Foreword

The history of economic growth has been affected by paradigmatic technological changes that have shaped new technological and economic trajectories. From the steam engine to the life sciences, going through the electronics revolution, such technological revolutions have had long-standing implications.

The fuel cell revolution in the energy sector has all the characteristics for being such a new paradigmatic change. While the technology, and above all its diffusion, is still in its infancy, we know even less about its implications for firms and industries. In this respect, not only is this book filling an important gap, but it is one of the very first contributions on the matter, which makes it timely and most useful for understanding these processes. In particular, the book, which is the outcome of a collective research, provides new and original insights that open up the ‘black-box’ of the initial history of the industry, and guide the reader to understand how the new industry emerges and the drivers of firm entry and growth.

It will not come as a surprise that in order to extract economic value from a new technology, firms must assemble it in a product or they have to provide a service. This calls for access to complementary assets. The issue is especially important when dealing with general purpose technologies suitable for a large number of applications, as the fuel cell technology is. Simply put, in the fuel cell business the full-fledged in-house exploitation of the innovation activity is not an option. As a matter of fact, in this industry firms’ technological interconnections are both relevant and widespread. Moreover, the complexity of the fuel cell technology commands skills and contributions from different sectors, such as electronics, chemical, textile, oil and gas, automotive and so on. This also implies that different organizations are entering the fuel cell business, often from varied core businesses. Special examples include the ceramic tile producers that are employing their assets and skills to produce ceramic electrodes, or the textile companies that are diversifying their traditional business into carbonized membranes to be used in fuel cells.

The ability to produce returns from the technology also depends on volumes produced and sold. Common sense then suggests that larger, often incumbent firms, are more likely to invest in R&D and to withstand the ‘innovator risk’, as they are able to sink costs into higher sales. However, at
the early stages of a new technology smaller firms move first because they are more inventive and better suited for exploration. The evidence presented in this book suggests that we are still at the stage in which the smaller firms play a critical role in moving the technology boundaries forward.

At the same time, the need for exchanging complementary assets calls for an efficient division of inventive labour. Fuel cell players at large are building an original and effective platform to transfer competences, technology, financial resources and market knowledge through a largely spontaneous web of formal and informal agreements. In some specific cases, which are covered by several contributions in this book, market forces are not able to stimulate this collaboration. Governments and public institutions are therefore called to promote interfirm collaborations and partnering, as well as to directly intervene in the R&D effort and in the technology and resource distribution. This raises the importance of incentive schemes and public–private partnerships involving public research organizations (such as universities and state research labs).

From a different standpoint, this book offers an updated picture of the rising fuel cell value chain. It discusses the role of each player in the overall new technology development and commercialization, and it investigates some specific geographical contexts and end-users markets. This enables the reader to understand the strategic choices faced by the organizations involved in these processes, whether small- and medium-sized high technology players, or incumbents from the application market-side (that is, car producers) or the supply-side (that is, chemical raw materials companies). Furthermore, the book examines the competitive landscape. It shows how niche-playing opportunities can bridge the options to tap small premium markets and avoid immediate large market pressures. Thus, this book can also be viewed as a strategic map to orient entry and firm growth, and to single out players or potential partners for resources share and/or exchange.

Finally, the rise of the fuel cell technology represents a comforting response of business organizations to environmental and energy issues. The growing awareness on climate change and on the impact of production and consumption on natural resources equilibrium is driving companies towards a more sustainable business model. Such a strategic shift calls for a new focus on the innovation processes, where sustainability is together a business frontier and an objective. This book moves an important step in this direction as well.

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