1. Introduction

1.1 BACKGROUND

The objective of this research is to answer the following questions: have organizational innovations (OIs) significantly and positively impacted on economic growth, and can this be shown both quantitatively and qualitatively? As adjuncts to this main question, some other issues need to be answered. First, can OIs be successfully transferred from one country to another? In particular, is it possible to provide quantitative evidence that the so-called lean production system of Japan, with its corollary of just-in-time/quality control (JIT/QC), has been successfully operating in the USA with a significant effect on this country's sectoral and hence macro growth? Second, what are the links between OIs and economic growth from a theoretical point of view?

Table 1.1 summarizes the major OIs that have taken place over the last 150 years. This non-exhaustive list is based upon the major findings presented in Chapter 2. This study is devoted to analysing and exploring these OIs in relation to economic growth, with emphasis on the internal OIs of firms (taking place inside the firm, for example *kanban*). Economic activities have been variously organized since ancient times. Farms, estates, mines, shops, craft production and governments are organizational entities that have existed in many areas of the world for at least 3000 years. A large estate was the object of the first known economic or management manual ever written, that of Xenophon (*circa* 370 BC [1990]). Closer to our era, the Industrial Revolution that began in Britain about 200 years ago generated new forms of economic organization, such as factories and the appearance of managers. Later, in other parts of Europe, in the USA and in Japan, new forms of industrial organization were developed, for example, the big integrated business, the M-form of firms, 'scientific management', and lean production. Many of these new OIs took place in the USA from the 1870s to the 1920s, and many of them in Japan, in particular from the 1950s to the 1970s.

These examples raise the following questions: what is the definition of an organizational entity (OE) and when does this OE become an OI? An OE can be a production form, or an industry structure, or a firm structure, or a production process, or a network of OEs, or an institution in general.[1] This

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Table 1.1 Organizational entities and innovations historically

Object of OE	Type of OI	Approximate date of introduction and country of first appearance
Production or distribution	Craft production	From ancient times
	Putting-out production	18th century (Britain), 19th century (USA)
	Factory production	End of 18th century (Britain)
	Mass production	End of 19th century (USA)
	Mass distribution	End of 19th century (USA)
	Integration of mass production and distribution	End of 19th century (USA) and beginning of 20th century
	Lean production	1960s and 1970s in Japan
Industry structure	Small, medium and large enterprises	End of 19th century (USA)
	Oligopolies, monopolies, etc.	End of 19th century (USA)
	Clusters and industrial districts (also as networks)	1950s, 1960s, 1970s in the USA, Japan, Germany, Italy
Networks	*Zaibatsus*	End of 19th century (Japan)
	Keiretsus (with subcontractors)	Since 1950s (Japan)
Firm structure	Diversified	1920s (USA)
	Focal	1930s (Japan)
	Vertically integrated	End of 19th century (USA)
	Conglomerate	End of 19th century (Japan)
	Functionally managed	1870s and 1880s (USA)
	Divisionally managed	1920s (USA, Japan)
	Teamwork based	1950s and 1960s (Japan)
Production process	U-shaped machine layout	1960s (Japan)
	Scientifically managed	1910s (USA)
	Quality controlled	1950s (Japan)
	Just-in-time oriented	1960s (Japan)
Institutions	Government agencies	After World War II (Japan)
	Anti-trust laws	1890s (USA)
	Stock exchanges	End of 19th century (USA)

Source: Based on the findings presented in Chapter 2.

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list of OEs depends on the object of analysis; for instance, if we consider the production form as an OE, then the object of analysis could be the craft production mode or the mass production mode and so on (see Table 1.1). If a factory producing furniture is taken as a concrete example of a firm structure, it is an OE, which involves the following concepts: ownership, people working in it to produce output, tools and machinery used by these people, some targets to be achieved by everybody; relations between various employees, between employees and employers, between employees and tools and machinery; relations between this factory and other factories or other OEs, and a learning process for everybody involved in this factory.

All these concepts encompass dynamic organizational interactions for the OE to survive. Any one of these interactions continually change and, eventually, new OEs appear. These new OEs become OIs when they are very different from previous OEs. For example, the putting-out OE was eventually transformed to the factory OE, hence the latter became an OI; the mass production OE became a lean production OE and so on. In these cases, the factory OE and the lean production OE became OIs in relation to their previous states.

In this introduction, Table 1.1 summarizes the OIs that will be the object of further exploration in this study.[2] A more detailed and economics oriented analysis of these OIs will be undertaken in subsequent chapters, thus seeking to justify their existence and value. Note that all these OEs are interrelated, either through their object or their type. For example, a lean production OE includes focal factories, the JIT/QC philosophy and so on. Also, all the OEs are a consequence of the type of underlying ownership, core competences, strategies and other features that will be analysed in subsequent chapters. Furthermore, since OEs and OIs are virtually the same concept, with the difference that OIs mean new and very important OEs, reference will only be made to OIs in the remainder of this book.

All these major OIs, as recognized by numerous researchers, took place in the two largest economies of the world today, the USA and Japan. These two countries' gross domestic products (GDPs) together constituted approximately 30 per cent of the world's total GDP (purchasing power parity – PPP) in 1999, or 43 per cent of the world's total GDP (non-PPP) in 1999 (World Bank Group, 2001). Also, these two countries experienced, at different times in their economic history, a very high industrial growth. Table 1.2 summarizes the growth rates in the two countries for some key periods (the period 1925 to 1950 was excluded, as it was exceptional in terms of the great depression, and the preparation or outbreak of wars. However, this period is included in this study of OIs).[3]

Before we proceed, another question must be addressed. What is the relationship between OIs and technological innovations or technology, at least

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Table 1.2 Average annual real growth rates of industrial production for some key periods in the USA and Japan, 1866–1996

Period	USA	Japan
1866–1891 (for Japan: 1876–1901)	6.0	4.4
1895–1920 (for Japan: 1900–1925)	5.6	5.1
1951–1976	4.3	12.6
1971–1996	3.3	3.2

Source: Based on Mitchell (1998) and World Bank Group (2001).

from a definitional point of view? The definition of technology provided by an international institution, the United Nations Centre on Transnational Corporations (UNCTC), in 1985 is revealing: 'Technology may be embodied in the form of capital goods, such as machinery, equipment and physical structures; or it may be disembodied in such forms as industrial property rights, unpatented know-how, *management and organisation* (my emphasis) and design and operating instructions for production systems' (UNCTC, 1985, p. 119).[4] A key objective in this study is to separate embodied from disembodied in the definition of technology. Hence, whenever we refer to OIs we mean disembodied technology (according to the above definition of the UNCTC). The term technical innovations (TIs) is adopted to refer to embodied technology (for example, new machines, new products and so on). As argued in Chapter 3, TIs have been the main target of the immense literature on economic growth. The aim of this study is to introduce a systematic awareness that OIs may play a distinct and indeed preponderant role in the process of such growth (as distinct from the role of TIs or technology as a whole).

The following example is used here to illustrate the importance of OIs. The semiconductor industry has been very important for both the Japanese and the American economies. A recent detailed account of this industry by Langlois and Steinmueller (1999) reached some notable conclusions:

> One of the factors driving the success of Japanese firms in memory products in the early 1980s was the higher quality of the chips they produced. For Japanese chips, defect rates – the fraction of chips that prove to be defective – were probably half to one-tenth the rates for American products. By the second half of that decade, however, American firms had dramatically increased expenditures for quality control, imitating Japanese practices such as total quality management (TQM), greater attention to preventive maintenance, and automated process control and monitoring. By the early 1990s, American manufacturers had probably begun to match the defect levels of their Japanese counterparts. Intel reportedly reduced its

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> defect rate by a factor of 10. There is also evidence that American firms have improved manufacturing yield rates and direct labour productivity since the early 1990s … (ibid., p. 49)

A brief comparison between TIs and OIs is necessary at this point. Overall, technology in the ordinary sense is responsible for changes in economic growth. Certainly TIs have played a primary role in promoting such growth. Effectively, the theorists of economic growth have been concentrating their research on the impact of four main categories of factors affecting such growth: capital, labour, technology (in the sense of TIs) and human capital. However, despite the writings of such eminent economists like Marshall (1890) and Schumpeter (1934; 1942a/b) that OIs significantly generate economic growth, and despite the writings of management scholars that OIs do actually matter significantly in the growth of firms, the vast majority of modern economists have consistently ignored OIs in their analysis of economic growth models. This is true for both exogenous and endogenous types of models, and yet, on a priori grounds, OIs are no less important than factors such as TIs.

What are the implications of not explicitly including OIs in the theories and empirics of economic growth? The famous residual of Solow's analysis (1957), the so-called total factor productivity (TFP) was found to be substantial in many studies. This residual has *usually* been explained by technological factors (or TIs in the present terminology). However, how do we know that OIs have not contributed equally to TFP, or even more? Unless we carefully explore the contribution of OIs we will not be able properly to refute or accept their importance. Consequently, the issue is there to be explored. This is exactly what this study is about: do the major OIs significantly affect economic growth and how do they do this? Is it also possible to provide quantitative evidence to answer this question?

A further issue must be identified before we proceed to address the core points of the study. Are OIs related to entrepreneurship? The immediate answer is yes, as it is the entrepreneurs and managers (in a broad sense) who instigate, introduce and implement OIs. However, in this book, the specific contribution of these people is not explored, except on an ad hoc basis, as this would involve much more space than is available. Future research should attempt to investigate such contributions in a more systematic way (a preliminary analysis is provided in Sanidas, 2004c). After all we do not a priori know whether or not OIs are exogenously, or endogenously, determined by entrepreneurs and managers, and whether, in general, OIs, entrepreneurship and management are part of a larger and more complicated mechanism of determination involving other parameters as well such as law, institutions, culture and so on.[5]

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1.2 MAIN POINTS

1.2.1 Evidence on the Impact of OIs on Economic Growth

There is a need to explore the significance of OIs in promoting economic growth on a firm, sectoral and macro basis. Furthermore, this significance ought to be both qualitative and quantitative in kind. Management research has already provided ample evidence to suggest that some OIs matter considerably for the firms' expansion (for example, Davidson and Griffin, 2000; Thomson and Strickland, 2001). This study, effectively, extends the theoretical literature by introducing new concepts integrated into existing ones in order to show that OIs, or disembodied technology, have a significant positive impact on economic growth. This study also provides some empirical evidence on the significance of OIs in promoting industrial growth in the context of manufacturing sectoral growth.

1.2.2 Exploration of OIs Ignored by Other Scholars

Chandler (1977; 1990) and to a lesser extent Lazonick (1990) amongst others have provided considerable evidence (mainly qualitative) that 'organizational capabilities', as these authors call them, played a key role in shaping the growth of firms (mainly big business) and industrial sectors in an evolutionary manner. These capabilities were linked with some of the OIs listed in Table 1.1, but have not included some others, such as the production process of JIT/QC. Consequently there is a need to explore the ignored OIs and in particular JIT/QC as well more systematically.

1.2.3 A Comparison between the USA and Japan Regarding the Impact of OIs

An extensive comparison between the two countries, in terms of industrial growth and OIs, is needed in order to further support the overall evidence. By comparing the two largest economies in this study, a gap in the literature is filled. Chandler has briefly compared the two countries, although he concentrated primarily on the USA. Lazonick has made a more conscious effort to bridge the gap, but he too concentrates mainly on the USA. Fruin (1992), a Chandlerian scholar, has concentrated his work on exploring Japan. Best (1990) has made a good qualitative comparison between the two economies in terms of some OIs, but again without quantitatively linking them to their respective economic growth.

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1.2.4 Essence of Contributions

The contributions of this study are linked to providing quantitative and theoretical evidence as to the relationship between economic growth and OIs. Thus, an 'atomic/systemic' theoretical economic growth model, which incorporates the OIs and is based on microeconomic foundations, is suggested (see Figures 5.2 and 5.3 in Chapter 5, for a brief description). To construct that model, it is necessary to identify OIs through history, to provide evidence of their link with economic growth and to group OIs into three main axes. It also becomes indispensable that OIs are further scrutinized in order to explore them in terms of fundamental firm operations and activities (such as the 'process of movements') that pinpoint the exact substance of OIs and their relationship with economic growth. In this way, the links between OIs and economic theory are thoroughly established. The atomic/systemic model also incorporates 'systems of innovations', 'sectoral systems' and 'evolutionary learning capabilities'.

This theoretical model is also used to determine proxies for measuring OIs. One of these proxies is in turn used to econometrically measure the impact of the main axis of OIs, namely the JIT/QC system, on American manufacturing sectors during the last 40 years. At the same time, it is shown that it is possible to successfully transfer the main axis of OIs from Japan to the USA. Furthermore, an explanation of the recent American continuous economic growth, and of the recent continuous Japanese recession through a set of propositions related to OIs and leading sectors is provided, according to the overall findings of this study.

In summary, the main innovations introduced in this study are:

- A synthetic approach of the identification of OIs and their contribution to economic growth. This approach includes the 'three axes of OIs' and is comparative in terms of the two countries, the USA and Japan.
- An extension to the theory of the firm with the introduction of the four fundamental firm operations that include the process of movements, the process of contracts, and so on.
- The proposition of an atomic/systemic model of economic growth that incorporates OIs through the four fundamental firm operations, leading firms and leading sectors within a more general framework of sectoral systems, systems of innovations and an evolutionary learning process. The concept of an evolutionary negentropic open system is crucial to this analysis, for instance, in order to appreciate the role of 'waste' in the growth of firms.
- A thorough quantitative analysis that provides evidence for the role of OIs in promoting economic growth. This analysis is primarily sectoral

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and applies to both countries, the USA and Japan. For the USA, the econometric analysis is carried out for the American manufacturing sectors which successfully transferred the JIT/QC system (a major OI) from Japan to the USA.

1.3 ORGANIZATION OF THE BOOK

In Chapter 2, entitled 'Organizational innovations from the 1860s in the USA and Japan', the major OIs are identified historically in the USA and Japan from about the 1860s to the present by mainly referring to some major works of eminent economic historians. This chapter pinpoints the main forces that shaped the appearance of OIs, their chronology and their evolution, together with examples of leading firms, leading sectors and sometimes links between OIs and TIs. The importance of this chapter for subsequent chapters is paramount. Directly or indirectly, elements of this chapter are used in various ways in the whole study to bring evidence to the study.

The next three chapters lay the theoretical foundations of why OIs should be included separately in explaining economic growth. In particular, in Chapter 3, entitled 'The role of OIs in the theory of economic growth', a general theoretical background to economic growth is proposed in order to take into account the impact of OIs. This background first reviews the relevant literature and introduces some important concepts and theories of the significance of OIs in explaining growth. Then, it suggests that OIs are not necessarily a 'handmaiden' of TIs, but rather they should be separately examined. It also proposes (in a non-mathematical way) a general form of a production function that has explicitly taken into consideration various types of organizational inputs. The latter are linked with some fundamental concepts such as division of labour, transaction costs, institutions and others. However, a more thorough and comprehensive explanation as to why OIs should be included in theories of economic growth will take place in Chapters 4 and 5.

Chapter 4, entitled 'Contribution of specific OIs to economic growth and the three axes of OIs', is a continuation of the themes of Chapter 3. However, in Chapter 4 the links between industrial growth and the OIs are established in a concrete manner. Thus, a theoretical explanation is offered regarding the replacement of the putting-out system by the factory one; the role of scientific management and its 'successors'; the appearance and evolution of mass production in the USA; the appearance and evolution of lean production in Japan, and so on. The links between these OIs and industrial growth are made according to various economic concepts and propositions, like those mentioned in the previous chapter, but in a more concrete and analytical manner.

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In Chapter 5, entitled 'The process of firm operations: core of the atomic/systemic model of economic growth', the proposition is made that in order properly to explain the close link between OIs and economic growth, we must explore the heart of this growth which is the firm. Thus, a taxonomy of operations and activities of running a firm (hence including costs and benefits) is proposed, according to which OIs, as analysed up to Chapter 4, are a mixture of these operations. It becomes apparent in this chapter, that OIs are a consequence of what is called here the 'process of movements', as opposed to the 'process of contracts' which is related to the transaction costs theory, and so on. This chapter also analyses the role of leading firms, leading sectors and networks in the context of OIs and economic growth, so that finally a basis for an atomic/systemic model of economic growth incorporating the role of OIs and firms is suggested. This model also incorporates systems of innovation, entropy, sectoral systems and evolutionary learning process. This chapter extends the existing theory of the firm by introducing the negentropic system of four processes of firm activities, their corresponding opportunity costs and a set of related propositions. Within this extended theory the role of OIs and other types of innovations in economic growth is explicitly and intrinsically included.

In Chapter 6, entitled 'OIs and manufacturing sectors' growth in the USA and Japan', a quantitative sub-sectoral analysis is carried out for the USA and Japan, first from the 1880s up to World War II in a brief manner (due to lack of data) and with emphasis on the American economy, and second from 1960 to 1996 in a more detailed manner. Some general trends and tendencies are discerned concerning the leading sectors in terms of OIs. Real output and TFP per industrial sector are scrutinized for different sub-periods so that more appropriate conclusions can be drawn both for the USA and Japan. The statistical methods used in this chapter are relatively simple, from graphs and tables to cointegration analysis. One of the sub-sections explores some of the main reasons for the recent prolonged recession in Japan. In order to support the findings as to the role of OIs, some of the TIs are also briefly explored for both countries by referring to some leading sectors.

In Chapter 7, entitled 'Empirical evidence on the links between industrial sectoral growth and the lean production system (JIT/QC) in the USA', the focus is on the American manufacturing sub-sectors for the period between 1958 and 1996, and in terms of OIs the JIT/QC system becomes the object of analysis. First, the chronology of implementation of the lean production system (LPS) is established in the USA in relation to Japan, both in terms of the just-in-time (JIT) and the quality control (QC) processes. Then, a thorough econometric analysis is conducted by exploring models with various lengths of cross-sectional or pooled time-series data. These models are either simple regression models or more complex ones such as the vector error

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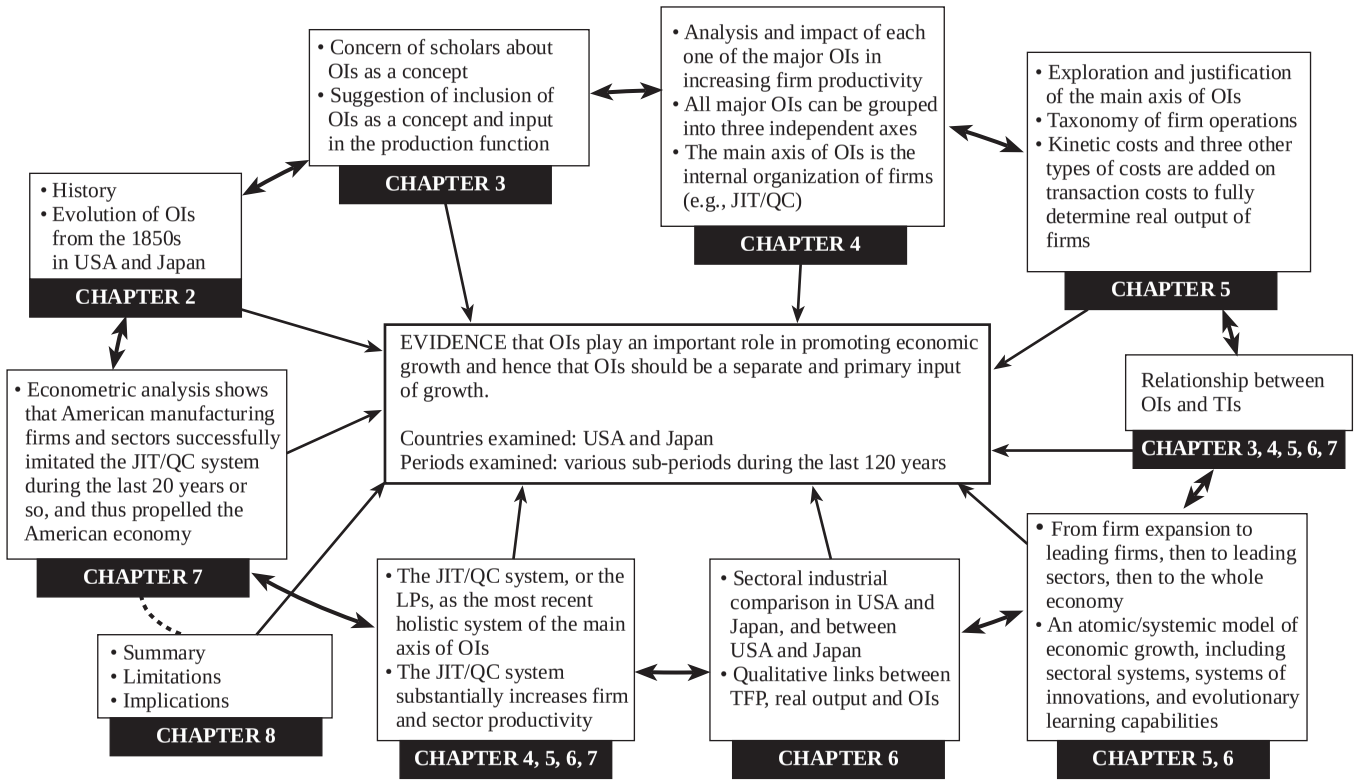

Figure 1.1 The circular flow of the main points for each chapter

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correction models (VECM), and incorporate or include the TFP or labour productivity variables as the main variables to be quantitatively explained. The main purpose of this chapter is to show empirically that the LPS or its equivalent JIT/QC has been successfully transplanted in the USA from Japan, and that this imitation has been the main reason for the recent American economic revival (from about the mid-1980s up to the end of the 20th century).

Finally, Chapter 8 draws out the conclusions, limitations and implications of this study.

In short, Chapter 2 reveals the nature and evolution of OIs, Chapters 3, 4 and 5 establish the necessary theoretical background for the inclusion and impact of OIs in explaining economic growth, whereas Chapter 6 discusses the importance of sectoral growth in the two countries regarding OIs, and Chapter 7 presents empirical evidence for the impact of OIs using various statistical techniques. Figure 1.1 summarizes the main points that each chapter contains in a circular flow of interdependent nodes.

NOTES

1. Van de Ven and Poole (1995, p. 512) provide the following similar definition: 'The entity may be an individual's job, a work group, an organisational strategy, a program, a product, or the overall organisation … '.
2. According to this research, there were no discernible or emerging new OIs in the 1980s and 1990s, except perhaps an Internet system that started to take shape in the second half of the 1990s.
3. World Wars I and II are mostly excluded in this study for being unusual historical periods.
4. Also quoted in Dicken (1998, p. 248).
5. All these issues, briefly mentioned in this introduction, will be fully explored in this book.

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