

**INNOVATION AND SOCIAL LEARNING:
INSTITUTIONAL ADAPTATION IN AN ERA OF TECHNOLOGICAL CHANGE**

edited by Meric S. Gertler and David A. Wolfe
Program on Globalization and Regional Innovation Systems
Munk Centre for International Studies
University of Toronto

Table of Contents

1. Innovation and Social Learning: An Introduction – David A. Wolfe and Meric S. Gertler
2. Farms, Phones and Learning in the Trade Regime – Robert Wolfe
3. Institutional Learning in International Financial Regimes – Tony Porter
4. Institutional Learning in Standards Setting – Liora Salter
5. Locational Tournaments, Strategic Partnerships and the State – Lynn K. Mytelka
6. Technology, Culture and Social Learning: regional and national institutions of governance – Meric S. Gertler
7. Institutions of the Learning Economy – Michael Storper
8. The Learning Region – Richard Florida
9. Regional Innovation Systems and Regional Competitiveness – Philip Cooke
10. Regions as Laboratories: The Rise of Regional Experimentalism in Europe – Dylan Henderson and Kevin Morgan
11. Negotiating Order: Sectoral Policies and Social Learning in Ontario – David A. Wolfe

Innovation and Social Learning: An Introduction

by David A. Wolfe and Meric S. Gertler

INTRODUCTION

We live in an era of rapid economic and technological change marked by a high degree of uncertainty. Over the past ten years, we have witnessed the shift from a steep recession at the beginning of the decade through two international financial crises to the recent phase of hyper growth, marked by higher levels of employment, significant gains in productivity and a rise in consumer spending, especially in North America. So strong has been the economic performance of the past few years that some commentators have hailed it as the return to a “golden age,” similar to that which marked the three decades following World War II – despite the economic slowdown beginning in late 2000. This shift is attributed to two underlying developments: the first is the trend towards globalization which is increasing the linkages between Europe, North America and East Asia in terms of investment, trade, research and development; and the second is the emergence of an integrated set of information and communication technologies linking diverse communications and entertainment media together in digital form. Together, these trends are reshaping the economies of the industrial and industrializing economies and changing much of the accepted wisdom about how they operate.

Despite this nascent optimism about the future, many still fear a return to the conditions of slower growth and higher unemployment of the preceding decades. Even in those countries currently enjoying their new found prosperity, considerable uncertainty remains about how long it will last and concerns are being raised about the inequitable distribution of gains and losses from the transition to this “new economy.” The US government has drawn attention to the emergence of a growing “digital divide” within its society between those who enjoy access to, and the benefits of, the new technologies, and those who face exclusion from their share of the benefits (US Dept. of Commerce, 2000). In Europe similar concerns have been expressed about the dangers of a Europe moving at two speeds – in both a social and a geographic sense. Over the past decade, considerable energy has been devoted to ensuring that the less favoured regions of the continent share equally in the prospects for growth that a more integrated market is expected to bring (Morgan and Nauwelaers, 1999).

The ability of individual economies and societies to respond to the challenge of the current transition is determined, in large measure, by the capacity of existing institutions to adapt to the changes underway. While the nature and extent of the adaptation required may seem novel, the process itself is not. Periods of rapid economic and technological change are characterized by a condition of extreme uncertainty. They place a premium on the ability to acquire, absorb and diffuse relevant knowledge and information throughout the various institutions that affect the process of economic development and change. Two key concepts appear to be central to the concerns at the heart of this question: the role of institutions and the process of learning. The emphasis on institutions emerges out of the ongoing insights generated by the field of evolutionary economics which emphasizes that innovation is increasingly a social enterprise that

occurs within a variety of institutional settings: primarily the firm, but also the other institutions that comprise the innovation system. In this sense it is imperative to develop an understanding of the dynamics within institutional settings that impact on, foster or constrain the innovation process. Second, the centrality of learning for the innovation process stems from the recognition that the knowledge frontier is moving so rapidly in the current economy that simple access to, or control over, knowledge assets affords merely a fleeting competitive advantage. It is the capacity to learn which is critical to the innovation process and essential for developing and maintaining a sustainable competitive advantage.

The focus on institutions arises from the simple observation that virtually all economic activity occurs within an institutional context. In the economic analyses of Weber, Veblen, Schumpeter and Karl Polanyi, economic processes are embedded and enmeshed in a variety of institutions, including habits and customs, as well as government, religion, culture and the legal framework of a society. For Polanyi in particular, the instituting of economic processes endows them with a unity and stability by creating a structure that has a definite function in different societies; however, the specific way that economic processes are embedded in both the economic and noneconomic institutions of a society varies (Polanyi, 1957). “Markets do not exist or operate apart from the rules and institutions that establish them and that structure how buying, selling and the very organization of production take place” (Zysman, 1994, p. 244). This concept of institutions also bears a close affinity to that found in the neo-institutionalist stream of the international relations literature. From that perspective, institutions reflect persistent and connected sets of rules, formal and informal, that prescribe behavioural roles, constrain activity and shape expectations (Ruggie, 1982; Keohane, 1990).

The critical issue is: how well – or ill– suited are the institutions of a region, nation or international regime to the task of coping with the magnitude of change currently underway in the global economy? In an economy where information is becoming an increasingly fundamental commodity and the very basis of production is becoming more knowledge-intensive, the role of institutions in retaining and transmitting knowledge to their members becomes ever more crucial. The emerging digital economy places greater emphasis on the importance of knowledge in all areas of activity, making it vital that the knowledge being socially stored and transmitted is appropriate to the emerging technological style or paradigm.

Closely related to this is the question of how social learning actually occurs in an institutional context. Economists concerned with questions of technological change have identified a range of mechanisms through which institutional learning occurs: learning-by-doing, learning-by-using and learning-by-interacting. The majority of this literature focuses on the narrower and, to some extent, more conventional issues of producing and disseminating technological knowledge. The emphasis has largely been on the process of learning by searching that is intrinsic to innovation, the increasing importance of cooperative relations between users and producers of technology or networks of producers in disseminating new knowledge, or the role of specialized educational institutions in providing necessary supports to the innovation process (Lundvall, 1988; Johnson, 1992).

However, the broader issues raised by the current period of social change require a more

inclusive notion of social learning – one which focuses on the capacity of institutions to sustain growth and facilitate the adjustment process from declining sectors and occupations to expanding ones by adapting and changing in response to new competitive conditions. This particular concept of learning is critical for the kinds of organizational changes associated with the emerging, knowledge–based economy. Increasingly, the organizational issue is how to pool and structure knowledge and intelligence in social ways, rather than access them on an individual basis. The capacity for social learning and increased networking may be seen as essential for tapping into the shared intelligence of both the individual firm or organization, as well as a collectivity of firms within a given geographic space. This form of shared or networked learning assumes that neither the public sector nor individual private enterprises are the source of all wisdom; rather, the process of innovation and institutional adaptation is essentially an interactive one in which the means for establishing supportive social relations and of communicating insights and knowledge in all its various forms are crucial to the outcomes.

This insight suggests a higher order of learning by institutions – one based on a capacity for reflexivity and the ability to apply institutional memory and intelligence to monitor the success of institutions in adapting to ongoing changes in the environment. This higher order is *learning-by-learning* where the (institutional) self-monitoring of the learning process itself becomes an integral feature of the institutional structure. Whether the organized intelligence and institutional adaptability of a region, nation or international regime constitutes a progressive force for change in the process of restructuring or an “institutional drag” depends on this self-monitoring, or the ability to shed inefficient norms and practices and replace them with ones that facilitate the process of economic change and social adaptation (Sabel, 1994; Cooke, 1997).

This higher level of institutional learning is potentially relevant for regional, national, and supra-national levels of governance. The forces described above are not only affecting individual economies and societies, but also altering the relations between the national, supra-national and regional levels of governance. The spread of globalization and the growing interdependence of individual economies have led to a debate about the capacity of national institutions to respond to the changes underway in the global economy. Some argue that the growing disjuncture between the formal authority of the nation state and the emerging global system of production and distribution is shifting attention away from the national level to the supra-national and sub-national levels. Others are not as quick to accept the demise of national institutions in the governance of innovation-based learning. Nevertheless, developments associated with the trend towards globalization reinforce the growing salience of supra-national institutions: the internationalization of production and of financial markets; the integrative capacity of information technologies that overcome many of the previous economic barriers in transportation and communications; the increased power of international regimes and organizations in the management of economic affairs; and the increasing scope of power and authority delegated upward to supra–national bodies. Collectively, these trends are contributing to an increased focus on the institutional capacities of emerging international organizations and supra-national bodies.

Conversely, the impact of new technologies also focuses attention on the role of regions. A number of factors contribute to the increasing prominence of regions in the process of

institutional change and social learning. Geographers have long noted that complex systems of technology, production processes, industrial organization and their supporting infrastructures of social and political institutions, exhibit distinctive spatial characteristics. Production relations tend to aggregate over time among networks of firms following the pattern of input–output relations, or traded interdependencies, that provide the basis for knowledge exchange in the local economy. These technological spillovers are tied to knowledge and practices that are often tacit (and hence, context–specific), rather than explicit (Cooke and Morgan, 1998). Together, the forms of collaboration and interaction associated with both traded and untraded interdependencies highlight the importance of the regional dimension, especially in the current era of rapid technological change and increasing globalization (Storper, 1997).

THE ROLE OF INSTITUTIONS

Before proceeding further, it is important to have a clear sense of the nature of institutions themselves, and the role they play in regulating economic life. There are a number of different approaches to the concept of institutions in sociology and economics, encompassing a rich and well-established intellectual legacy. At their broadest level, institutions incorporate social roles based on established norms and expected patterns of behaviour, thus precluding the necessity for individuals to relearn their social roles anew everyday. They operate as an important mechanism for transmitting information about accepted norms and expected patterns of behaviour to the members of society. The origins of this idea go back to the early part of the twentieth century, to the writings of Max Weber, who introduced the fundamental concept of *social action*. Social action is that action whose subjective meaning takes account of the behaviour of others and is thereby oriented in its course. Many types of social action are guided by the belief in the existence of a legitimate order. Legitimate orders in turn are guaranteed in two ways: 1) through purely subjective means based on affect, belief in an ethical or esthetic set of values, or religious belief; and 2) by the expectation of specific external effects, or interest situations. Weber distinguishes between two such sets of effects: 1) convention, where deviation from it within a social group results in a reaction of disapproval; and 2) law, where there is a high probability that physical or psychological coercion will be applied in order to ensure compliance or avenge violation. Finally, he defines a social relationship whose regulations are enforced by specific individuals, usually a chief and an administrative staff, as an organization (Weber, 1978, pp. 4-34).

Weber's typologies of social action and legitimate orders have been adopted and used in many different contexts, but one of the most enduring is that established by Hans Gerth and C. Wright Mills (1954). While clearly acknowledging their debt to Weber, Gerth and Mills build into their conceptual framework the insights of social psychology, which adds a dimension missing from Weber. Where social action constitutes the basic unit of analysis for Weber, Gerth and Mills adopt the concept of *role* as theirs. This concept "refers to: 1) units of conduct which by their recurrence stand out as regularities and 2) which are oriented to the conduct of other actors. These recurrent interactions form patterns of mutually oriented conduct" (Gerth and Mills, 1954, p. 10). The roles played by people are delimited by the kind of social institutions into which they are born and mature. An institution is seen as an organization of roles, which carry different degrees of authority, so that one of the roles is understood and accepted as

guaranteeing the relative permanence of the total conduct pattern (Gerth and Mills, 1954, p. 13). The roles played by people are delimited by the kind of social institutions into which they are born and they mature. A person may play many different roles and each of these may be a segment of the different institutions and situations through which they move. An institution is seen as an organization of roles which carry different degrees of authority, so that one of the roles is understood and accepted as guaranteeing the relative permanence of the total conduct pattern (Gerth and Mills, 1954, p. 13).

Following in this tradition, Berger and Luckmann's classic treatise assigns institutions and the process of institutionalization a central role. According to them, "institutionalization occurs whenever there is a reciprocal typification of habitualized actions by types of actors" (Berger and Luckmann, 1967, p. 54). The reciprocal typifications of actions that constitute institutions always take place in the context of a shared history. The nature of the institution cannot be understood without a knowledge of the historical process in which it was produced. Institutions also channel and define human conduct by subsuming it under social control.

From the perspective of evolutionary economics, institutions occupy a similar status, but they play specific roles in the functioning of an economy. They reduce uncertainty in everyday life by forming patterns of interaction and shaping the way individuals view and understand society. Institutions are central to the process of learning discussed above. Learning processes are inherently social and interactive, not just individual, and new knowledge is created through processes that are institutionally embedded. Institutions also provide basic functions for the operation of economies. "They provide information, reduce uncertainty, manage conflicts and cooperation, and create incentives and trust. These functions not only give stability and structure to the economy, they are also crucially important for innovation. All innovative activities are riddled with uncertainty and in the modern economy there are many institutions to assist in coping with the technical and financial uncertainties of innovation" (Johnson and Nielsen, 1998, pp. xiii-xv).

This institutionalist perspective is grounded in an older tradition in economics closely associated with the work of Thorstein Veblen and John R. Commons. While there are important differences within this tradition, the work of Veblen has the greatest relevance to the present undertaking. Veblen was particularly concerned with investigating the effects of technological change on institutional structures and with the ways in which established social conventions resist such change. Veblen's focus on institutions shares in common key concerns with the sociological tradition, in its emphasis on the importance of viewing human action within the context of its institutional surroundings. For Veblen, technology is the driving force of economic change. Its pace and direction are affected by the institutional framework within which it occurs. It also has institutional consequences in the way in which it alters the material circumstances of individuals and the methods, patterns and habits of them as well (Rutherford, 1994, pp. 38-39). Veblen also discusses the ways in which material and technological conditions which shape patterns of life subsequently become subject to convention or part of our commonly held values and beliefs – what Veblen called "settled habits of thought" (Veblen, 1919, p. 239).

An important parallel to these themes in the work of Veblen is found in the thinking of

Harold Innis. Innis, who studied at the University of Chicago but after Veblen's time, was nonetheless strongly influenced by Veblen's institutionalism (Barnes, 1999). Running through his work is a preoccupation with questions of the techniques of production of particular commodities or forms of communication and the broader institutional structures and social relationships, which grow up around and sustain those forms of production. In this regard, Innis was concerned with questions of stability and instability in social and economic relations and with the factors that disturb that stability. In his desire to understand the factors that divert a pattern of economic relations from a path of balanced growth, he devoted considerable attention to disruptive factors, such as the introduction of new technologies; to unstable factors, such as the persistence of massive overhead costs and "unused capacity"; and to rigidities, such as the exercise of monopoly power.

In his perceptive essay on "The Penetrative Powers of the Price System," the implications of some of these themes are suggested in an intriguing, but underdeveloped fashion. Drawing on the work of Sombart and Geddes, Innis noted the significance of the shift from the commercial phase of capitalism to the industrial phase and within the latter, from the palaeotechnic (based on coal and iron) to the beginnings of the neotechnic (new sources of power and base metals). In a noteworthy passage, he documented the disruptive impact of new transportation technologies (the internal combustion engine) and sources of power (oil and hydro-electricity) on prevailing institutional patterns and relationships, particular the role of the state in economic regulation. He saw the decline of the old and the rise of the new industrial technologies as a key development during the years of the Depression. Concomitantly, the geographic areas tied to the old or new technologies suffered a more or less positive fate. Most critical, however, were the implications of this transition for prevailing institutional structures and patterns of social relations:

Neotechnic industrialism superimposed on palaeotechnic industrialism involved changes of tremendous implication to modern society and brought strains of great severity. The institutional structure built up on iron and steel and coal has been slow to change. Governmental machinery in those regions in which palaeotechnic society developed late has been extended and government intervention in regions in which it developed earlier has been intensified as a result of the rigidities of labour organization and corporate finance (Innis, 1956, pp. 263-264).

Alongside Veblen and Innis, the writings of Karl Polanyi (as noted earlier) mark an important contribution to the study of institutions. Both in his classic study *The Great Transformation* (1944) and in his more anthropological writings, Polanyi stressed that all economic relationships were grounded in institutional processes, not just the transactions of atomized individuals. For Polanyi, economies represent "instituted processes of interaction between man (sic) and his environment, which results in a continuous supply of want satisfying material means" (Polanyi, 1957, p. 248). The market represented just one of the many institutional forms that economic processes could adopt. What was critical always was the specific way in which these economic processes were embedded in both economic and non-economic institutions. Religion and government could play just as important a role in establishing the structure of economic institutions in certain societies as purely private mechanisms. Nowhere did he see this as more true than in the creation of the market. Ultimately for Polanyi, the market is a socially constructed economic institution, which differs from

previous forms in the extent to which it subjects other social institutions to purely economic calculations and processes: the “self-regulating market demands nothing less than the institutional separation of society into an economic and political sphere . . . Such an institutional pattern could not function unless society was somehow subordinated to its requirements” (1957, p. 71).

The writings of Joseph Schumpeter offer a final strand of thought within the institutionalist tradition of economics. Although usually identified by his views on the dynamic role of the entrepreneur in promoting economic and technological innovation, there is a sub-theme running through Schumpeter’s writings that reflects a concern with the link between technological and institutional change. In contrast to Veblen, who saw existing institutions as a fetter on the prospects for economic and technological advancement, Schumpeter believed that capitalism’s subversion of pre-capitalist social institutions posed the greatest threat to its own survival. Through the extension of the market and the universalization of commodity exchange, capitalism eliminated most of the institutional fetters of the old feudal order, thus destroying the protective shell of the status and political order within which it had been nurtured. Eventually, both the economic dynamics of capitalism and its socializing effects did away with the very class – the aristocracy – that had provided political leadership for the new economic order. In Schumpeter’s view, its demise eliminated the strong bulwark afforded to capitalism by its feudal shell. That process, impressive in its relentless necessity, was not merely a matter of removing institutional deadwood, but of removing partners of the capitalist stratum, symbiosis with whom was an essential element of the capitalist schema (Schumpeter, 1950, p. 139).

This focus on institutions was submerged in the 1960s and 1970s under a wave of alternative approaches; but recently has experienced a renewed interest. Three approaches are helpful for the present discussion: in comparative politics, international relations, and some elements of the new institutional economics. Within the discipline of comparative politics, the work of Peter Hall highlights the need for an institutional approach to understanding the role of the state. Hall views the state as a network of institutions, operating within a complex of related institutions that form part of society and the economy. This approach locates the determining factors behind economic policy and performance in the organizational structures of the state and society. Institutions “refer to the formal rules, compliance procedures, and standard operating practices that structure the relationship between individuals in various units of the polity and economy” (1986, p. 19). The strength of such analyses depends on the capacity of institutions to endure and adapt. To the degree that national institutions change, the key challenge is to identify the socioeconomic and political coalitions that support the change and analyze how they contribute to the process (Hall, 1997, p.183).

This theme finds strong expression in the work of John Zysman who argues that distinctive institutional structures across nations, which are the product of historically, conditioned political and industrial development, define the choices available to individual firms or actors in responding to new economic or technological trends. Historically conditioned and nationally specific institutional structures create distinctive patterns of constraints and incentives. He also links this institutional approach to the question of power by arguing that relations among institutions embed and channel the existing power relations among groups in society (1996, pp.

414-15). More recently, this emphasis on distinctive national constellations of institutional structures has been adopted with renewed enthusiasm in the emerging literature on national business systems and “divergent capitalisms” (Doremus et al., 1998; Whitley, 1999, Gertler, 2001).

Another important source of thinking in the revival of institutional analysis has been the field of international relations (IR) where the work of Stephen Krasner, John Ruggie and Robert Keohane among others has led to a growing interest in how long-term international relations may be structured in a stable manner through the creation of international regimes without the dominance of a single hegemon. The institutionalist approach in IR theory has been contrasted with the realist approach which has long held that economic or military power is the determining factor in structuring the prevailing pattern of international relations. According to Krasner and Ruggie, international regimes are a form of social institution that constrain or influence the expectations of actors in a given area of international relations (Ruggie, 1982, p. 196). International regimes limit the ability of their members to act within the domain of that regime. The concept of institutionalism has been further expanded in the work of Robert Keohane, who delimits the institutional approach in IR theory to include those authors who see cooperation as a key feature of economic interdependence. For Keohane, the existence of shared economic interests leads to a situation where states will work together to create international institutions and rules. In a manner similar to Berger and Luckmann, Polanyi, Hall, and Zysman, he defines institutions more specifically as “persistent and connected sets of rules, formal and informal, that prescribe behavioural roles, constrain activity and shape expectations” (1990, p. 732). Institutionalism has also experienced a rebirth of interest in economics. Drawing inspiration from the work of Veblen, Polanyi and other institutionalists, a new generation of scholars sees the institutional approach as a necessary counterweight to the methodological individualism of the neoclassical approach. While there are many different strands that can be associated with the new institutional economics, one of the most comprehensive approaches is presented by Geoffrey Hodgson. Referring back to Veblen’s conception of institutions as “settled habits of thought,” he defines institutions as “a social organization which, through the operation of tradition, custom or legal constraint, tends to create durable and routinized patterns of behaviour” (1988, p. 10). The significance of institutions is their ability, in face of uncertainty, to create stable patterns of expectations through the incorporation of habits and routines. The use of habits and routines helps actors to deal with the complexity of everyday economic life by reducing the need for rational calculations involving large amounts of diverse information. They are also essential for incorporating the acquired skills, tacit knowledge and accumulated information of collectivities of workers organized into firms. Habits and routines organized into institutional forms within the firm thus constitute an important mechanism by which skills and technological learning are preserved and transmitted within the firm (Hodgson, 1993, p. 234).

A critical point of debate in this recent approach to institutional analysis concerns the relations between institutions and organizations. Edquist and Johnson maintain that institutions (“things that pattern behavior” such as norms, routines, rules and laws) and organizations (consciously created “concrete things” such as firms, universities, private research labs, and technology transfer organizations) are quite distinct and that, for the sake of conceptual and empirical clarity, they should be regarded as separate (Edquist and Johnson, 1997, p. 43). They

therefore argue that institutions should be defined more narrowly, akin to the approach taken by North (1990) and Williamson (1985), to mean “sets of common habits, routines, established practices, rules, or laws that regulate the relations and interactions between individuals and groups” (Edquist and Johnson, 1997, p. 46). They proceed to demonstrate how institutions, so defined, act to manage conflicts and cooperation, provide incentives to economic actors, channel resources to innovation-generating activities and, at times, constitute obstacles to innovation.

However, recent work in the sociology of organizations disagrees with this distinction and argues that formal organizations are subsumed under the broader category of institutions. For writers such as DiMaggio and Powell, the rules and norms which constitute institutions, are reflected in organizational structures and processes. This perspective assumes that changes in organizational structures and processes reflect changes in the broader sets of institutional norms and rules in which they are embedded (1991). In his recent overview of the implications of institutions for the study of innovation, Rogers Hollingsworth explicitly endorses the view that “institutional rules, norms and conventions unfold in tandem with organizational structures” (2000, p. 619), although these represent merely two out of what he sees as five levels of reality that are necessary for an adequate analysis of institutions. This approach is also consistent with the perspective taken by other writers in the innovation systems perspective, such as Richard Nelson, who tend to use institutions and organizations interchangeably (1988; 1994). We follow the latter approach, accepting the view that organizations are best understood as being nested within (and shaped by) the broader institutional environment in which they are situated.

INSTITUTIONS AND SOCIAL LEARNING IN THE NEW ECONOMY

The role of institutions and institutional change assumes a position of critical importance in periods of rapid economic and technological change. The critical concern of the essays collected in this volume is to understand how institutions inhibit or promote the process of restructuring endemic to a period of rapid economic change. As we noted at the outset, at the heart of the current transition are the dual processes of globalization and the convergence of an integrated set of computer, communications, and video technologies with the capacity to process and transmit data in digital form. The new information and communications technologies are exponentially increasing the capacity to handle information, as knowledge-based inputs simultaneously become a salient component of every aspect of production. New information technologies augment both the existing knowledge base and the need to access it in ways that demand a new capacity for learning and the absorption of knowledge. This dilemma draws attention to the fact that the quantitative change in technologies is gradually leading to a qualitative one – the emergence of “socially distributed cognitive intelligence,” or “networked intelligence.” According to one informed assessment of this phenomenon, “The Age of Networked Intelligence is . . . not an age of smart machines but of humans who through networks can combine their intelligence, knowledge, and creativity for breakthroughs in the creation of wealth and social development. It is not just an age of linking computers but of internetworking human ingenuity” (Tapscott, 1996, pp. xiv).

This point underscores the fact that economic and technological changes do not occur in isolation from underlying social and institutional transformations. The new information and

communications technologies constitute the key factor, or core technology, underlying the emergence of a new techno-economic paradigm. The emergence of a techno-economic paradigm differs from less pervasive forms of innovations in terms of the characteristics associated with its key factor: a relatively low and constantly falling cost curve, plentiful source of supply, and ease of application across many sectors of the economy. However, according to Freeman and Perez, the key factor diffuses throughout a modern economy as the core of a rapidly growing system of technical, social and managerial innovations (1988, pp. 58-61). The outcome of such a transition depends on a complex process of change in forms of social organization and the resolution of political conflict. In passages reminiscent of Veblen and Innis, Perez (1983) argues that the new constellation of technologies cannot be generalized throughout an economy without a corresponding shift in a wide range of social and political institutions. Long periods of growth and decline in industrial economies result from the measure of complementarity, or lack thereof, between the prevailing organization of the production process and the dynamics of the socio-political institutional structure. New technological systems emerge in the sphere of production as a complex of interrelated technologies and a new form of the organization of production. The problem of adjustment emerges out of the fact that the collection of institutions that comprise the prevailing socio-political infrastructure no longer complements the new technological system. A period of structural crisis in capitalist economies does not merely involve the Schumpeterian “gales of creative destruction” in the economic sphere, but a restructuring of the entire socio-political infrastructure.

The challenge of institutional adaptation to the underlying process of technological and economic change resonates strongly with our concern with the fundamental questions of social learning. The extent to which a nation or region’s capacity for technological learning and adaptation is supported or weakened by its institutional structure is critical to its success in a period of rapid economic transformation. The diverse approaches to the study of institutions outlined above present two apparently contradictory perspectives: one which views institutions as systems for organizing and constraining social behaviour through the reproduction and transmission of accepted norms and values; and another which views institutions more positively as mechanisms which can embed and preserve collective social knowledge about a wide range of subjects, especially those related to economic processes. In the first formulation, represented in the sociological tradition by Berger and Luckmann, or in the economic tradition by Veblen and Innis, institutions impede the process of social and economic adaptation. From this perspective, “institutional rigidity” or “institutional drag” is portrayed as a serious obstacle to change. The more optimistic perspective, such as that associated with Hodgson, views institutions as a vital mechanism for storing and transmitting the accumulated social knowledge critical to the process of change and adaptation. The key feature differentiating the two perspectives is the capacity for institutional adaptation and social learning.

A common thread running through both streams of the literature is the critical importance of institutions for incorporating social roles based on established norms and expected patterns of behaviour. Thus institutions represent a fundamental mechanism for socializing individuals into a wide range of roles across the numerous social fields where they interact, and they act as an important mechanism for transmitting information about accepted norms and expected patterns of behaviour. But the emphasis in this approach has been overwhelmingly on how individuals

and firms learn, and it overlooks the fundamental challenge of how learning – and forgetting – occur within institutions themselves. Johnson (1992) suggests that in periods of rapid economic change the capacity for institutional forgetting may be just as important as the capacity for institutional learning. The accumulated inertia of existing habits or practices in economic and social institutions may block the potential for new learning processes. Old habits of thought and routines, even some norms and values, may have to be destroyed before existing social institutions can assimilate the new knowledge. “The difficulties connected with creative forgetting constitute a risk for irrational lock-in of resources. Tax rules, capital markets, the character of competition and ownership and other institutional factors affect how these questions are handled” (1992, p. 30). This question clearly seems relevant for the much wider range of social and political institutions identified by Perez as well.

The more difficult question involves the issue of how institutions learn. Lundvall has been in the forefront of those stressing the need for an increased emphasis on learning in the new economy, arguing that it may be more appropriate to describe the emerging paradigm as a “learning economy,” rather than a “knowledge-based” one. Learning in this respect refers to the building of new competencies and the acquisition of new skills, not just gaining access to information. The rapid pace of change associated with the “frontiers” of economically relevant knowledge, means that its economic value tends to diminish the more widely it is disseminated. The easier and inexpensive access to information tends to reduce the economic value of more codified forms of knowledge and information. In tandem with this, forms of knowledge which cannot be codified and transmitted electronically (tacit knowledge) increase in value, along with the ability to acquire and assess both codified and tacit forms of knowledge, in other words, the ability to learn. In this sense, the dramatic effect of information and communication technologies on the rapid diffusion and availability of information and the emphasis on a “learning economy” are integrally linked. It is the capability of individuals, firms, regions and nations to learn and adapt to rapidly changing economic circumstances that is more likely to determine their future economic success in the global economy (Lundvall and Borrás, 1998).

One way to approach the notion of institutional learning in the broader sense implied by Perez is through the concept of reflexivity. This idea is derived from a number of sources – not least the work of Anthony Giddens. For Giddens, reflexivity is grounded in the structures of social practice that are fundamental to his social analysis. “Continuity of practices presumes reflexivity, but reflexivity in turn is possible only because of the continuity of practices that makes them distinctively ‘the same’ across time and space. ‘Reflexivity’ hence should be understood not merely as ‘self-consciousness’ but as the monitored character of the ongoing flow of social life” (1984, p. 3). Moreover he ascribes the characteristics of reflexivity not only to individuals but also to institutions. This element of *institutional reflexivity* has been picked up by Cooke (1997) who suggests that a capacity for self-monitoring must be viewed as an aspect of the institutionalized intelligence required to cope with the need for constant innovation that the industrial economies face in the context of continuous change and uncertainty. He suggests that the kind of institutional intelligence implied by the notion of *institutional reflexivity* implies a fourth level of learning, above and beyond the three referred to above – learning-by-learning – an essential element of the associational economy. This idea is elaborated further in Cooke and Morgan (1998), who see reflexivity as a crucial dimension of intelligence that is fundamental for

the learning capacity of an organization or a region. They define reflexivity as “the systematic process which combines learning and intelligence such that, in a number of feedback loops, the system receives guidance” (1998, p. 73).

Charles Sabel further develops this notion with his analysis of *learning by monitoring*. Sabel argues that the creation of discursive institutions where economic actors engage in discussion can play a critical role in reconciling the demands of *learning* with the demands of *monitoring*. By learning, he means acquiring the knowledge to make and do things valued in the marketplace; by monitoring, he means the ability of the parties involved to ensure that the respective gains from learning are distributed among them according to standards that they have agreed upon. The activity of discussion is critical for reconciling these two objectives, for “discussion is precisely the process by which parties come to reinterpret themselves and their relation to each other by elaborating a common understanding of the world” (1994, p. 138; see also Sabel, 2000; Helper, MacDuffie and Sabel, 2000).

Michael Storper (this volume) places equal emphasis on the importance of fostering public institutions that encourage concerned parties to commit to the kinds of conventions and relations that support an institutionalized learning economy. He sees talk as an essential process for generating these kinds of conventions and shared understandings. The value of talk arises from the need for communicative interaction that goes beyond the mere transfer of information between parties to build the conditions essential to achieve mutual understanding and acceptance: “Talk refers to communicative interaction, designed not simply to transmit information and relay preferences, but to achieve mutual understanding. In the case of prospective learning, information from other experiences where learning has worked . . . can be valuable as a stimulus” (p. ??). The kind of talk that can build up this level of trust occurs most effectively within the context of public institutions, but the relation between talk and trust is highly circuitous – the inability to engage in the talk that can build trust and mutual understanding often reflects the absence of a tradition that values the presence of these kinds of public institutions. However, talk must be supported by a range of incentives that encourage the parties to maintain their involvement with these institutions. Small, repeated experimental interactions may prove effective as a mechanism for getting the parties to work together in a limited fashion and facilitate institutionalized learning.

Where this process succeeds, these institutions can play an important role in connecting the state to the economy, as well as various economic actors to each other. In institutions that foster learning by monitoring, actors can gauge the benefits they are gaining through their involvement without making themselves overly vulnerable. This allows them to achieve a limited degree of cooperation by defining common goals, yet continuing to scrutinize each other’s actions. Sabel suggests that this process may be particularly beneficial in situations of rapid economic change and in the emerging knowledge-based economy, where the production of complex goods requires the coordination of many specialized firms across diverse branches of the industrial and service sectors. Where learning by monitoring has successfully been institutionalized in this way, it allows actors to assess reflexively where cooperation is advantageous and mutually beneficial, by placing responsibility for the process directly on the actors themselves (Sabel, 1994, p. 159).

The concepts of *reflexive learning* and *learning by monitoring* bear a certain affinity to ideas that have also been developed in the international relations literature. Ernst Haas has written about the importance of learning in international organizations. By learning he means “the process by which consensual knowledge is used to specify causal relationships in new ways so that the result affects the content of public policy” (1990, p. 24). In this sense, learning occurs when members of the organization begin to question earlier beliefs about the appropriateness of the course of action that they are pursuing and to consider alternative ones – in other words, to reevaluate their approach. The learning process involves the development of new common understandings of the problems that members of the organization face and consequently, a shared approach to the solutions. In this sense, learning implies a sharing of meanings among those who learn.

Both Ernst and Peter Haas employ the concept of epistemic communities to expand on this notion of how learning takes place in international organizations. According to the latter, epistemic communities (networks of knowledge-based experts) play an important role in examining the cause and effect relationships among complex problems, helping to frame issues for debate in international settings and proposing specific points for negotiation which may help to define or point the way to potential solutions or international agreements (Haas, 1992). He defines epistemic communities as “a network of professionals with recognized expertise and competence in a particular domain or issue area” (1992, p. 3). Epistemic communities play an important role in helping overcome the problems of uncertainty and inertia that pervade international negotiations. Epistemic communities can help alter the negotiation strategies pursued by states in the international arena. States may respond to the new knowledge or new approaches generated by epistemic communities by pursuing new objectives or new negotiating strategies in the international context. Decision-makers are more likely to resort to the expertise available through epistemic communities under extreme conditions of uncertainty or following a shock to the international regime. Under these circumstances, epistemic communities provide insight by interpreting the cause and effect relationships that may have triggered the crisis or shock and they can help analyze the likely consequences of alternative courses of action. In situations of developing new or unprecedented approaches to dealing with international problems, epistemic communities can play a central role in defining new conceptual frameworks for dealing with the situation. Three of the essays included in this volume deal with just such processes: Robert Wolfe analyses the process by which decision-makers have devised new conceptual frameworks to expand the regime governing international trade relations; Tony Porter documents how decision-makers in international bodies struggled to respond to shocks to the existing international financial regime; while Liora Salter examines a similar process with respect to international standards for dealing with the myriad of issues generated by new technologies.

What this literature also makes clear is that social learning dynamics have become more important recently at the international level, just as they have at the national and sub-national (regional and local) scale, and for many of the same reasons. The emergence of new information and communication technologies has created the potential for internationally organized systems of production, trade and investment to be radically restructured. The same technologies have also created entirely new markets for telecommunications products and services, and these markets

are themselves structured on a global scale. They have also enabled the liberalization of the international financial system, with the risk of substantially increase system-wide instability. Against this backdrop, learning plays a key role in enabling the institutions that regulate economic processes to evolve and adapt to change.

These concepts provide us with a useful way to approach the question of social learning and institutional adaptation posed above. The institutional capacity of individual regions, nations and international regulatory regimes to respond to the challenge of economic restructuring stimulated by the emergence of a new paradigm may largely depend on their capacity for *institutional reflexivity*, that is, their capacity to monitor reflexively their own ability to shed inefficient institutional norms and practices and replace them with ones that assist the process of economic change and social adaptation. The creation of new institutions, or the transformation of existing institutions at the regional, national and international level where this can occur, is an essential part of this process.

OUTLINE OF THE BOOK

The essays gathered together in this volume explore the challenge of how social learning occurs at the broader level of organizations and institutional frameworks. While we would not claim that they provide definitive answers to the questions posed thus far, collectively, they provide some valuable insights into a number of the questions that we have raised.

The expanding domain of the global market, both functionally and geographically, poses a major challenge to states wishing to maintain social control of the economy while promoting dynamic growth. Farms and phones may seem an unlikely pair for a discussion of international institutional innovation, but they represent two sources of enormous political controversy that dominated the Uruguay Round of multilateral trade negotiations between 1986 and 1993 – the old issue of agriculture, and the new issues of intellectual property, investment, and services as they relate to telecommunications. In his chapter, Robert Wolfe approaches the world trading system as a set of social institutions created by states for co-ordination of economic flows between states. He argues that the possibilities for continued successful adaptation of these institutions in the face of new challenges will depend first and foremost on how states learn about new problems and potential solutions. This learning phase precedes (and indeed, makes possible) bargaining and negotiation between states. In both telecommunications and agriculture, we cannot understand how the institutions of the trading system adapted to structural change during the Uruguay Round without understanding how states learned. States learned from other states, often with the support of epistemic communities; they learned from the requests made of them and from the offers made by others. Moreover, the most crucial forms of interaction took place in face-to-face meetings between state officials, in which talk and mutual persuasion led to the development of commonly held understandings (“consensual knowledge”) of the most pressing trade issues of the day and potential avenues for their resolution. The greater role for global markets enabled by technological change has inevitably created a greater need for states to act together, thereby enhancing the importance of social learning on an international scale.

While it is commonplace to think of international finance as the domain of atomistic market actors, Tony Porter argues in his chapter that this sector of the world economy is in fact dependent upon a dense fabric of institutions, ranging from informal social institutions, such as the private tacit understandings that have regulated the Eurobond markets, to large formalized organizations such as the International Monetary Fund. Porter argues that the efficacy of these institutions depends crucially on their ability to evolve and adapt through learning, and his chapter analyzes the capacity of international financial regimes to learn. He argues that the system's capacity for higher level social learning has increased over time. But although we have seen a greatly increased capacity for communicating, producing, assessing and storing information, institutional fragmentation and the lack of open deliberation remain a serious problem. Hence, in contrast to Wolfe's analysis, Porter argues that in the realm of international finance, social learning leading to institutional innovation is reactive rather than proactive. In his view, instances of systemwide learning are sporadic and tend to appear most commonly in the wake of crises. This is most striking in the lack of coordination between the institutions concerned with prudential regulation and those concerned with the liberalization of financial flows.

Not all of the chapters presented in this volume are equally sanguine about the prospects for institutional learning and adaptation to occur in response to the emerging techno-economic paradigm. A critical precondition of the new information technology paradigm is the existence of standards for interconnection and for assuring harmonization. Liora Salter's chapter explores the processes and the institutional context of standard-setting in this paradigm. Standardization occurs in a complicated network of institutions, which are currently undergoing precisely the kinds of changes envisioned in this volume. New forms of organization are being created to take account of the particular demands of the emerging paradigm. However, Salter argues that institutions must meet two challenges to be worthy of the label "learning institutions." They must demonstrate creative adaptation within the new economy on its terms, and creative (i.e. democratic and humane) response to the pressures introduced by the new economy and its negative by-products. This case study of communication and information standards strains against much of the analysis presented in the rest of the volume in its negative assessment of the potential for collaboration, networking and social learning in these institutions. These findings must be factored into any discussion of "learning institutions," and into policy prescriptions for adapting to the new economy.

Salter is not the only contributor who foresees potential impediments to social learning. Lynn Mytelka's chapter explores the implications for localized learning stemming from the turbulence created by globalized innovation-based competition and the heightened capital mobility. She is especially concerned with its effects on the learning environment for small and medium-sized enterprises (SMEs), many of which are suppliers within international production networks. Mytelka argues that inward foreign direct investment has the *potential* to complement and catalyze production locally and stimulate innovation through knowledge spillovers and the transfer of information and technology through customer-supplier linkages. However, it can also crowd out local competitors, strip proprietary knowledge and other assets from these firms through mergers and acquisitions, and engage in a variety of market-distorting practices with highly negative effects for the achievement of broader social and economic goals. Accelerated

capital mobility, exacerbated at the regional level by what she calls locational tournaments, potentially erodes the basis for the development of localized learning economies.

Although the interest in social learning dynamics at the international and local or regional scales is well justified, it is important to acknowledge the enduring nature of national institutions and the key role they play in supporting these learning dynamics. While there seems to be growing consensus that shared, distinctive regional “cultures” play a vital role in facilitating social learning processes leading to innovation, the origins of these cultures remain somewhat obscure. Much of the existing literature emphasizes the role of regional histories and institutions in shaping regional cultures of cooperation and facilitating the joint production and transfer of new product and process innovations. In his chapter, Meric Gertler argues that this conventional explanation may overemphasize the influence of regional institutions, while underemphasizing the importance of institutional forces at the scale of the nation state. When users and producers interact to generate new knowledge through social interaction, they share considerably more than spatial proximity and cultural or communicative commonalities. Through the use of a case study involving the transnational interaction between technology users and producers, Gertler demonstrates that effective social learning is underpinned by a shared set of rules, expectations, norms and practices that arise from a common macro-regulatory framework. Although firms may wish to collaborate, if their individual evolution has not been shaped by a similar set of national institutions, the likelihood of success in achieving effective inter-firm learning will be considerably reduced.

Michael Storper reminds us that economies, to be successful, must be equipped to keep outrunning the powerful forces of standardization and imitation in the world economy. Once their firms’ products are imitated or their outputs standardized, these economies are subject to downward wage and employment pressures. They must become moving targets by continuing to learn. Storper suggests ways to construct frameworks of action in the learning economy, and identifies four major steps in the formulation of such an economic strategy. The first is strategic assessment. The second step is the definition of the capacities for action and identities of actors, which are associated with the world(s) of production to be assisted by policy. The third step is the implementation of specific versions of heterodox meso-economic policies, whose content is defined by a combination of technical assessment and social process, especially talk. Finally, and only at the end of this long and ‘soft’ process, can the need for further formal institution-building be realistically assessed and practically undertaken, the latter on the basis of confidence-building precedent (and hopefully success in learning), and consequently emerging collective identities.

Despite continued predictions of the “end of geography,” regions are becoming more important modes of economic and technological organization in the age of global, knowledge-intensive capitalism. Richard Florida’s central argument is that regions are themselves becoming focal points for knowledge-creation and learning, as they take on the characteristics of *learning regions*. In Florida’s conception, learning regions function as collectors and repositories of knowledge and ideas, and provide an underlying environment or infrastructure that facilitates the flow of knowledge, ideas and learning. They have thus become increasingly important sources of innovation and economic growth within the globalized economy. He suggests that we are likely to see a shift from strategies and policies that emphasize competitiveness to ones which

revolve around the concept of *sustainable advantage*. Sustainable advantage means that organizations, regions and nations shift their focus from short-run economic performance to recreating, maintaining and sustaining the conditions required to produce and support globally competitive firms over a longer period of time. According to Florida, the ability for government to adopt the principles of continuous knowledge mobilization and knowledge-intensive organization will become a source of sustainable advantage for firms, regions and nations in the 21st century.

Philip Cooke's chapter examines the extent to which regions can and do support innovation by firms and other organizations. He outlines the results of a large-scale research project on "Regional Innovation Systems" funded by the European Union (EU) and judges the degree to which diverse European regions match up to the theory and practice of "the new regionalism." The research examines nine EU regions and two from Central and Eastern Europe in order to determine the extent to which the competitiveness of regions was related to their degree of systemic innovation capability. Three key points emerge from this account of innovation and competitiveness amongst firms in diverse parts of Europe. First, despite the hype about globalization, most European firms spend much of their time and energy operating mainly in regional and national markets. Second, firms innovate because to compete they must produce higher quality at lower cost. Finally, the organizations that exist to help firms innovate are failing to do so. They are not used and not respected by firms because they do not meet their needs or help them to identify their needs. Cooke concludes that the whole regional innovation and enterprise support system is in need of serious overhaul with re-focusing within the EU Framework and Structural Funding programs, and more innovative thinking and action on innovation from the regions.

One of the key questions in regional development today – a question which resonates for theory, policy and practice – is whether interactive learning networks evolve organically, through the repeated transactions of firms and their cognate associations, or whether they can be constructed through judicious public policy. Dylan Henderson and Kevin Morgan argue that a radically new kind of regional policy is emerging in the European Union in which the accent is on collective learning and institutional innovation rather than upon basic infrastructure provision. They also argue that these new regional innovation policies signal the most determined effort to date to build social capital, a relational infrastructure for collective action predicated on trust, reciprocity and the disposition to collaborate to achieve mutually beneficial ends. There is a danger that the indicators used to assess these policies may not be appropriate; for example, new regional policies, which aim to raise innovation capacity, might be judged by the standards of the old regional policies (short-term job creation) and be prematurely jettisoned because they fail to meet these standards. Regional innovation policy, as expressed in the RTP and RIS programs they describe, clearly has its limits. At present these programs are small-scale, low-budget experiments that have yet to be fully deployed even in the regions where they have been pioneered. To be effective, Morgan and Henderson argue, such programs need to be taken up and extended by national and supra-national authorities in the EU, otherwise they might atrophy for lack of scale and resources. For all that, regional experimentalism might have some lessons for the higher echelons of the state, particularly as regards governance structures and policy-making processes, where politicians and officials too often think of themselves as tutors rather than

learners.

Finally, David Wolfe argues that the process of social learning poses a particular challenge for older industrial regions with mature or established economies, such as those in the industrial heartland of North America and Europe. In these economies, institutional practices are embedded in well-established cultural and social practices. In some instances, these practices may support innovation and social learning, but in others, they may not be particularly well suited to the institutional requirements of the new paradigm of the learning economy. In these cases, the need to “forget” may be a prior condition of the ability to learn. The inertial effect exerted by the power of old routines and habits may block the ability of firms or networks to develop new learning processes. Innovative attempts to stimulate a learning economy and create new associative forms of governance on a sectoral basis by the NDP government elected in Ontario in 1990 enjoyed limited success, but ultimately foundered on the resistance engendered by established cultural and social practices in some sectors and the political inability to forge a new development coalition to support the shift.

If all of the major studies of innovation agree on one thing, it is the finding that the most important innovations arise when previously separate and distinct bodies of knowledge are brought together in novel ways. It is our sincere hope that, by addressing ongoing conceptual debates in fields as diverse as economic geography, innovation systems, international relations, and the political economy of growth and development, the papers in this collection will themselves yield important insights into the structure of social learning dynamics and their role in the innovation process.

REFERENCES

- Barnes, T.J. (1999) ‘Industrial Geography, Institutional Economics and Innis’, in T.J. Barnes and M.S. Gertler (eds), *The New Industrial Geography: Regions, Regulation and Institutions*. London: Routledge.
- Berger, P.L. and Luckmann, T. (1967) *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. New York: Anchor Books.
- Cooke, P. (1997) ‘Institutional Reflexivity and the Rise of the Region State’, in G. Benko and U. Strohmayr (eds), *Space and Social Theory: Interpreting Modernity and Post-Modernity*. Oxford: Blackwell.
- Cooke, P. and Morgan, K. (1998) *The Associational Economy: Firms, Regions, and Innovation*. Oxford: Oxford University Press.
- DiMaggio, P. and Powell, W.W. (1991) ‘Introduction’, in W. W. Powell and P. DiMaggio (eds), *The New Institutionalism in Organizational Analysis*. Chicago: University of Chicago Press.
- Doremus, P., Keller, W., Pauly, L., and Reich, S. (1998) *The Myth of the Global Corporation*. Princeton: Princeton University Press.

- Dosi, G., Freeman, C., Nelson, R., Silverberg, G. and Soete, L. (eds). (1988) *Technical Change and Economic Theory*. London and New York: Pinter Publishers.
- Edquist, C. and Johnson, B. (1997) 'Institutions and Organizations in Systems of Innovation', in C. Edquist (ed), *Systems of Innovation: Technologies, Institutions and Organizations*. London and Washington: Pinter Publishers.
- Freeman, C. and Perez, C. (1988) 'Structural Crises of Adjustment, Business Cycles and Investment Behaviour', in G. Dosi, C. Freeman, R. Nelson, G. Silverberg and L. Soete (eds), *Technical Change and Economic Theory*. London and New York: Pinter Publishers.
- Gerth, H. and Mills, C. W. (1963) *Character and Social Structure: the psychology of social institution*, London: Routledge & Paul.
- Gertler, M.S. (2001) 'Best Practice? Geography, Learning and the Institutional Limits to Strong Convergence,' *Journal of Economic Geography* 1: 5-26.
- Giddens, A. (1984) *The Constitution of Society: Outline of the Theory of Structuration*. Berkeley: University of California Press.
- Haas, E. B. (1990) *When Knowledge is Power: Three Modes of Change in International Organizations*. Berkeley and Los Angeles: University of California Press.
- Haas, P. (1992) 'Introduction: Epistemic Communities and International Policy Coordination,' *International Organization* 46(1): 1-35.
- Hall, P. A. (1986) *Governing the Economy: The Politics of State Intervention in Britain and France*. New York: Oxford University Press.
- Hall, P. A. (1997) 'The Role of Interests, Institutions, and Ideas in the Comparative Political Economy of the Industrialized Nations', in M. I. Lichbach and A. S. Zuckerman (eds), *Comparative Politics: Rationality, Culture, Structure*. Cambridge, UK: Cambridge U.P.
- Helper, S., MacDuffie, J.P. and Sabel, C. (2000) 'Pragmatic Collaborations: Advancing Knowledge While Controlling Opportunism,' *Industrial and Corporate Change* 9: 443-488.
- Hodgson, G. M. (1988) *Economics and Institutions: A Manifesto for a Modern Institutional Economics*. Cambridge, U.K.: Polity Press.
- Hodgson, G. M. (1993) 'Evolution and Institutional Change: On the Nature of Selection in Biology and Economics', U. Maki and B. a. K. Gustafsson, Christian (eds), in *Rationality, Institutions and Economic Methodology*. London and New York: Routledge.
- Hollingsworth, J. Rogers (2000) "Doing institutional analysis: implications for the study of innovations," *Review of International Political Economy* 7:4 (Winter), pp. 595-644.

Innis, H. A. (1956) *Essays in Canadian Economic History*. M. Q. Innis (ed), Toronto: University of Toronto Press.

Johnson, B. (1992) 'Institutional Learning', in B-Å. Lundvall (ed.), *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers.

Johnson, B. and Nielsen, K. (1998) 'Introduction: Institutions and Economic Change', in K. Nielsen and B. Johnson (eds), *Institutions and Economic Change: New Perspectives on Markets, Firms and Technology*. Cheltenham: Edward Elgar.

Keohane, R. O. (1990) 'Multilateralism: An Agenda for Research', *International Journal* 45 (Autumn).

Lundvall, B-Å. and Borrás, S. (1998) *The Globalising Learning Economy: Implications for Innovation Policy*. Targeted Socio-Economic Research Studies, DG XII, Commission of the European Union. Luxembourg: Office for Official Publications of the European Communities.

Lundvall, B-Å. (1988) 'Innovation as an Interactive Process: From User-Producer Interaction to the National System of Innovation', in Dosi et al. (eds).

Lundvall, B-Å. (1992) 'Introduction', in B-Å. Lundvall (ed.), *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers.

Lundvall, B-Å. (1998) 'The Learning Economy: Challenges to Economic Theory and Policy', in K. Nielsen and B. Johnson (eds), *Institutions and Economic Change: New Perspectives on Markets, Firms and Technology*, Cheltenham: Edward Elgar.

Lundvall, B-Å. (ed.). (1992) *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers.

Morgan, K. and Nauwelaers, C. (1999) *Regional Innovation Strategies: Lessons for Less Favoured Regions*. London: The Stationery Office.

Mumford, L. (1934) *Technics and Civilization*, New York: Harcourt, Brace and World.

Nelson, R. R. (1988) 'Institutions Supporting Technical Change in the United States', in G. Dosi et al. (eds), *Technical Change and Economic Theory*. London and New York: Pinter Publishers..

Nelson, R. R. (1994) 'The Co-Evolution of Technology, Industrial Structure and Supporting Institutions', *Industrial and Corporate Change* 3(1): 47-63.

North, D. C. (1990) *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.

OECD. (1994) *Assessing and Expanding the Science and Technology Knowledge Base*, DSTI/STP/TIP (94)4, Paris: Organisation for Economic Co-operation and Development.

OECD. (2001) *Understanding the Digital Divide*, Paris: Organisation for Economic Co-operation and Development.

Perez, C. (1983) 'Structural Change and Assimilation of New Technologies in the Economic and Social Systems', *Futures* 15(5):357-75.

Polanyi, K. (1957a) 'The Economy as Instituted Process', K. Polanyi, C. Arensberg and H. Pearson (eds), in *Trade and Market in the Early Empires*, Glencoe, Ill.: The Free Press.

Polanyi, K. (1957) [Inc.: 1944] *The Great Transformation*, Boston: Beacon Press.

Ruggie, J. G. (1982) 'International Regimes, Transactions and Change: Embedded Liberalism in the Postwar Economic Order', *International Organization* 36(2): 195-231.

Rutherford, M. (1994) *Institutions in Economics: The Old and the New Institutionalism*. Cambridge, U.K.: Cambridge University Press.

Sabel, C. F. (1994) 'Learning by Monitoring: The Institutions of Economic Development', in N. J. Smelser and R. Swedberg (eds), *The Handbook of Economic Sociology*, Princeton, NJ and New York: Princeton University Press and Russell Sage Foundation.

Sabel, C.F. (2000) *Learning by Monitoring*. Cambridge, MA: Harvard University Press (forthcoming).

Schumpeter, J. A. (1950) *Capitalism, Socialism and Democracy*, Third ed., New York: Harper and Row.

Storper, M. (1997) *The Regional World*. New York: Guilford Press.

Tapscott, D. (1996) *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*. New York: McGraw-Hill.

US Department of Commerce (2000) *Falling through the Net: Toward Digital Inclusion*, Washington, D.C.

Veblen, T. (1919) *The Place of Science in Modern Civilization and Other Essays*. New York: B.W. Huebsch.

Weber, M. (1978) *Economy and Society: An Outline of Interpretive Sociology*, Guenther Roth and Claus Wittich (eds), Berkeley: University of California Press.

Whitley, R. (1999) *Divergent Capitalisms: The Social Structuring and Change of Business Systems*. Oxford: Oxford University Press.

Williamson, O. (1985) *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York: The Free Press.

Wolfe, D. (1988) 'Socio-Political Contexts of Technological Change: Some Conceptual Models', B. Elliott (ed.), in *Technology and Social Process*. Edinburgh: University of Edinburgh Press.

Wolfe, D. A. (1994) 'State, Law and Economy: The Reflexive Basis of Institutions', Canadian Institute for Advanced Research, Program in Law and the Determinants of Social Ordering, Working Paper No. 8. Toronto, October.

Zysman, J. (1994) 'How Institutions Create Historically Rooted Trajectories of Growth', *Industrial and Corporate Change* 3(1): 243-83.

Zysman, J. (1996) 'Institutions and Economic Development in Advanced Countries', in G. Dosi and F. Malerba (eds), *Organization and Strategy in the Evolution of Enterprise*. Basingstoke: Macmillan.