

Preface

This is a key year for the evolution of international markets. The global economy is experiencing the most severe downturn since the thirties, it is temporarily leaving a path of sustained growth that characterized the last decades, and is facing an impressive decline of trade between countries. Banks are going bankrupt, the stock market has crashed, firms are going out of business or drastically reducing their production and exports, workers are being fired and investment in new business creation or innovation is shrinking. Meanwhile, consumers' confidence has dropped at its minimum, aggregate demand has been declining for months and expansionary policies and international coordination have failed to counteract the crisis until now. It is quite likely that all this will change sooner or later, but at the end of this crisis our understanding of the macroeconomy may change as well.

In front of these crucial events, this book is not an attempt at proposing a radically new way of interpreting macroeconomic phenomena, and, as a matter of fact, it is not even a book on macroeconomic theory. My more modest goal is to collect a number of insights derived from recent research on the role of competition and innovation in the analysis of three topics: business cycles, trade and growth through innovations. These topics are usually analyzed in different fields of research with limited communication, but they all have one common aspect: they study aggregate phenomena of the macroeconomy starting from the microeconomic analysis of markets. This book analyzes three main issues in a unified framework: the role of market structures in shaping the reaction of the economy to shocks and macroeconomic policies in the short and long run, the impact of globalization and trade policy on international market structures, and the role of investments in R&D and of innovation and competition policy in determining technological progress and growth. The novel aspect of our research is that we endogenize the market structures departing from two usual assumptions adopted in the modern theories, that is, on one side perfect competition (which leads to indeterminate market structures), and on the other side monopolistic behavior by an infinity of firms *à la* Dixit-Stiglitz (which leads to exogenous market structures).

The Endogenous Market Structures (EMSs) approach, as I will call it, is based on theories of imperfect competition with strategic interactions, as Cournot competition, Bertrand competition, Stackelberg competition, imper-

fect collusion or patent races based on investments in R&D, and introduces them in a macroeconomic framework where entry in the markets is endogenous and constrained by fixed costs of entry. This realistic characterization of the supply side allows us to explain a number of stylized facts that remain largely unexplained in the traditional approaches to business cycle, trade and growth, and to revisit a number of policy implications concerning macroeconomic policy, trade policy and innovation policy. In this sense, we hope that the EMSs approach will contribute also to the understanding of the current crisis, of the policies that we need to implement to solve such a crisis and avoid future ones, and of the scenarios for the destiny of globalization and growth.

From a research point of view, this book is a follow up of my earlier one, *Competition, Innovation, and Antitrust* (2007, Springer: New York and Berlin), which focused on microeconomic and industrial policy issues. This one is dedicated to the macroeconomic implications of the theory of EMSs, a topic on which economists as John Sutton (London School of Economics), Russell Cooper (University of Texas at Austin), Pietro Peretto (Duke University), Marc Melitz (Princeton University), Fabio Ghironi (Boston College) and many others have been working in the last years.¹

The book is organized as follows. Chapter 1 reviews the standard neoclassical approach to macroeconomics. The aim is to summarize in the shortest space all the main results of the traditional approach to microfounded general equilibrium models of growth, trade and business cycle and to emphasize the advantages and the disadvantages of this approach. The neoclassical approach is based on the crucial assumption that all markets are perfectly competitive and that there are constant returns to scale, which leads to the indeterminacy of the market structures: nothing can be said about how many firms are active in any market, about their production or investment levels and about their (stock market) value, while mark ups and operative profits are zero. Recent developments have introduced the analysis of monopolistic firms in otherwise standard models, leading to important investigations in the fields of endogenous growth, intra-industry trade and New-Keynesian macroeconomics, but in most of these models the market structure remains exogenous, with constant mark ups, absence of strategic interactions and a continuum of monopolistic firms. These limitations motivate our approach,

¹ We should cite on the theoretical front at least Michael Devereux (University of British Columbia), Jean-Pascal Benassy (Cepremap, Paris), Olivier Blanchard (M.I.T.), Francesco Giavazzi (Bocconi University), Florin Bilbiie (HEC Paris Business School), Nir Jaimovich (Stanford University), James Markusen (University of Colorado at Boulder), Elhanan Helpman (Harvard University), Krešimir Žigić (CERGE-EI, Prague), Frank Stähler (University of Otago), Anthony Creane (Michigan State University), Toshihiro Matsumura (University of Tokyo), and on the empirical front Timothy Bresnahan (Stanford University), Steven Berry (Yale University), Mark Manuszak (Federal Reserve Board), Hugo Hopenhayn (U.C.L.A.), Jeffrey Campbell (Federal Reserve Bank of Chicago), Christian Broda (University of Chicago) and David Weinstein (Columbia University).

that is aimed at studying the determinants and the consequences of genuinely endogenous market structures.

Chapter 2 reviews the foundations of the theory of EMSs and applies it to simple macroeconomic models. I build the concept of EMSs gradually, starting from a general definition that applies to models of competition in and for the market and that derives from my earlier book. Then, I focus on a class of microfounded partial equilibrium models that can be used to study both competition in quantities and in prices. The third step is to specialize this framework to the case of isoelastic preferences leading to constant elasticity of substitution between goods and to derive Cournot, Bertrand and Stackelberg equilibria. Fourth, I extend this static equilibrium model to a dynamic situation with two periods and provide a first example of the dynamic effects due to the presence of EMSs. Fifth, I introduce general equilibrium considerations in the basic model. Last, I develop a fully dynamic general equilibrium model with Cournot competition between firms producing homogenous goods and EMSs, which will be the workhorse model of a large part of the book. I characterize the EMSs in the short run and in steady state. This set up without physical capital or any form intertemporal substitution (that is, without the traditional mechanisms of business cycle propagation) provides the first insights of the EMSs approach to macroeconomics. Consider a positive shock to such an economy (a reduction of variable costs, for instance due to lower energy prices, or the introduction of a general purpose technology which reduces entry costs, for instance cloud computing). The shock increases profits and the stock market value of the firms, which attracts entry of new firms and leads to stronger competition between them, lower mark ups, larger individual and aggregate production, and larger total consumption (while any additional effect would be absent in a neoclassical version of the same model with perfect competition). In conclusion, I discuss the role of trade between countries and growth due to technological progress in such a framework.

Chapter 3 starts with an empirical analysis of the U.S. aggregate data over the last sixty years, emphasizing a few stylized facts concerning the process of business creation. In particular, entry of firms and profits appear to be strongly procyclical while mark ups exhibit a countercyclical pattern, which is confirmed by a Vector Auto Regressive analysis. This motivates the development of a dynamic stochastic general equilibrium model with EMSs that extends the one of the previous chapter with the introduction of endogenous savings, endogenous labor supply and imperfect substitutability between goods. In this framework the equilibrium interest rate is not governed by the marginal productivity of capital as in the neoclassical approach, but by the dynamics of the stock market value, in particular by the stock market return in terms of capital gains and dividends, which depends on the entry process and on the endogenous level of competition. Notice that the stock market affects the real economy not only because it reflects productivity changes, but also because it reflects the strategic interactions between firms engaged in

competition and the entry/exit process due to various shocks. The introduction of EMSs creates a competition effect associated with positive temporary shocks which enhances their propagation by reducing the mark ups and increasing the real wages (so as to magnify the impact on consumption and labor supply due to intertemporal substitution). Both supply and demand shocks induce impulse response functions that are largely in line with the evidence. Moreover, the analysis of the second moments of the basic model (and of its extension to the accumulation of physical capital) shows that the introduction of EMSs allows us to outperform Real Business Cycle models in explaining the cyclical variability of U.S. data, in particular of output, consumption, labor supply, profits and mark ups. The model can also be used to evaluate the impact of shocks to the fixed cost of entry, and, more important, the role of fiscal and monetary policy. On one side, I show that the optimal fiscal policy requires countercyclical tax rates on sales and labor income to optimize the process of business creation along the business cycle. On the other side, I emphasize the distortions induced by inflation on the mechanism of entry and discuss the impact of strategic interactions on the effectiveness of monetary policy. Finally, I discuss the impact of labor and credit market imperfections in the dynamic model with EMSs.

Chapter 4 begins with an empirical discussion on the impact of market size on the endogenous elements of a market structure (prices, production levels and number of firms) and provides some support for the implications of the EMSs approach through case studies and a panel data analysis of the German manufacturing sector. In particular, larger market sizes appear to increase less than proportionally the number of firms, while increasing their individual production and reducing their mark ups: these results are in contrast with the traditional Dixit-Stiglitz model of monopolistic competition and support the existence of strategic interactions in endogenous entry models. This empirical analysis motivates an extension of the Krugman model of trade to strategic interactions. In particular, I introduce Cournot and Bertrand competition in a standard model of intra-industry trade and show that the gains from trade derive from price reductions due to the strength of global competition rather than from an increase in the number of consumed varieties. Afterward, I extend our dynamic stochastic general equilibrium model to trade between two countries: the basic version of this model is due to Ghironi and Melitz, and I discuss its pathbreaking implications for the behavior of the real exchange rate and also its extension to EMSs. The rest of the chapter is dedicated to policy issues in a simple (but quite general) model of EMSs, and derives implications for trade policy, export promotion policy, R&D policy and exchange rate policy. The main result concerns the general optimality of strategic export promotion, in particular through positive export subsidies, in the presence of endogenous entry in global markets. This result is in contrast with the neoclassical theory, for which export taxes are optimal (to improve the terms of trade) and with the strategic trade policy approach with exoge-

nous market structures, that recommends export taxes on price setting firms (for profit shifting reasons). In case of international EMSs, I show that it is always optimal to subsidize exports to induce the domestic firms to reduce their prices (or expand their production) so as to gain market shares abroad and limit entry of competitors. I characterize the optimal trade policy under alternative forms of competition and show that the optimal unilateral export subsidy is inversely related to the elasticity of foreign demand (actually, when goods are homogenous the optimal subsidy under EMSs is the exact opposite of the optimal export tax in the neoclassical trade theory). The same idea can be applied to competitive devaluations. Finally, I apply the same framework to show the general optimality of R&D subsidies and protection of domestic intellectual property rights to strengthen the incentives of the domestic firms to invest in R&D and lead the competition for international markets.

Chapter 5 starts with an empirical test of the EMSs approach to the competition for the market. The test is based on the different role played by incumbent leaders in investing in R&D, and is built around a unique dataset for the German manufacturing sector. In line with the theoretical predictions of the EMSs approach, Tobit regressions (augmented with instrumental variable analysis) show that incumbent leaders tend to invest more than the other firms if and only if they face an endogenous entry threat. Moreover, the analysis emphasizes a number of market specific and institutional factors (such as IPRs protection) that are correlated with investment in R&D, and suggests the need for a microeconomic analysis of the drivers of technological progress. On this basis, first I analyze endogenous growth models with EMSs in the competition in the market, and then I extend the Schumpeterian growth model with patent races characterized by strategic interactions between firms investing in R&D and endogenous entry. In this context I emphasize the emergence of a form of dynamic inefficiency in the business creation process, which is characterized by too many small firms: a better allocation of resources could be achieved with larger firms investing more efficiently in R&D. Moreover, I show that incumbent leaders tend to invest more than the outsiders when pressured by entry, and they end up leading the growth process. As a consequence, strengthening the protection of IPRs is going to increase the value of being an incumbent leader, which in turn is going to enhance the incentives to invest for both the leaders and the outsiders, and therefore to augment the growth rate: this implies that patent protection and the neutrality of antitrust policy toward IPRs (of high-tech leaders) do promote investments in innovation and they do so especially in case of sequential innovations. I also use the model to study fiscal and monetary policy in a growing economy, showing the general optimality of R&D subsidies and of a monetary policy that minimizes the distortions on the business creation process. Finally, I investigate international growth issues, with particular attention to the endogenous size of markets, to the world technological leadership and the international coordination of R&D policy.

Chapter 6 provides a non-technical discussion of the main results of the EMSs approach and employs them to discuss a number of recently debated issues. This chapter is accessible to a non-specialized audience and tries to point out the novel contributions of the EMSs approach for the understanding of real world phenomena and for policymaking, starting of course from the current recession and its possible solutions. I pay close attention to three broad topics: the evolution of global markets of the New Economy and their EMSs (as for cloud computing, online advertising or the browsers market), the evolution of macroeconomic phenomena (as business creation, long run growth, globalization and innovation), and the prescriptions for policymakers (on macroeconomic policy, trade policy, innovation policy and competition policy). With this mix of applications I want to make a key point: there is no way to understand the macroeconomy that does not start from the structure of the markets that belong to it, especially the high-tech and global markets whose shocks, innovations and exchanges are at the basis of economic fluctuations, growth and trade.

Chapter 7 concludes my two books on EMSs in partial equilibrium microeconomics and general equilibrium macroeconomics summarizing in a non-technical way their results and their implications for industrial and macroeconomic policy.

This book is the fruit of fifteen years of studies and I want to express my gratitude to all the teachers and colleagues who have contributed to my understanding of the macroeconomy. The first category includes at Southampton University Morten Ravn, James Malcomson and Jacques Cremer, at the London School of Economics Nobuhiro Kiyotaki, at U.C.L.A. Gary Hansen, Michele Boldrin, Pietro Reichlin, Costas Azariadis, Carlos Vegh and Edward Leamer, at M.I.T. Daron Acemoglu, Guido Lorenzoni and Jaume Ventura, and at Harvard University Philippe Aghion, Gary Chamberlain, Elhanan Helpman, David Laibson, Ariel Pakes, Kenneth Rogoff, Andrei Shleifer, Joseph Zeira, and, most of all, Alberto Alesina and Robert Barro. At the University of Milan, Bicocca, I benefited from discussions with many colleagues from my Department, especially with Patrizio Tirelli, Emilio Colombo, Silvia Marchesi, Michela Cella, Dario Pontiggia and, most of all, Andrea Colciago. Andrea has been coauthor of two papers (one of which at the third round of submission for *The Economic Journal*) that are largely reflected in Chapter 3: I am extremely grateful to him for substantial help in the quantitative analysis of this chapter. I would also like to thank Andy Snell, John Moore and Jozsef Sakovics from the University of Edinburgh. Finally, I am grateful to Alessandro Penati: working for his asset management company Epsilon many years ago, I learnt all the little I know about applied finance.

The ideas of this book were presented in many recent seminars (University of St. Andrews; University of Amsterdam; Catholic University of Leuven; IMT, Lucca; Tilburg University; Charles University, Prague) and conferences (the Round Table on Competition in a Period of Crisis and the Intertic

Conference on Recent Developments in Antitrust Policy in Rome, the Anglo-French-Italian Macroeconomic Workshop in Pavia, the OECD Conference on Innovation in the Software Sector in Cáceres, Spain, the ZEW Conference on the Economics of Innovation and Patenting in Mannheim, Germany, and the 2008 CRESSE Conference in Athens). I am thankful to Fabio Ghironi, Marc Melitz, Jean-Pascal Bénassy, Andrew Scott, Charles Horioka, Guido Ascari, Huw Dixon, Frode Steen, Liam Graham, Jan Boone, Michal Kejak, Evangelia Vourvachaki, Manfredi La Manna, Marco Faravelli, John Beath, Richard Schmalensee and many others for useful comments.

There have been three important events that largely helped the preparation of this book. The first one, which forced me to think in a systematic way about the material of this book, was the Bi-annual Lecture of the Review of Business and Economics, organized by the Faculty of Economics, Applied Economics and Business of the Katholieke Universiteit Leuven (Belgium). I gave this Lecture on December 12, 2007, and I am extremely grateful to the Faculty and the Dean for the kind invitation, to the audience, and, for insightful discussions, to Raimond De Bondt, Christophe Crombez, Dirk Czarnitzki and Kornelius Kraft. The last two became also two coauthors later on, and I am extremely indebted with one of them, Dirk, for extensive help with the empirical analysis of Chapters 4 and 5.

The second event was the 2008 Intertic Conference, held at the University of Milan, Bicocca on “Endogenous Market Structures and Industrial Policy” in June 5-6, 2008, a unique occasion to develop the academic debate on this emerging body of literature. I am grateful to all the participants, starting with Avinash Dixit, who gave the Intertic Lecture, John Sutton, who gave the Stackelberg Lecture, and the three Vice-Presidents of Intertic (the International Think-tank on Innovation and Competition) Simon Anderson, Dirk Czarnitzki, and Krešimir Žigić. I am particularly thankful to the interesting discussions with Pietro Peretto, Tommaso Mancini-Griffoli, Lilia Cavallari, Kevin Tsui, Arijit Mukherjee, Emek Basker, Toshihiro Matsumura, Irina Suleymanova, Axel Gautier, Lidia Tsyganok, Yannis Katsoulacos, Michele Polo, Chiara Fumagalli, Michael Ward, and the other participants.

The last important event is the Dynamic Competition Lecture that I have been invited to give at the International Workshop on IPRs and Competition Policy in Osaka (Japan) on November 27, 2009. The preparation of that lecture relies heavily on the thesis developed in this book. I am thankful to Noriyuki Doi, Testuya Shinkai and the JSPS group for the kind invitation to Japan.

I present a lot of unpublished material in the book. The rest derives from articles of mine, as “Endogenous Market Structures and Strategic Trade Policy” (2010, *International Economic Review*), “The Economic Impact of Cloud Computing on Business Creation, Employment and Output in the E.U.” (2009, *Review of Business and Economics*), “Stackelberg Competition with Endogenous Entry” (2008, *The Economic Journal*), “Growth Leaders” (2008,

Journal of Macroeconomics), “Endogenous Market Structures and Macroeconomic Theory” (2007, *Review of Business and Economics*), “Political Geography” (2006, *Public Choice*), “International Unions” (2005, *The American Economic Review*, with A. Alesina and I. Angeloni) and “Innovation by Leaders” (2004, *The Economic Journal*).

I used early drafts of the first two chapters for teaching purposes. The first one (in a very preliminary version) for a course of undergraduate advanced macroeconomics held at Luiss University (Rome) in 2002-2003 and (in part) for a postgraduate course in Political Economy that I gave between 2003 and 2006 at the DEFAP (PhD in Public Economics) in Milan. I use the second chapter for my classes of Industrial Organizations for the Scottish Graduate Programme in Economics held since 2007 at the University of Edinburgh. I am thankful to all of my students for many smart comments. The book could be also used as a textbook for advanced macroeconomic courses with a special emphasis on microfoundations and international economics.

Most of this monograph and of my earlier one is based on theoretical research that I have developed alone. The hope is that the associated reduction of academic productivity has been partly compensated by a coherent view on these topics. My first contribution to the EMSs approach in macroeconomics appeared in an article of 2004, which ironically generated what may be the most extreme forms of reaction that an academic paper can generate. On one side, journalists from the Economist, the Sunday Times, Le Libre Belgique and other newspapers publicized it as a theoretical defense of the position of Microsoft in its famous antitrust case.² My research did not have that case in mind, and it was aimed at more general and largely unrelated conclusions. Nevertheless, my position radically against the traditional view of incumbent leaders that jeopardize innovation, and my analysis of the beneficial role of these leaders in driving sequential innovations and technological progress were correctly associated with a critical view of the positions of the EU antitrust authorities. I am glad to notice (without causal implications) that, since then, Europe has witnessed a substantial change in the terms of the debate on the role of Microsoft in the software market.

On the other side, the same article has attracted a radical epistemological critique in an essay self-defined “Towards Good Social Science”³ which had nothing else to do than comparing the nature of “good natural science”, exemplified by the heliocentric cosmology, the theory of relativity and the theory of evolution, with the nature of “bad social science”, which the essay exemplified with my theory of innovation and growth in the field of economics (!) and with the rational choice theory of religion by Rodney Stark in the field of sociology. The critique argued that, contrary to the good science,

² For instance, see “Combattre les barrières, pas les leaders” (*Le Libre Belgique*, June 18, 2004).

³ Moss, Scott and Bruce Edmonds (2005, *Journal of Artificial Societies and Social Simulation*, 8, 4, 1-15).

both the last two theories were not based on a proper empirical motivation. The reader will find here old and new empirical motivations for my theory of innovation and for the EMSs approach in general, including a wide investigation with Tobit regressions and IV analysis of the determinants of R&D investments and of the role of incumbent leaders and entry pressure, an analysis of the relation between market size and endogenous components of the market structure through panel and cross-sectional data, and a VAR analysis of the cyclical behavior of the market structures along the business cycle.

However, as a consequence of this critique, a methodological remark is in order. I believe that economic theory is not about absolute or even relative truth as natural science, but about reasonable descriptive and normative principles that derive from assumptions that must be realistic (or more realistic than in other theories) but parsimonious, that provide explanations for important empirical regularities, and that become a useful benchmark for policymakers over time. Only in this general sense, social science can be, hopefully, useful.

A last word on the cover of this book, which reproduces a masterpiece by Michelangelo Merisi called Caravaggio, painted probably in 1595 and currently at the Louvre Museum of Paris. The work of Caravaggio and this painting in particular may be seen as a turning point of Western paintings, the ultimate achievement in the evolution of realism and the ultimate source of the following major international artists, as Velasquez, Rubens, de La Tour, van Honthorst, Rembrandt and, of course, Vermeer. In this early genre painting, the Milanese artist depicted a gypsy girl reading the palm of a boy who expects a prediction of his future. Something else, however, is going on in the scene, and we leave the reader to realize what.

Macroeconomics cannot predict the future, but hopefully it can provide the tools to understand some endogenous and structural aspects of the way markets work.

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