1. Introduction – human capital and agglomeration

**Charlie Karlsson, Börje Johansson and
Roger R. Stough**

In recent decades, we have witnessed an increasing interest in phenomena associated with the emerging knowledge economy. However, the concept as such was launched in the late 1950s and early 1960s (Drucker, 1959; Machlup, 1962). The fundamental characteristics of the global knowledge economy of today are on the one hand a continuous increase in knowledge investments such as education and knowledge production, and on the other hand, a widening application of knowledge in the development, production, distribution and use of goods and services. In this context, knowledge can be defined to comprise the abilities, capabilities, methods, creativity and persistence in identifying and solving problems by collecting, selecting, interpreting and applying existing knowledge and information (cf. van Oort and Raspe, 2007).

The above observations imply a distinction between knowledge as ‘an object’ and knowledge as talent, skills, know-how and understanding embodied in individuals. The concern of this book is primarily the latter aspect, including creativity as a dynamic and knowledge-enhancing capacity. It is individuals and teams of individuals who identify and solve problems and pursue activities that involve creation of new knowledge. It is also individuals who are responsible for advancing formal and informal education, where teaching, tutoring and other forms of exchange of ideas transfer knowledge to other individuals. Thus it is only natural that skills and abilities of individuals to solve problems and transfer knowledge are a focal point in the knowledge economy. These skills and abilities are built up in investment processes, which involve formal and informal education as well as learning by doing, learning by using and accumulation of experiences. Normally, we view the value of these skills and abilities of an individual as his or her human capital.

The increased interest in the knowledge economy has led to the development of new models of economic growth, frequently referred to as the

theory of endogenous growth, in which the production of knowledge is endogenously determined, and in which the spillover of knowledge plays a critical role in the growth process (Romer, 1986; Lucas, 1988). The foundation for the role of knowledge was in principle introduced several decades earlier in Arrow (1962) and Solow (1956, 1957), who both advocated the significance of learning mechanisms for increasing productivity. In the original versions of the endogenous growth theories, knowledge was assumed to move instantaneously and without friction between economic agents. However, it is obvious that the spread of knowledge is far from perfect and that knowledge transfer is a both time- and resource-consuming process (Karlsson and Johansson, 2006). This implies that different economic actors located at different points in geographical space have different knowledge access, even if they are in the same trade. Assuming that knowledge is essential in the growth process, this implies that different locations have different growth prospects given the differences in their knowledge accessibility. On top of this we can observe that the critical input in the knowledge economy – the human capital – is strongly concentrated in geographical space, much more so than most other types of economic resources and activities. In other words, we can conclude that human capital exhibits strong tendencies to agglomerate in certain locations.

In this discourse, it is interesting that economists have for a long time stressed that there exists a link between the agglomeration of human capital, sometimes called talent (Florida, 2002), and regional development and growth (Myrdal, 1957; Hirschman, 1958; Kaldor, 1970). The contributions from these scholars observe that urban regions function as seedbeds of creativity and innovation, and that human capital, in particular, is an important factor in stimulating economic growth (Park et al., 1925; Jacobs, 1961; Thompson, 1965; Lucas, 1988).

Park et al. (1925) were probably the first to stress the role of urban regions in concentrating and stimulating human creativity. Jacobs (1961) illustrated how urban regions function as open systems, which attract talented individuals from different backgrounds and spur their creative capacities. Lucas (1988) presented a formal theory showing how urban regions function as attractors for human capital, thereby forming an arena for the generation of new ideas and economic growth. It is in this connection important to observe that large urban regions are also the dominant communication and transport network nodes and as such the primary locations of emission and reception of knowledge and information. Because these regions contain concentrations of complex communication arrangements and transport terminals, information diffuses more easily from and to urban regions than it does within the hinterland of each urban region and otherwise peripheral areas (Florax and Folmer, 1992; Guillaing and Huriot, 2001).

In recent years, the literature on urban and regional economics has revealed a substantial increase of interest in how agglomeration in general and knowledge spillovers in particular affect the regional growth process at the firm level, the sector level and the overall level. This interest has developed into enquiries into how agglomeration economies can explain differences between regions in terms of the knowledge intensity of firms, and the knowledge spillovers between firms have been highlighted (Rosenthal and Strange, 2003; Capello and Nijkamp, 2004; Cheshire and Duranton, 2004). We can observe that human capital measured in terms of people with higher education¹ levels tend to agglomerate to a substantially higher degree than the population at large.² This naturally raises the following questions: Why do highly educated people, i.e. the carriers of human capital, tend to concentrate in large agglomerations? What are the agglomerative forces? How does this agglomeration of human capital affect different types of economic activities and in particular their location behaviour?

All these questions are formulated in the spirit of urban agglomerations as magnets, which attract persons who embody knowledge. They are assumed to select such locations, but why? How does the agglomeration of human capital and certain types of related economic activities affect regional growth and development? Other pertinent questions concern to what extent knowledge-intensive labour (i) becomes more productive in urban agglomerations; (ii) has greater opportunities to harvest the fruits of its knowledge investments in urban milieus; and (iii) does not crowd out others in the knowledge-rich regions.

These questions are examples of issues raised and discussed in this book. The purpose of this introductory chapter is to discuss these questions at an overall level as well as to provide an overview of the contributions by the different chapters in this book. The outline of this chapter is as follows: in Section 1.1 we discuss and try to explain why human capital tends to agglomerate in large urban regions. How this affects the location of different types of economic activities is analysed in Section 1.2. In Section 1.3 we discuss the effects that human capital agglomeration can have on regional growth and development. The contributions collected in this book are presented in Section 1.4.

1.1 THE AGGLOMERATION OF HUMAN CAPITAL AND TALENT

The tendency of human capital and talent to concentrate in cities and urban regions, i.e. to urbanize, has been known for centuries. In synthesizing the literature, the formation and growth of industrial as well as

modern cities at a general level are explained by benefits or more precisely spatially bounded externalities arising from a variety of market and non-market forces. At the same time, many researchers in the USA have advocated models of a representative city, characterized by an 'optimal size'. This phenomenon is often referred to as an inverted U-shaped (concave) curve, describing the relationship between the utility or real income per worker and the city's population or employment (Mills, 1967; Henderson, 1974). When smaller cities grow, workers benefit in terms of rising real per capita incomes due to the localized agglomeration benefits from increasing scale.³

The identified market and non-market forces include division of labour, lower search costs for matching specialized labour and firms, market size and non-traded intermediate inputs. Bigger and more dense local markets can, for example, support more varieties, and hence offer economies of diversity both in household consumption and in the use of local intermediate inputs (Krugman, 1991), where diversified inputs are assumed to improve innovation and efficiency among local producers (including exporters). Another important force is information spillovers, i.e. technological externalities from human capital, within industries and in input and output markets from economic agents in close proximity, which generate localized benefits for clustered firms when the spatial information decay is rapid (Henderson and Thisse, 2004; Rosenthal and Strange, 2004).

Duranton and Puga (2004) make a distinction between matching, sharing and learning mechanisms. The matching mechanisms work in such a way that the larger the number of employers and workers in a regional labour market, the higher are the chances for a good match between the needs of the employers and the skills of the workers, which increases regional labour productivity. Sharing mechanisms imply that spatial proximity between producers and customers allows both to reduce their spatial transaction costs, which induces lower prices, increased demand, higher output and higher wages. Learning mechanisms, finally, imply that the larger the number of people brought together in an urban region, the higher the potential for learning, which implies that knowledge production as well as knowledge diffusion becomes more efficient. In this case, one may wish to add that there is more to learn in knowledge-rich regions – and even more in large knowledge-rich places. Nevertheless, the general conclusion from this discussion is that clustering of firms and people may arise due to a number of different underlying forces generating spatially concentrated increasing returns to scale (Marshall, 1890; Duranton and Puga, 2004). With the general rise in real incomes, cities have also become centres of arts, entertainment and other amenities. Brueckner et al. (1999) show how the concentration of human capital increases with

the supply of regional amenities. A more general understanding of the urbanization process also demands that issues such as the development of infrastructures and institutions are brought into the picture (North, 1981).

To understand the underlying urbanization processes it is necessary to start from a microeconomic framework, which contains centrifugal as well as centripetal forces. There are numerous models of urbanization in the literature on regional and urban economics. The original two-sector models were set up to explain urbanization in general and not specifically the agglomeration of human capital. In the original models people move from a rural sector to a general urban sector as an effect of exogenous factors, such as (unexplained) technology shifts (Lewis, 1954). These two-sector models focus on questions such as the existence of urban bias, the effects of public policies on urban–rural development, and the efficient allocation of population between the rural and the urban sector at a given point in time. What is typical of these models is that they are static and that urbanization is driven by exogenous technological factors that favour either the urban sector or the terms of trade of the urban sector. Extending the microeconomic issues in this type of model would include questions such as: (i) does urban productivity rise because in-migrants are more productive, or (ii) do migrants and already established workers become more productive because a growing urban region gets augmented agglomeration economies, or (iii) because of the interaction effects of both individual effects?

In recent decades, another type of two-sector model – the core–periphery model – has been used to explain urbanization (Krugman, 1991; Puga, 1999). These models usually specify two interacting regions. The core question in these two-sector models is the following: what conditions will retain two agglomerations, and what conditions will channel urbanization towards one of the regions? When the latter happens, an important and disproportional share of economic activities becomes concentrated in one of the regions. These models assume that there exists one sector characterized by monopolistic competition. The normal starting point is two identical regions that initially are affected by some external factor such as an exogenous (historical) location decision, which makes one of the regions the largest, or a technological improvement, which reduces transport costs in one region relative to the other. This external factor induces the development of an expanding core and a declining hinterland due to the existence of increasing returns. These models have a limited focus, since they target the analysis on what happens to the core–periphery relationship, when, for example, transport costs fall. This implies that even if these models are spatial models, their power to highlight agglomeration and urbanization in general and the agglomeration of human capital in particular remains unexploited. To provide a better understanding of agglomeration and

urbanization in a more comprehensive way, the models must be capable of depicting the city formation process more generally. In this sense, there is a need for formulations with several urban regions, whose number and size are determined endogenously in a dynamic process. Fujita et al. (1999) struggle with this issue, and Fujita and Thisse (2002) suggest alternative ways to elaborate such ideas.

Within the framework of an exogenous growth model, it is possible to illustrate how increases in national population are accommodated through increases in the number of cities in the national system of cities (Henderson and Ioannides, 1981). Efficient city size will also grow due to exogenous technological changes, which increase agglomeration economies or reduce the commuting costs in urban areas. These basic ideas were developed by Black and Henderson (1999) in an endogenous growth model, where there are two types of cities, each using different technologies and having different human capital intensities. In their model, members of growing dynastic families are allocated between the two types of cities. Human capital is the only capital in the model and there is no formal market for human capital. However, there exists an intra-family capital market with family members in low capital-intensity cities lending to those in high capital-intensity cities. People in cities with a high human capital intensity earn a (positive or negative) premium relative to those in the other type of city, but their nominal wages must be high enough to pay back the human capital they have borrowed in order to earn the returns of their higher required levels of human capital.

Assuming conditions allowing for steady-state growth, people accumulate human capital continuously. The regional stock of human capital within cities generates a knowledge externality, which is translated into improved production efficiency and thus the efficient city sizes grow continuously. The urban knowledge externalities are the source of national economic growth. Hence urban and national growth processes are interdependent, parallel processes. In the Black and Henderson model, both types of cities grow at the same rate in terms of their size, and if the national population growth is high enough, both types of cities grow in number at the same rate.

What more can be said about the agglomeration of human capital and talent? In terms of modelling, there exist endogenous urban growth models with human capital agglomeration. In the model presented by Henderson and Wang (2005), there is a migration from rural to urban sectors driven by increased human capital and per capita income. The urban sector consists of many cities, which grow in size with human capital accumulation and in number as the national population increases and people move from the rural to the urban sector. The demand for food products produced in

the rural sector is assumed to be income inelastic. This implies that as real incomes increase, the relative demand for food products will decline at the same time as the productivity in the food sector increases. Thus labour will be pushed out of the rural sector, and induced to move to the urban sector as the relative demand for urban products increases over time. However, to get a deeper understanding of the agglomeration of human capital there are a number of further questions that need to be considered:

- What induces people to invest in human capital?
- What is the composition of the labour demand in the rural and the urban sector, and how does it change over time?
- What factors induce educated, knowledge-intensive labour to move from the rural to the urban sector?
- Why do certain activities prefer to locate in cities and urban regions?
- How does the composition of urban activities change over time?
- What role do infrastructure and institutions play in the urbanization process?
- Is there an inter-urban equilibrium that is consistent with a change process involving both expanding and declining urban regions?

1.2 HUMAN CAPITAL AGGLOMERATION AND THE LOCATION OF ECONOMIC ACTIVITIES

To more fully understand why human capital has such a high tendency to agglomerate in cities and urban regions, one needs to fully explore urban regions as places for both production and consumption. It seems obvious, starting with the production aspect, that certain industries and activities in the economy at each point in time prefer an urban location, and thus can be classified as urban industries and activities. Certain industries such as universities have largely been urban for centuries with a few noted exceptions, at least in the USA, of universities located in more rural and isolated places. Other industries, such as many of the manufacturing industries that developed in the city centres during the industrial revolution, have with few exceptions left the city centres to locate either in the outskirts of the city region or in more peripheral places, including totally non-urban locations. Recent decades have witnessed how, for example, knowledge-intensive business services agglomerated historically in urban centres and, in particular, in the core of large urban regions.

One major reason for the agglomeration of production in urban regions and metropolitan areas today is the existence of various positive externalities such as:

- the potential to realize internal economies of scale in a larger and denser market;
- the existence of a larger labour market with a more diverse and specialized labour force;
- the existence of a larger supply of specialized input services;
- the existence of well-developed intra- and interregional infrastructures, which allow for frequent local face-to-face interaction with customers and suppliers in the region as well as planned face-to-face interaction with customers and suppliers in other regions.

Industries and firms with knowledge-intensive and knowledge-creation activities that demand accessibility to a labour force with deep and varied knowledge and specialization, as well as labour equipped with special talents, will be attracted by the labour market in large and dense urban regions. The underlying reason is that the competitiveness of firms in these industries is critically dependent upon their creativity (Andersson, 1985; Fujita and Thisse, 1996). The level of creativity is a function of personal communication within groups of people with common interests and goals (Lucas, 1988). However, distance is a barrier to the spread of information and knowledge (Hägerstrand, 1965). Thus efficient communication within such groups is dependent upon the options for face-to-face interaction (Saxenian, 1994), since the knowledge to be exchanged is often complex, uncertain and developing. The incentives to develop interactive communication come from the need to avoid the risk of misunderstanding when the knowledge involved is complex (Gaspar and Glaeser, 1998). Here frequent encounters are critical for an efficient diffusion and good understanding of information and knowledge (Leonard and Strauss, 1997). A prerequisite for efficient communication is that the individuals involved understand things in the same way and thus share the same culture (Arrow, 1974; Cohen and Levinthal, 1990). Proximity between economic agents favours the establishment of a common language and thus facilitates the understanding of the information and the knowledge exchanged (Guillain and Huriot, 2001). Proximity is a vehicle for calibrating the processes of encoding and decoding complex messages.

The size of the communication groups is critical, since people have different skills. To solve complex problems and to create new knowledge, the groups must be large enough to contain the necessary complementary skills and experiences. Knowledge creation and problem solving are critical for competitiveness in the modern knowledge economy, which implies that the most important activity of economic agents to achieve this is information and knowledge exchange. Due to their rich and specialized supply of arenas for such exchange processes, large and dense

urban regions offer the best conditions for arranging such communication activities – ranging from congress meetings to bars – and it is natural that such information-intensive activities agglomerate in large urban regions (Fujita and Ogawa, 1982).⁴ Florida (1995) characterizes such regions as ‘learning regions’, although the label ‘creative regions’ seems more to the point. In Florida’s interpretation firms benefit from concentrating their activities in such regions, because such locations allow them to minimize transport (contact) costs for a given level of learning, and to maximize their learning with a given budget for interaction costs. Firms striving to augment their creative capabilities have strong incentives to locate in these learning regions.

Consider now that new problems to be solved are emerging. Under such conditions, there is a need to change the composition of the creative groups. Large urban (metropolitan) regions are proper places for such rearrangements. This implies that large and dense urban regions give rise to substantial static and dynamic scale and scope effects, because in such regions it is possible to have many creative groups as well as to change the composition of each group over time. It must also be acknowledged that ideas and knowledge have public-good characteristics, which implies that the communication processes will generate localized spillover effects. This implies that the creative processes in large urban regions themselves can induce strong agglomeration tendencies (Fujita and Thisse, 1996).

Large urban regions and, in particular, metropolitan regions are centres of innovation, headquarters and the locus of advanced business services. Large urban regions are normally highly diversified,⁵ making it possible for new firms but also for development units in established firms to experiment with different technologies until they learn what technology best satisfies their goals (Duranton and Puga, 2000). When firms have adopted a standard technology, production will be decentralized to smaller, more specialized urban regions. According to this model, large diversified urban regions function as centres for R&D and innovation and as incubators for new high-tech products. The market penetration and routine development of these products follow the product cycle model in the sense that once a product has become standardized and its production process has become routine, the location of its production will move to smaller cities or be off-shored to countries with lower land and labour costs.

Duranton and Puga (2005) present a model of functional specialization in large urban regions. For the organization of production and final sale, the large multinational firms need specialized business services, which Duranton and Puga summarize as ‘headquarter functions’. Due to the improvements in transportation and communication technologies, these headquarter functions can be localized in large urban regions, often far

away from many of the production facilities located in smaller cities all around the world. Such a location makes it possible for the headquarters to buy inputs locally from specialized business service firms in areas such as R&D, marketing, financing, law, exporting, logistics etc. The co-location of headquarter functions in large urban regions generates agglomeration benefits due to the shopping behaviour of these headquarters. Together they create the foundations for a wide variety of specialized intermediate business service firms from which the headquarters can buy locally when they want to outsource various services.

As the urban demand for educated and experienced individuals expands, wages for such kinds of employees will increase, and more and more of these individuals are attracted to these regions. A large market is attractive for individuals who are rich in human capital, because it provides better expected job matches and thus a higher wage (Kim, 1990), but probably also a more interesting job. It also offers lower risks for unemployment in case of idiosyncratic employment shocks. Large urban regions generally offer more 'liquid' labour markets to people with specialist skills. In order to attract human-capital-rich employees, knowledge-intensive firms may be forced to offer jobs in large urban regions with liquid labour markets. To attract these employees to other regions they would normally need to pay substantially higher wages.

Urban regions are also the location of institutions of higher education, which implies that they also attract households that give priority to education possibilities for their children. In addition, the location of one or several universities in an urban region means that the conditions for communication externalities are greater in these locations.

1.3 HUMAN CAPITAL AGGLOMERATION AND REGIONAL GROWTH AND DEVELOPMENT

The early development economists in the postwar period emphasized that the spatial agglomeration of human capital generated benefits over and above the private returns reaped directly by the individuals themselves. Today these social benefits are usually considered the result of either market-mediated or extra-market-mediated⁶ human-capital externalities (Moretti, 2004a). Contributions by Arrow (1962), Romer (1986) and Lucas (1988) stress that human-capital externalities arising from uncompensated learning processes between individuals are an important source of economic growth, underpinning the importance of arguments, which refer to technological non-market externalities. However, pecuniary market externalities related to human capital, for example, may arise

if firms choose their investments in physical capital in anticipation of the expected average human capital of their future employees (Acemoglu, 1996). It is in this context important to distinguish between (i) static externalities, which imply that increases in human capital have a one-time effect on output (Lucas, 1988), and (ii) dynamic externalities, which imply that increases in human capital make the economy grow faster, due either to a larger number of innovations (Romer, 1990) or to more efficient imitation of technologies developed by others (Nelson and Phelps, 1966). If we are able to demonstrate that there exist human-capital externalities, this has indeed strong policy implications (Aghion and Howitt, 1998).

Obviously there are strong theoretical arguments but also tentative empirical evidences that the agglomeration of human capital contributes to regional development and growth. Empirical studies, for example, have found that an urban region's supply of educated people plays an important role in generating urban growth in metropolitan areas in terms of population, employment and incomes (Glaeser et al., 1995). Glaeser (1994) showed that the association between human capital and growth seems to get stronger over time. Black and Henderson (1999) found in a panel context for the USA that cities with higher shares of college graduates grow faster in each decade during the period 1940–90.⁷

Rauch (1993) found empirically that the geographic concentration of human capital significantly increases productivity and wages. He approached his research problem by augmenting the standard wage regression of the Mincer type (Mincer, 1974; Card, 1999) with data on the properties of the cities where individuals are located. In his empirical modelling, he related the wage w of individual i in city c to basic characteristics of the individual, such as education and experience, X_{ic} , to the average level of schooling in city c , S_c , and to other characteristics of city c , Z_c , using the equation

$$\log w_{ic} = \alpha X_{ic} + \beta S_c + \gamma Z_c + \varepsilon_{ic},$$

where ε_{ic} accounts for all unobserved factors influencing individual wages across cities. By estimating the above equation using data for US cities in 1980, he found β to be significantly positive, indicating the existence of human-capital externalities at the city level in the USA. Rauch's approach has certain drawbacks: (i) it does not account for unobserved city characteristics, which are time-invariant, while still affecting both schooling and wages; and (ii) it assumes city-level schooling to be exogenous.

Rosenthal and Strange (2004) report in their literature survey that there seems to be a consensus that a doubling of the size of cities is associated with a productivity increase in the range of 3 to 8 per cent. Other

studies have shown that if the employment density is doubled, wages and productivity increase by about 6 per cent in the USA (Ciccone and Hall, 1996), by about 5 per cent in European countries (Ciccone, 2002), and by 4 per cent in the UK (Anastassova, 2006). Karlsson and Pettersson (2005) show in panel study of urban centres in Sweden that a 10 per cent increase of local accessibility to population, i.e. labour, increases gross regional product per square kilometre by more than 5 per cent. Furthermore, the share of the labour force with three or more years of university education also has a significant positive effect on regional product. For Germany, Möller and Haas (2003a, 2003b) found that a doubling of the employment density tended to raise individual wages by about 2.5 per cent and that these benefits increased with the skill level. However, this is not a measure of human-capital externalities, since it also includes the effects of other influences. Suedekum (2006) analyses human-capital externalities in a study of the effect of regional human capital shares on regional employment growth. He finds that regional human-capital accessibility has a positive impact on subsequent employment of low-skilled workers, indicating a complementary relationship between skilled and unskilled workers. Moretti (2004b) reports that he found the largest wage increases for college students between 1980 and 1990 in the US cities where the share of college graduates had increased most. In another study using plant-level data, he found that the output of plants in high-tech city industries did rise with the levels of schooling in other high-tech industries in the same city (Moretti, 2004c), which is consistent with the existence of human-capital externalities. However, there is an alternative explanation. It could be that skill-based technological progress is translated into productivity and wage increases of college graduates in high-tech industries. In such a scenario, cities specializing in industries having rapid productivity growth would experience faster growth and attract more college graduates from other regions. The period 1980–90 was characterized by increased wage premiums for college graduates, which Katz and Murphy (1992) explain by skilled-based technological progress, which supports the alternative hypothesis.

It has been questioned to what extent the urban wage and productivity premium can be ascribed to human-capital externalities. Glaeser and Mare (2001) argue, for example, that a large part of the urban wage premium is due to spatial sorting of workers with respect to observable and unobservable characteristics. Still, they find that human-capital externalities increase wages in urban regions by about 12 per cent. For French cities, human-capital externalities are estimated to increase wages in urban regions by about 3 per cent (Combes et al., 2008).

One reason for the current uncertainty concerning the size of the

human-capital externalities is the critical identification problems involved (Angrist and Kreuger, 2001). Omitted variables in the econometric specification may imply that human-capital externalities are not properly identified. If, for example, shifts in the supply of and demand for different skills in urban regions, i.e. structural change, are not acknowledged in the analysis, this could lead to substantially biased estimates. Ciccone and Peri (2006) show, using a Mincerian wage equation, that a positive effect of average schooling may not be due to human-capital externalities. Instead, they suggest an alternative approach, which starts from the fact that the wage differential between workers with low and high education mirrors differences in marginal social products between the two types of workers when human-capital externalities are absent. According to their results, there is no significant evidence of human-capital externalities at the level of US states and cities.

It is also interesting to note that the use of instrumental variables in some cases, as in the study by Acemoglu and Angrist (1999), has reduced social returns from education to below 1 per cent, which is substantially lower than in earlier studies. They assume that US states rather than cities are the relevant aggregates when estimating the equation used by Rauch (1993). They show that at the state level changes in compulsory schooling and child-labour laws can be used as instruments for changes in average schooling at the state level. According to their study, there is no evidence between 1960 and 1980 of significant schooling externalities.

However, Heuermann (2008), using instrumental variables in a study in Germany, finds human-capital externalities to be an important wage-determining factor. According to his estimations, the regional share of highly qualified workers increases wages by 1.8 per cent for highly qualified workers and by 0.6 per cent for other workers. He claims that human-capital externalities are underestimated by about 50 per cent in simple regressions for workers at all qualification levels. He interprets his results to indicate that knowledge externalities emerging through communication and learning processes are of greater importance for highly qualified workers, while other workers are influenced primarily by pecuniary externalities coming from investment decisions by firms affected by the overall regional human-capital endowments.

This introductory overview has highlighted some of the current knowledge as regards three critical questions related to the emerging knowledge economy: (i) why do human capital and talent tend to agglomerate in large urban regions? (ii) how does this agglomeration affect the location of different types of economic activities? and (iii) how does this agglomeration affect regional growth? In this way we have presented important aspects of the state of the art in the field, which serves as a foundation for the

different contributions contained in this book. The contributions in this book extend the current research frontier in three directions, with their focus on the role of human capital and talent for creativity, entrepreneurship and regional development, the role of institutions for the behaviour of firms and entrepreneurs and the influence of the global context for the location, export and innovation behaviour of firms in a knowledge economy.

1.4 STRUCTURE AND CONTRIBUTIONS

The content of this book is presented in the subsequent 13 chapters as well as in this introductory chapter. The 13 chapters are organized in three subparts: Chapters 2–7 focus on human capital and talent, Chapters 8–10 on institutions, and Chapters 11–14 on the global context.

1.4.1 Human Capital and Talent

Chapter 2, by Charlie Karlsson and Börje Johansson, is a conceptual effort that seeks to underpin the other contributions in this book with a solid review and synthesis of the relationship between creativity, knowledge and regional development. The understanding of economic development in regions in developed countries has gone through a fundamental change during recent decades. Nowadays, regions are increasingly looked upon as quasi-independent, dynamic marketplaces that are connected via flows of interregional and international trade, and via knowledge flows. Regional development is driven by changes in the economic specialization, which can be explained by two different, but complementary, theoretical frameworks for analysing location and trade, one old and one new. The old theoretical framework assumes that changes in the economic specialization of regions depend upon changes in the supply of durable and semi-durable regional characteristics. The new theoretical framework, known as the new economic geography, assumes that changes in the economic specialization of regions are driven by the dynamic interaction of regional market potentials and rational firms experiencing increasing returns. In their pure form, these theoretical frameworks can explain changes in regional economic specialization and consequently regional development without any reference to knowledge creation and other changes in knowledge assets. This is certainly a bit odd for a period of history often referred to as the era of the knowledge economy. So, does knowledge have no role to play as a force driving regional specialization and regional development? Or, is it the case that the traditional ‘knowledge-free’ explanations of changes in

regional specialization and regional development are missing important points? In this chapter, the authors claim that knowledge infrastructure, human capital, talent, creativity, knowledge generation, knowledge protection, knowledge accumulation, knowledge appropriation, knowledge flows etc., as well as the creative use of knowledge, are basic factors that influence the specialization of regions and hence of regional development in both a regional and a global context.

In Chapter 3, Corinne Autant-Bernard, Pascal Billand and Nadine Massard stress that science has always been ‘cooperative’ in the sense that, with the development of modern scientific methods and the scientific journal system, scientists have communicated their findings to each other, both formally and informally. However, to anyone concerned with the creation and diffusion of knowledge and its application, it is clear that we are in a time of intense change. The main feature of this change is probably the increasingly networked nature of knowledge creation. The innovation process involves more and more actors, and more interconnected actors. These transformations are likely to affect both the location of R&D and the nature of new knowledge creation. Therefore they bring forth new issues for the geography of innovation. The aim of this chapter is to point out the main questions that arise when mapping knowledge diffusion over space and to suggest some research directions to deal with these questions.

In Chapter 4, Mediha Sahin, Alina Todiras and Peter Nijkamp argue that migrant entrepreneurs are new opportunity seekers in the urban economy and essential for a vital modern city. The phenomenon of ‘migrant entrepreneurship’ refers to business activities undertaken by migrants with a specific sociocultural and ethnic background or migrant origin. Migrant entrepreneurship distinguishes itself from ‘normal’ entrepreneurship through its orientation to migrant products, to migrant market customers or to indigenous migrant business strategies. Migrant groups that produce a strong entrepreneurial group can be of great economic significance for the migrant business community as well as for the total community, through job and opportunity creation. Recent literature has documented that migrant businesses are one of the fastest-growing sectors in the Dutch economy.

However, knowledge and information that documents entrepreneurial differences among migrants is lagging far behind this rapid growth. Previous research has mainly focused on knowledge of native entrepreneurs that informs mostly policy, education and research. Against this background, this chapter aims to investigate entrepreneurial similarities and differences from a multicultural perspective on migrant entrepreneurs. The authors focus mainly on four active and prominent migrant groups in the Netherlands: Turks, Moroccans, Surinamese and Antilleans.

First, they give a brief historical overview of migration from and to the Netherlands with an emphasis on postwar immigration and its impact on Dutch society. Next, they discuss the living and working conditions of migrant groups and they compare these groups with each other as well as with native Dutch groups in terms of their entrepreneurial behaviour. Their comparison and evaluation are, of course, limited by the available data. After evaluation of the development of migrant entrepreneurship in the Netherlands, they examine the basic concepts of migrant entrepreneurship on the basis of the main characteristics and psychological, sociological, economic and demographic determinants. Finally, they consider some socioeconomic and sociocultural effects of migrant entrepreneurship on the national economy, sustainability and diversity.

Juan Julio Gutierrez in Chapter 5 explores the determinants of three innovation outputs in low- and medium-technology (LMT) manufacturing factories located in El Salvador, Guatemala, Honduras and Nicaragua. These countries are participants in the Central American Free Trade Agreement with the USA. Three types of innovations are discussed in this chapter: (i) new products; (ii) new production processes; and (iii) small or incremental changes in product performance, which may over a long time period have major technological and economic effects. The theoretical basis for identifying the determinants of innovation outputs builds upon two strands of literature. First, innovation is dependent on the factory's networks of internal and external relationships. The internal network is equated to intrafirm cooperation, which encompasses the relationship of local foreign-owned factories with their headquarters. The external network is divided into inter-factory and interfirm relationships and institutional relationships. Second, innovation inputs that produce technological change are: (i) adaptation and development within the factory; (ii) acquisition of machinery and equipment; and (iii) human capital. The analytical framework is applied to a cross-country factory-level database of LMT manufacturing industries (the World Bank's 'Investment Climate Survey'). The results support the idea that external networks, mainly interaction with universities, and purchasing of foreign licences constitute a mechanism for generating innovation outputs in LMT sectors. However, foreign ownership does not seem to have a positive impact on innovative output, which indicates enclave characteristics of foreign-owned factories. On the input side, the results show importance and robustness with regard to: (i) machinery and equipment acquisition, where new technology is embodied in those capital goods; (ii) adaptation and development within the factory, where learning by doing is an integral component in the process of making incremental output innovations in LMT manufacturing industries; and (iii) the hiring of new personnel, which helps absorb,

use and adapt new technology, assuming that technological know-how is embodied in technical personnel.

There is an increasing interest in the role of endogenous factors in regional development. The literature places emphasis on factors such as regional industrial structure and diversification/specialization, human capital, population size and growth, leadership and institutional arrangements, in addition to the traditional concern with regional resource endowments. Robert J. Stimson in Chapter 6 reviews the evidence from Australia on the role some endogenous factors play in differentiating regional performance in mainly non-metro settings.

Michael Olsson in Chapter 7 stresses that the mobility of workers is important, not least as a source of knowledge transfer. In the labour market, unemployed persons face accessibility to vacancies, and employers with vacancies face accessibility to unemployed persons. In a country like Sweden, the unemployment insurance regulations state some rather strict mobility requirements for those unemployed who are insured against unemployment. If these regulations were used in practice by the labour market agencies, the two accessibilities would change substantially compared to the current practice. Moreover, this would have consequences for the flow of knowledge.

1.4.2 Institutions

In Chapter 8, Kristina Nyström uses an institutional approach to investigate the relationship between the regional institutional environment and regional new firm formation. The importance of perceived attitudes regarding private enterprises, local taxes, political majority, the size of the government sector, and perceived rules and bureaucracy on new firm formation in 286 Swedish municipalities are investigated. The empirical findings show that perceived positive attitudes towards private enterprises and political governance by a right-bloc majority tend to have positive effects on new firm formation. A large local government sector, on the other hand, tends to have negative (crowding-out) effects on regional new firm formation. This chapter also explores if the effect that different regional institutional arrangements have on new firm formation is similar across industries. The pattern in the private service sector industries is most similar to the general pattern in the economy, while perceived rules and bureaucracy is the only institutional–environment variable that has an impact on new firm formation in manufacturing industries.

Referendums in which imperfectly informed individuals are called to vote for or against an innovative project can bring about inefficient outcomes, as compared to the outcomes that would arise with

completely informed individuals. In Chapter 9, Tsuyoshi Hatori and Kiyoshi Kobayashi present an incomplete information game to investigate the influence of interest groups' voices on judgements of individuals. It is shown in the chapter that, because of the lack of knowledge of individuals about an innovation project, a limited number of interest groups that disagree with the innovation can use their voices in strategic fashion and try to prevent a referendum outcome containing the majority will. Alternative institutional designs are introduced to overcome this inefficiency, and some problems regarding the referendum process are outlined.

In Chapter 10, by Kakuya Matsushima and Kiyoshi Kobayashi, the risk-sharing structure between the firm providing transportation services and the customers of the pre-paid and post-paid systems is investigated theoretically. The pre-paid systems refer to the complete contracts that have to be established before service transactions, while the post-paid systems refer to the incomplete contracts, where the application of the pre-paid specified fare structure is described in the contract, and the actual payments are conditional upon the actual consumption by the consumers. The three-period contract model is formulated to investigate the impacts of pre-paid and post-paid systems upon the firm's profit and the consumers' welfare. The chapter concludes that social welfare can always be improved by introducing a post-paid system in addition to the conventional price system.

1.4.3 The Global Context

Gary S. Cook and Naresh R. Pandit in Chapter 11 examine the small but growing literature that offers explanations for the location of multinational enterprises (MNEs) in clusters. It tests propositions of this literature against the findings of a study that compares MNEs and non-MNEs regarding the advantages and disadvantages of a location in the City of London financial services cluster, which has an extraordinarily large MNE component. As such, it makes a contribution towards current efforts to bridge the gap between the established theories of MNEs and those of industrial clustering. The evidence presented in the chapter is based on 39 semi-structured interviews with very senior managers across seven major subsectors of the financial services industry in London and 310 postal questionnaires. The primary conclusion in this chapter is that MNEs and non-MNEs have different and multiple motives for locating in the cluster. MNEs perceive significantly higher benefits of close proximity in terms of competing with rivals and benchmarking against them compared to non-MNEs. Moreover, they perceive significantly higher benefits in terms of ease of communication and ability to have face-to-face contacts than

non-MNEs, undermining popular ‘end-of-geography’ arguments. The authors also reach two auxiliary conclusions. Strong clusters generate disadvantages in the form of congestion and the like, and this is perceived as a disadvantage by MNEs. Moreover, since disadvantages may change over time, MNEs need continually to assess which activities they need to locate in a cluster. The second auxiliary conclusion is that for MNEs, clusters may provide advantages over and above those available to non-MNEs.

During the 1980s, many economists started to use the term globalization as a catchword for an increased interaction between countries in world trade. However, the literature does not provide a clear definition of globalization. In Chapter 12, Börje Johansson and Desirée Nilsson set up a number of criteria and formulate hypotheses about globalization, which they explore for Swedish export flows during the period 1965–2000. Globalization, in this chapter, is referred to as increases in country diversity, extended export radii, less effect of distance on trade flows, and increases in the ratio of exports to importing countries’ incomes. However, the results from the empirical analysis do not support the hypotheses of increasing trade globalization. It is rather the case that export flows are becoming more internationally regionalized.

Martin Andersson, Sara Johansson and Hans Lööf in Chapter 13 present a comprehensive description and analysis of the international trading activities of firms based on new detailed Swedish data. As a small open economy with a limited domestic market, Sweden constitutes an interesting contrast to existing evidence. The authors show that many of the stylized facts from large countries (specifically the USA) about firms’ participation in international trade also pertain to a small open economy. They provide robust evidence of selection operating from market to market, which is consistent with the hypothesis that firms with a low productivity level are confined to markets with low productivity thresholds. Furthermore, they show that selection also applies to the number of products traded. Both export and import productivity premiums increase with the number of markets and number of products traded, respectively. There is a substantial heterogeneity among exporters and importers in terms of the number of markets they trade with, and in terms of the number of products they trade.

The purpose of the final chapter in this book, Chapter 14, written by Urban Gräsjö, is to analyse the effects of national and international knowledge flows on innovative activity. Therefore a knowledge production function is estimated with patent applications in Swedish municipalities as the measure of innovation. The knowledge resources applied are R&D investments and high-value imports. In order to account for the importance of proximity, the knowledge resources are expressed as accessibilities. The

total accessibility of a municipality is decomposed into local, intraregional and interregional accessibility. The main results indicate that the knowledge resources in a given municipality tend to have a positive effect on the innovative activity of another municipality, given that the municipalities belong to the same functional region. Thus the results of the analysis indicate that knowledge flows transcend municipal borders, but that they tend to be bounded within the functional region. This result holds for both R&D investments and high-value import products.

NOTES

1. According to the human capital theory, education enhances an individual's skill level and thereby his or her human capital (Schultz, 1961; Becker, 1964). A workforce with a higher skill level increases the production capacity of an economy.
2. In the Nordic countries, for example, this evolution is combined with an increased share of knowledge-intensive labour in medium-sized urban regions as well (e.g. NUTEK, 2006).
3. The inverted U-shaped (concave) form implies that at some point the marginal benefits of increasing city size are overtaken by rising marginal costs for commuting and other diseconomies. The idea of a concave curve is at best a 'tentative simplification' and discussions of the pertinent diseconomies are beyond the purpose of this introductory chapter.
4. Actually, Beckmann (1976) suggested the need for interaction among individuals as an explanation for the existence of cities.
5. Baumont et al. (1998) maintain that cities and urban regions can be defined basically by the concepts of agglomeration and diversity.
6. Extra-market externalities from human capital accumulation include reductions in crime rates, better-informed voting decisions, improved health-related behaviour etc. (Davies, 2002).
7. The association between human capital and urban growth also holds for much longer periods, as shown by Simon and Nardinelli (1996) using data for England.

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