts with a more bottom-up analysis of the behavioural patterns of

innovators and their daily shaping of informal institutions through market and other social interactions. This means that I look at formal rules, norms and policy instruments, their political effects and the rationale on which they have been established, and not at the innovative performance of some sectors, firms or geographical areas. With this purpose in mind the book studies in detail the most recent developments of EU innovation policy in some of its most important areas. These include: research and knowledge production, intellectual property rights, the information society, standardization, and risk and social sustainability of innovation.

The book proceeds as follows. The first chapter sets up the analytical framework for the study of the EU's innovation policy. It defines the analytical parameters of the entire book in a way that gives coherence to the study of the different areas under the EU 'innovation policy' agenda. It first discusses the contents of 'innovation policy', and its emergence as a political agenda within the EU level. The 'governance' perspective of the following chapters focuses on three matters. First, the division of tasks between the EU and its member states, and the questions and problematiques related to the 'Europeanization' of these areas; secondly, the international position of the EU, in particular the role of the EU in the global regulatory context; and finally, the changing nature of public-private interaction in innovation and the influence of the EU in this regard.

Chapter 2 is devoted to EU public actions towards research and knowledge production. How is the production of knowledge related to innovation policy? How have governments traditionally approached this issue, and formulated their research and technological development (RTD) policies? What are the changing features of knowledge production, and how is this affecting public action? This chapter examines all these questions in relation to the EU's RTD policy. Science and technology have always been a central element in European integration. However the division of tasks between the EU and its member states has been constantly changing in what now is a multi-level structure. Likewise, the tremendous internationalization and globalization of knowledge production that has taken place over the last decade puts some pressure on national and regional policies, as previous boundaries are becoming blurred. Another issue of the chapter is the changing relationship between public and private spheres, not just in terms of financing knowledge production, but also how 'public' this knowledge is.

Chapter 3 takes up one of the most exciting areas related to innovation at EU level: the changing regime of intellectual property rights. The domain of intellectual property rights (IPRs) is a crucial regulatory framework for innovation, technological development and industrial activity, especially in the so-called knowledge-based economy. This regulatory framework has been changing very rapidly and deeply in the European Union since the beginning

of 1990s. Chapter 3 addresses these transformations by asking about the nature of the emerging regulatory system and its impact on the innovation process. The main argument is that the Europeanization of IPRs complements the logic of the single European market. However, some important effects of the regulatory regime for the appropriation of knowledge need further attention, particularly the trends towards a strong and broad regulatory system, the high degree of legal uniformity, and the social legitimacy related to the re-conceptualization of private property at EU level.

Chapter 4 deals with the building and governing of the information society at EU level. The rapid development of ICTs has generated new opportunities to be grasped by firms and individuals, and this was declared the most dynamic sector in the 'new economy'. These opportunities might be enhanced by policies that address and create a new context for these technologies. This has been the main purpose of the wide array of EU regulatory efforts since the mid-1990s. This chapter examines the division of tasks between the EU and its member states in the area of information society and e-Europe, the position of EU initiatives in a world-wide context, and the reorganization of public-private spheres.

Chapter 5 is devoted to standardization. Economists working in the field of innovation have long asserted the crucial role that the definition of technical standards has for the innovation process. Standards are semi-public, semi-private agreements shaping technological paths. With the advent of the single European market project in the 1980s, issues concerning standardization have been moved from national to EU level, without apparently any major upheaval. However, alternative modes of enforcing this semi-regulatory function have been tried along the way. Standardization is also an important issue at global level. Here the role of the EU is less clear, but no less important for trade. A final aspect that this chapter examines is the interaction between public and private spheres. This is a complex matter in the case of standardization, however, several authors already stress the need to give more voice to consumers and the public in general in the standardization process.

Chapter 6 looks at risk and the social sustainability of innovation at EU level. The cases of BSE, dioxine and GMO have recently shaken the governance of science at EU level. The strong social distrust that these cases generated touched not just the political elite, but also the role of scientists. This has prompted a rapid reorganization of scientific advice in food safety matters. However, this is just the tip of the iceberg. These cases have shown, together with the overall social considerations about the limits of biotechnology, that the innovation process needs to be socially sustainable. This is particularly evident in the current risk society. This chapter examines these trends, through the three lines of analysis indicated; namely, the dynamics of Europeanization

and internationalization of these issues, and the changing relationship between the public and private realms.

The conclusion identifies the governance patterns of the innovation policy of the EU in the past decade. This chapter also addresses the challenges and opportunities ahead in two interrelated ways. First it analyses two practical consequences arising from the dynamics; namely, the limits of EU action and the issue of democratic accountability. And, secondly, this chapter elaborates on the theoretical consequences of these dynamics both in terms of the theory about systems of innovation, and the recent debates about the EU as a competition state.

REFERENCES

- Beck, U. (1992), *Risk Society - Towards a New Modernity*. London, Sage.
- Biegelbauer, P. and S. Borrás (eds), (2003), *Innovation Policies in Europe and the US: The New Agenda*. Aldershot, Ashgate.
- Druckner, P. (1998), 'From capitalism to knowledge society'. In *The Knowledge Economy*, D. Neef. Boston, Butterworth-Heinemann.
- Fagerberg, J., P. Guerrieri and B. Verspagen (eds), (1999), *The Economic Challenge for Europe*. Cheltenham, Edward Elgar.
- Lundvall, B.-Å. (1998), 'The learning economy: challenges to economic theory and policy'. In *Institutions and Economic Change*, K. Nielsen and B. Johnson. Cheltenham, Edward Elgar.
- Lundvall, B.-Å. and S. Borrás (1998), *The Globalising Learning Economy: Implications for Innovation Policy*. Brussels, European Commission.
- OECD (2000), *Science, Technology and Innovation Policy in OECD Countries - a Review of Recent Developments*. Paris, OECD.
- Shapira, P., H. Klein and S. Kuhlmann (2001), 'Innovations in European and US innovation policy'. *Research Policy* **30**(6): 869-72.
- Soete, L. (2001), 'The new economy: a European perspective'. In *The Globalising Learning Economy*, D. Archibugi and B.-Å. Lundvall. Oxford, Oxford University Press.