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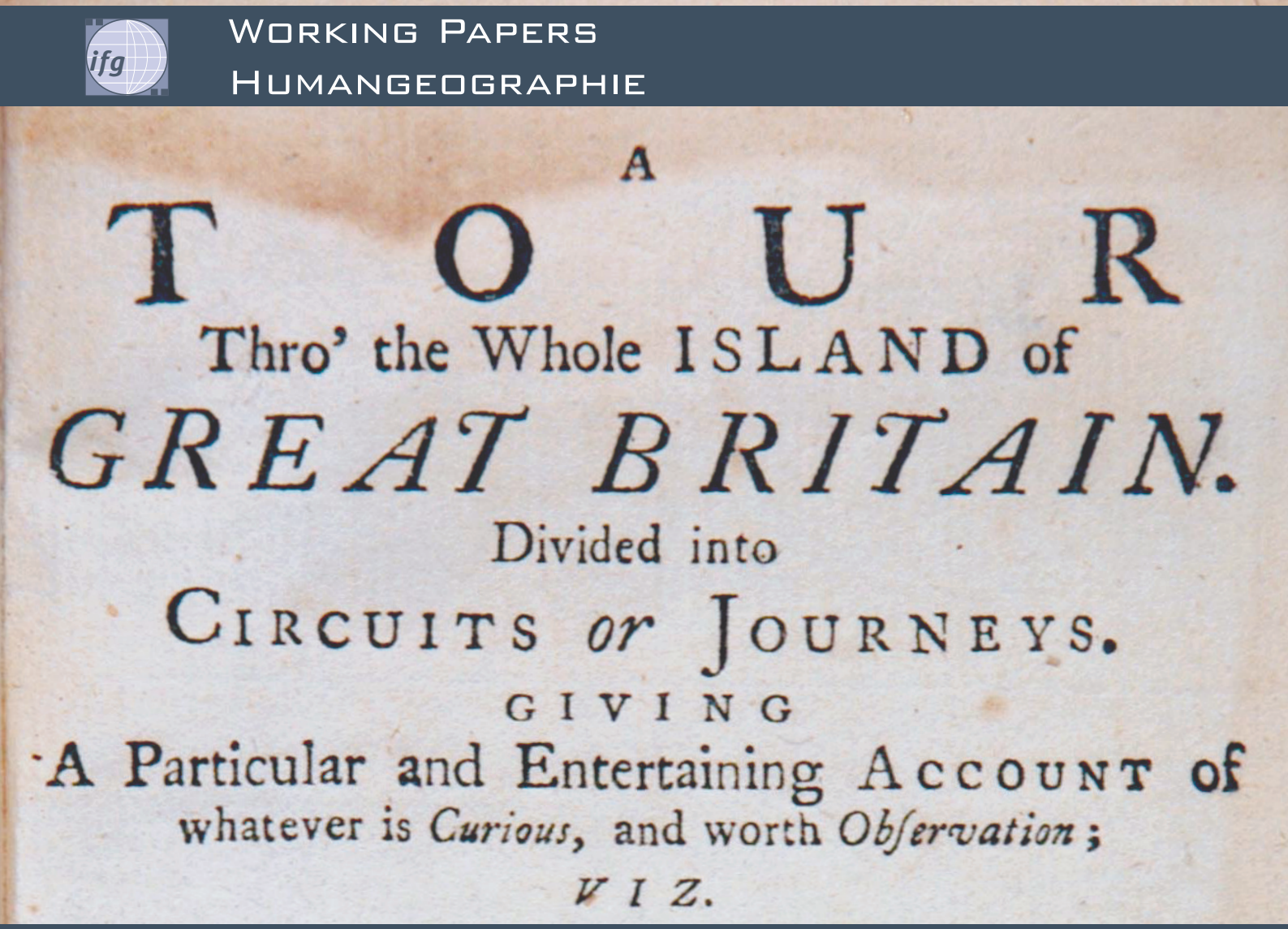

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Increasing Returns and Industrial Clustering:

From Daniel Defoe to Alfred Marshall

Institut für Geographie
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Zusammenfassung
Räumliche Konzentrationen in einer bestimmten Region, oder wirtschaftliche Cluster, wurden von zahlreichen Ökonomen im 18. und 19. Jahrhundert beschrieben. Beginnend mit frühklassischen Ökonomen wie William Petty und Daniel Defoe wurden verschiedene Versuche unternommen, die Vorteile der Lokalisation mit der Wachstumstheorie zu verbinden. Charles Babbage und Andrew Ure betonten die Bedeutung der Clusterung innerhalb des neu entstehenden Fabriksystems, was einen Einfluss auf das Werk von John S. Mill, J. Ramsay McCulloch und Karl Marx und ebenso auf das Werk von spät-klassischen Ökonomen wie Henry George und Henry Sidgwick ausübte. Diese Beiträge wurden von Alfred Marshall aufgegriffen, der die industrielle Clusterung als bestimmendes Element in seiner Preis- und Gleichgewichtstheorie platzierte.
Schlagworte: Industrial Clustering, Increasing Returns, Cournot-Problem, Spatial Economics, Alfred Marshall

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1. Introduction

Above all, increasing returns have gained a prominent status in economics. Although increasing returns to scale are significant in industrial processes, it took decades before they were placed adequately in theory. In 1994, James M. Buchanan and Yong J. Yoon published a collection of key contributions on this subject, in which they found it difficult to identify any theoretical tradition before 1980 (compare Krugman 1991, Arthur 1994, Yang/Ng 1998). The reason for this, Kenneth J. Arrow (2000: 173) presumes, lies in the simplicity and elegance of approaches which can be based on the assumption of constant or decreasing returns. From this assumption follows the qualification of convexity, which allows the impressing coherence and consistency of the theory of perfect competition. The history of imperfect competion and scale economies was much more discontinuous and shaped by re-discoveries in different contexts. A repeated area of rediscovery is the theory of foreign trade, where authors from Alexander Hamilton to Frederick List, from Charles F. Bastable to Elhanan Helpman have shown the importance of increasing returns, especially in formulating the infant-industry-argument. Historians of economic thought like Jacob Viner (1937: 71 f.), E. A. Johnson (1937: 126) and Jürg Niehans (1995) have shown this tradition even in the pre and early classical works of Andrew Yarranton, William Wood, Arthur Dobbs, David Binton, Nehemiah Grew, Josiah Tucker and David Hume.

Another range of applications are regional economics, where increasing returns help to understand, for example, different pathes of regional growth and industrial clustering. However, the history of increasing-return-approaches in regional economics has been investigated any further back than Alfred Marshall. As Paul Krugman (1995: 50) has rightly assumed, Marshall had supported himself on an intellectual tradition, which shall be presented in this article. I would like to ask how and why spatial concentrations of firms were analyzed in the history of 18th and 19th Century economics (compare Scheuplein 2006). After higlighting the significance of increasing returns due to spatial concentrations (2.), I would like to show how this argument was formulated in early classical theory (3.). Theorists of technology management like Charles Babbage und Andrew Ure restated the law of increasing return, referring to the growing industrial districts of the textile industry in Great Britain (4.). Their well known work had an impact on John R. McCulloch, John S. Mill and Karl Marx (5.) and later on late-classical economists as Henry George and Henry Sidgwick (6., 7.). Finally, increasing returns were merged into a new theoretical concept by Alfred Marshall (8., 9.).

2. Linking economic geography to economics

Spatial concentrations of industries are now a well known topic in regional economics and economic geography. Based on the works of Alfred Weber (1927) and Edgar M. Hoover (1948) both subdisciplines describe such phenomenons through the concept of agglomeration economies. They may appear because of advantages for all firms in all industries at a single location (urbanization economies) or because of advantages for all firms in a single industry at a single location (localization economies). For both kinds of agglomeration economies a wide range of advantages, such as transport systems and infrastructures, a pooled market for workers with industrial skills, local suppliers or spillovers between firms, has been identified and tested empirically. Though the concept of agglomeration economies has its roots in Alfred Marshall's "Principles of Economics", the tie to its original function in Marshallian Economics was severed: In "Principles..." agglomeration economies are an example for externalities, with which Marshall explains the existing variety of firms and market forms in his partial equilibrium approach.

These concepts never disappeared from regional economics and economic geography, but the real rise didn't begin before the 1980's, when clustering of industries became more significant in

national economies. On the one hand, many concepts such as the 'Innovative Milieu', the 'Flexible Production Complex' and the 'Industrial District' were created to clear the socio-economic reasons for industrial clustering (for an overview: Baptista 1998, Sheppard/Barnes 2000, Clark/Feldman/Gertler 2000). On the other hand, 'geographical economics' linked these questions to general equilibrium analysis again (Helpman/Krugman 1985, Fujita/Krugman/Venables 1999). While geographers focus on economic, social and cultural causes for the rises or falls of an industry in a particular location, economists concern themselves with the evenness of spatial development in an economic region. Although economic geographers treat generalizations from the concept of "increasing returns" (Martin/Sunley 1996) with suspiscion, a new exchange of ideas between both disciplines started. Meanwhile, a growing literature on theoretical foundations, empirical research and cluster policy is emerging (Braczyk/Cooke/Heidenreich 1998, Raines 2002). The worldwide spread of industrial clustering has underlined its general importance for modern economic development. With this in mind, it can be no surprise to find reasoning about spatial concentrations of firms in the history of economics long before Alfred Marshall. I am going to address these questions in the following observation: What was the practical impulse to record industrial clustering? In what way were the effects of clustering grasped as an increasing return to scale?

3. Economic growth and division of labour: spatial implications

One task which lead to early classical economics was to estimate pace and direction of economic growth. In Great Britain around 1700, authors tried to describe resources of the national economy. They listed traffic routes, raw materials, energy sources, working skills and traditional industries in different landscapes. In this way a 'land register' of national production capacities evolved, from which descriptions of regional specializations naturally resulted. Daniel Defoe was an outstanding contributor to this stock-taking (West 1997: 304-387, Novak 2001: 630-647).

In his "Tour through the Whole Island of Great Britain" and his "Complete English Tradesman" he gives a commercial topography of early modern Great Britain, which is characterized by a rising pattern of geographical specialization:

> *"So that (as I said before) there is no particular place in England, where all the manufactures are made, but every county or place has its peculiar sort, or particular manufacture, in which the people are wholly employed; and for all the rest that is wanted, they fetch them from other parts"* (Defoe 1738: 192).

In a similar kind he describes sectoral concentratations in his studies on the wool industry in his "Plan of the English Commerce" (Defoe 1704: 18, 1738: 372-375, 1727: 203, 1728: 65, 1742: 85-88). According to Defoe, clustering is not limited to the production of luxury goods, but relevant to all kinds of products for mass consumption (Defoe 1826: 189). Another interesting detail is his portrayal of the spread of retailers in London:

> *"In most towns, but particularly in the city of London, there are places, as it were, appropriated to particular trades, and where the trades which placed there succeed very well, but would do very ill any-where else; (...)"* (Defoe 1738: 39).

Defoe's account is exemplary of the new focus of classical Political Economy: not natural endowments, but societal work as the key factor for economic development. Or, as the anonymous author of the "Essay on Trade" (1719: 6) puts it: "(...) Land itself has not so great a share in the fundamental Riches of a Nation, as the Labour, Skill and Industry of the Inhabitants (...)". Therefore early classical economists, beginning with William Petty, highlight human work skills - arts and 'ingenious labour'. In this framework, the organization of work, plants and firms was investgated

and the spatial organization of industries formed a part of this topic. William Petty himself stressed the positive influence of industrial clustering for different manufacturing processes. Once a trade had grown at one location to a specific size, divisions within the labour pool would be possible. Through this division and integration of work every actor could reach a higher productivity:

> *„But the Gain which is made by Manufactures, will be greater, as the Manufacture itself is greater and better. For in so vast a City Manufactures will beget one another, and each Manufacture will be divided into as many parts as possible, whereby the Work of each Artisan will be simple and easie; As for Example. In the Making of a Watch, If one Man shall make the Wheels, another the Spring, another shall Engrave the Dial-plate, and another shall make the Cases, then the Watch will be better and cheaper, than if the whole Work be put upon any one Man. And we also see that in Towns, and in the Streets of a great Town, where all the Inhabitants are almost of one Trade, the Commodity peculiar to those places is made better and cheaper than elsewhere"* (Petty 1683: 473).

One should be aware, that this famous introduction of increasing returns into economic theory has a clear spatial link. It identifies the effects of division of labour due to a mode of action in spatial units (cities) and their substructures. In addition, similar linkings between division of labour, productivity and localization were made by William Temple (1672: 116-117). He saw this connection in the case of the dutch ports, which were specializing in particular products. George Berkeley (1735, querry 520) noted in his "Querist" the tendency toward spatial concentration in the wool industry, while Josiah Tucker (1758: 32-33) referred to the leading role of the english metal industries and their locations. Arthur Young (1770: 132) depicted in his "Six Months Tour through the North of England" the specialization in the Sheffield metal industry. Furthermore, William Coxe (1779: 225 - 229) told the story of the clockwork industry in the swiss canton Neuchâtel, which was later used by Dugald Stewart (1856: 12-13) to demonstrate the meaning of economic freedom for location decisions. John Aikin (1790, 1795) opulently presented the industrial development of the the cotton industry in Manchester, the wool industry of the West Riding of Yorkshire, the potteries in Staffordshire and other industrial sites.

With all these descriptions of a new geography of manufacturing, clearly the dynamic effects due to the localization of firms were noticed. This is evident even in the three prominent systematic approaches of 18th Century Political Economy (Berg 1983: 44). Richard Cantillon (1755: 99) pointed out that the manufacturing industries were orientated towards raw materials and consumers. For James Stewart (1767: Book I, chapter 9) industrial localization was caused by proximity to energy sources, the position in transport systems and the living cost of workers. Finally, Adam Smith (1776, Book II, Chapter 5; Book III, Chapter 3) developed a theoretical model for the manufacturing sector, in which he linked the division of labour, the extent of markets and the accumulation of capital. Economic dynamism derives from sectoral and spatial differentiation and integration: Societal progress separates agriculture, trade and commerce, which differentiate further internally. Smith stresses in his chapter "Of the different Employments of Capitals", that industrial locations are chosen primarily according to materials and consumers. Smith distinguishes between two patterns of evolution: Firstly, locations have developed through imitation of foreign products. Smith mentions especially industries like the silk industry in Lyon and London-Spitalsfield, which have always processed foreign raw materials and exported a large share of their products. Secondly, a pattern evolved with the processing of domestic agricultural materials. Several industries flourished in different locations promoting urbanization. Further specialization of products and processes, Smith adds, improves productivity at specialized locations and increases the localization of industries.

In summary, early classical Political Economy discovered the mechanism of increasing returns as a result of the division of labour. These economists recognized the spatial concentrations of firms as

an important feature of this mechanism. In the new framework of classical Political Economy, which understood human labour as the central cause of wealth, clustering of industries was theoretically integrated as a part of the organization of work.

4. Perspectives of engineers: Charles Babbage and Andrew Ure

It is well known that David Ricardos had no use for increasing returns. In order to stress the impact of corn duties on the national economy, he drew a model of a balanced economy with constant or diminishing returns (Blaug 1958, O'Brien 1975). While productivity, wages and prices differ between nations, the internal space of a national economy is homogenous. Ricardo rejects the logical conditions for a clustering of firms at specific locations generating additional profits. Although Ricardian Economists had a sense for dynamic effects in international trade (Maneschi 1998), they failed to work out the regional basis of increasing returns. Due to this, they never wrote about the localization of industries.

At the same time, different groups of people concerned with practical problems discovered the connection between spatial distribution and economic effects. In the 'age of reform' in the early 1830s, the poor knowledge of the new factory system was obvious. In 1833 the Factory Acts, the opening of a statistical department in the Board of Trade and the Manchester Statistical Society established an institutional basis for investigations of the new industrial world (Cullen 1975; Brown 1958; Berg 1980: 253 - 268). George R. Porter, the first head of the statistical department of the Board of Trade, published in 1836 "The Progress of the Nation", an overview of the British industry. With listings of employees and technical equipment, even descriptions of single industrial districts, for example the Birmingham metal industry (Porter 1836: 298), he gave an impression of the spatial spread of different branches. In these statistical reports, a sense for the connection between economic progress and spatial patterns is noticeable.

More important were surveys of technical and organizational conditions made by practitioners which dealt with the inventions of machinery. They built a new scientific subdiscipline, 'a science of machinery' as they called it, or 'industrial economics' as we call it today (Berg 1980, 179 - 202; Mathias 1991; Musson/Robinson 1969). The founders were the famous mathematician and engineer Charles Babbage in his "On the Economy of Machinery" (1832) and the engineer Andrew Ure with his "Philosophy of Manufactures" (1835). Additionally, works from the entrepreneur Edward Baines (1835), the physicist Peter Barlow (1836) and the journalist Charles Knight (1831) should be mentioned here. Whereas Adam Smith showed the organization of work on a pre-industrial basis, stressing the role of workers and their tools, Babbage and Ure put machinery and factories in the spotlight. Economics of scale, which exist more implicitly in Smith's work, are understood to be a crucial feature of industrial organization. Besides an extended treatment of internal scale effects, hints on external scale effects can be found (Babbage 1832: 213-4, 242; Romano 1982: 394). Spatial distribution of industries is, in this view, an integral part of the tendency to increasing returns.

Charles Babbage deals with locational problems in chapter 23, "On the position of large factories". His starting point is the localization of industrial firms: "It's found in every country, that the situation of large manufacturing establisments is confined to particular districts" (Babbage 1832: 225). This development is caused by the distance of raw materials, energy sources and even the transport infrastructure. Furthermore, Babbage points out, that industrial agglomerations tend to grow. They contribute to their existence as soon as they are born: As locations of informational exchange they help to equalize supply and demand and in this way they economize production at this specific location (Babbage 1832: 227-8). Due to the durable machinery, clusters of firms last for a long time.

Andrew Ure (1835: 67) asks in his chapter "Topography and Statistics of the Factory System" about the causes of regional specialization for particular textile industries. Natural circumstances and advantages of location in the transport system are necessary conditions in his view. However, advantages of production due to societal reasons are needed too. As far as a dynamic at a particular location has been established, capital and knowledge will agglomerate at this location. Here Ure (1836: 397) stresses the significance of advantages of specialization (e.g. work qualification, manufacturing process) and the competitive and cooperative relations between companies in the success of the British Industry. His evidence for the mechanism of improvement of a branch at a particular location is the cotton industry in Lancashire (Ure 1835: 41-3). Additionally, Ure refers to a historic failure, which demonstrates the advantages of localization:

> *"The local fixation of a manufacture is a remarkable circumstance. It has been found by the Glasgow people impossible to transfer themselves with all the knowledge and opportunities they possess the peculiar fabrics of Manchester; and vice versá, the Manchester people have made many efforts to naturalize the muslin trade of Glasgow and Paisley, but never with any advantage, so that the warehousemen of the town continue to get their supplies reciprocally from the other"* Ure (1835: 71; see also Babbage 1832: 368).

Both Babbage and Ure mention mechanical engineering as an important supplying industry, wich raises the advantages of industrial districts (Babbage 1832: 219-20; Ure 1835: 39). Similar arguments were presented in the debate on the export of machinery (Musson 1972; Jeremy 1977; Berg 1980: 203 - 209). Supporters of an export authorization, such as the Minister for Trade William Huskisson (1825: 55) referred to the "union of the powers, and of the great capitals" as a competitive advantage. These hints to an interdependent industrial organization at particular locations were cited by Babbage (1832: 366 - 371) and Ure (1835: 15).

In the beginning of British 'industrial economics', Charles Babbage and Andrew Ure stressed the significance of increasing returns due to economies of scale. They even knew about the spatial dimension of the new industrial organization and about their role for scale effects. However, being engineers and not economists, conclusions for the theories of production and distribution were left to other authors.

5. Cautious conclusions: John S. Mill, Karl Marx, J. Ramsay McCulloch

John S. Mill, Karl Marx and J. Ramsay McCulloch were greatly influcenced by Babbage's and Ure's description of the 'factory system'. John S. Mill widened the methodological framework and the economic model of classical Political Economy (Hollander 1985; Donner 1998). In his observation of various agents of production he even identifies a spatial differentiation of productivity:

> *"We now advance to the second great question in political economy; on what the degree of productiveness of these agents depends. For it is evident that their productive efficacy varies greatly at various times and places. With the same population and extent of territory, some countries have a much larger amount of production than others, and the same country at one time a greater amount than itself at another"* (Mill 1848: 100; see also p. 130).

In contrast to Ricardo, Mill placed a much higher responsibility on societal reasons for these international differences, and he had a sense for economic differences within a nation. In his further argumentation he investigated forms of cooperation and combination of work (chapter 8), the division of labour between town and country (§ 3) and the connection between the use of machinery and business size (chapter 9). Following Charles Babbage, Nassau W. Senior and John Rae Mill

(1848: Book I, chapter 9) discussed economies of scale as a reason for the growing size of businesses. He even discussed consequences for the laws of returns (Mill 1848, Book III, chapter 2, § 3 and chapter 3, § 4). Unfortunately, this discussion remained incomplete and Mill was generally more preoccupied with the tendency towards a stationary state (Riley 1998: 301-303; Hollander 1985: 297).

In contrast, Karl Marx saw increasing returns as the dominating tendency in modern capitalism and he enthusiastically praised its dynamic forces. He also thoughtfully worked out spatial structures of the economic process. He understood capitalism as a variable, historically developed system, in which spatial patterns of settlement, transport and production change with the variations of economic effiency (Harvey 1982, Smith 1984, Peet 1998). Marx not only mentions Babbage and Ure several times, but concerning spatial concentrations of firms, he also cites George Berkeley's comment on the division of labour in the british wool industry, William Petty's description of the watch industry in London as well as Adolphe-Jérôme Blanquis' discussion of the textile industry in Lyon and Nimes (Marx 1867: 359, 347, 342).

In his economic model, technological and sectoral shifts and economic trends cause an uneven spatial development between and within national economies. Marx identifies polarizing economic forces mainly through different productivities at particular locations. In "Capital", Marx investigates the organization of the labour process. He distinguishes between three methods for maximizing surplus value: 'cooperation', 'division of labour' and 'great industry' (factory system), which all differ in their use of work qualification, business size, management and their use of technology and science (Rattansi 1982). This makes it clear how work is divided into various businesses and firms, which includes consequences for the spatial structure (Marx 1867: 187 – 195). For instance, the first method of 'cooperation' involves a "conglomeration of labourers" and the "aggregation of various processes". Furthermore, the labour may be "carried on over an extended space" (Marx 1867: 331 - 334). With the second method the labour process is dismantled into various stages wich can be become independent firms. In this case "various manufactures so combined form more or less separate departments of a larger manufacture" (Marx 1867: 342, 352 - 3). The separation of the labour process is completed through a new grouping and integration, which may have spatial implications (Marx 1867: 369; see also 1847: 187). Furthermore, the extent of the division of labour is determined by population size and its relative density (Marx 1867: 357 - 8).

The third method replaces human labour with machinery. This results in a mainly spatial concentration of similar or different machineries at particular places (Marx 1867: 381 - 384). Marx considers that particular sites are chosen due to the location of a firm in the system of communication and transportation (Marx 1867: 386 - 7). Once a site has been chosen, a company stays there for a long time due to the rising amount of invested capital (Marx 1885: 165).

Although Marx talks about external economies of different firms in one town or region, particularly in connection to small factories ("Manufaktur") and the modern domestic industry (Marx 1867: 464 – 5, 511; 1988: 286), he saw the rise of internal economies in large-scale enterprises as the prevailing tendency. (Marx 1867: 616 – 23, 750). At the same time, Marx links the centralization of capital with a growth of plants. This is where the connection between increasing returns and spatial structures is most obvious in Marx's works.

J. Ramsay McCulloch was much more interested in the consequences of the modern factory system and he carefully took up insights of the new 'industrial economics' (O'Brien 1970). For example, he reviewed Babbages "On Manufactures" in the "Edinburgh Review". For McCulloch, increasing returns were a crucial aspect of modern economy and in his growth theory he was rather optimistic. In "Discourse", published in 1824, McCulloch declared sectorally specialized "districts" as spatial units in which productivity is formed:

> *„(...), there is another and most important branch of the division of labour, which not only enables particular individuals, but the inhabitants of entire districts, and even nations, to addict themselves, in preference, to certain branches of industry. It is on this territorial division of labour, if I may so term it, that the commerce which is carried on between different districts of the same country, and between different countries, is founded. The various soils, climates, and capacities of production, of different districts of an extensive country, fit them for being appropriated in preference to certain species of industry"* (McCulloch 1824: 97).

McCulloch later introduced this passage into his "Principles..." (1825: 120) and into his article "Political Economy" in the "Encyclopaedia Britannica" (1859: 230). He depicted forms of regional specialization in "Commercial Dictionary" (1832: 343 - 6) as well as in "Statistical Account of the British Empire" (1847: 691 – 694). But it was not before 1858 that McCulloch clearly linked the term "territorial division of labour" to a district of the manufacturing sector. In the article "Manufactures" McCulloch identifies natural and "accidental" circumstances as reasons for localization. The more efficiently firms in a particular location work, the more firms are attracted to this location. McCulloch (1858: 470) explicitly stresses this self-reproducing feature of industrial districts.

As it is well known, Charles Babbage's and Andrew Ure's new ventures into increasing returns had tremendous impact on the works of Mill, Marx and McCulloch. It is less known, that they connected the economic mechanism of scale economies with its consequences for spatial structures, too. However, these connections were cautious and the links to the theory of production were only explicitly addressed in the work of Karl Marx, although he was more interested in the internal growth of single firms.

6. The law of progress: Henry George

Even after the end of the Industrial Revolution in Great Britain after 1860, a remarkable economic growth continued. Crises and phases of prosperity sharpened the conciousness for the dynamic of the economic system. This observation was especially by looked at by Henry George, who began his work "Progress and Poverty" with the words: "The present century has been marked by a prodigious increase in wealth-producing power" (George: 1879: 3). With his optimistic view, George clearly distinguished himself from classical Political Economy (Whitaker 2001). He based his view on two kinds of scale economies. Firstly, a rising population makes a specialization of functions possible. Secondly, a rising density of population strengthens the integration of functions. Based on this mechanism, he formulated the law of progress: "Improvement becomes possible as men come together in peaceful association, and the wider and closer the association, the greater the possibilities of improvement" (George 1879: 457). This connection between density of population and productivity was more closely inquired in "Progress and Poverty". George discovered increasing returns as an outcome of different professions, which are specialized and working together, within a town (1879: Buch IV, Kapitel II). Similarly, he presented his "Social Problems" in order to explain negative consequences of urban concentration due the ownership of land (George 1879: 128, 134, 457; 1884: 308 - 314). These observations lead George to produce a detailed description of spatial patterns in economy (Whitaker 1998). George observed spatial structures in the manufacturing sector in his "Protection or Free Trade", where he supports a free trade policy (Martin 2001). He supports this by inspecting differences in natural endowment, in density of population and "differences in industrial development, in habits, customs and related occupations". From all this derives a regional specialization of industry:

> *„Such gains, moreover, as attend the division of labor between individuals, attend also the division of labor between communities, and lead to that localization of industry which causes*

> *different places to become noted for different industries. Wherever the production of some special thing becomes the leading industry, skill is more easily acquired, and is carried to a higher pitch, supplies are most readily produced, auxiliary and correlative occupations grow up, and a larger scale of production leads to the employment of more efficient methods. Thus in the natural development of society trade brings about differentiations of industry between communities as between individuals, and with similar benefits"* (George 1886: 63).

He returned to the advantages of localization in chapter 16, on the development of the manufacturing sector (George 1886: 169 – 174). He points out here that clustering is a feature of complex industries, which are dependent on supplying industries (George 1886: 169 - 70).

It should be noted that George linked his optimistic view on the long term perspectives of a modern economy to economies of scale. These economies of scale were positively influenced by clustering of economic activities. George did not present any satisfying integration of these insights into Political Economy, however his views of growth theory challenged scientific economists.

7. The early Marshalls and Henry Sidgwick

Since the early 1870's Alfred Marshall had worked on a new theoretical synthesis between classical Political Economy and a subjectivist approach. He was convinced of the growth perspectives of modern economy and had studied intensively 'industrial economics' (Whitaker 1990, McWilliams Tullberg 1990, Dardi/Gallegati/Pisciarelli 1991 und 1992, Arena/Quéré 2003). In the 'Principles of Economics' he cites Charles Babbages description of the advantages of large scale businesses (Marshall 1890: 326, 339) and Henry Georges growth theory (Marshall 1890: 379, 714).

Alfred Marshall touched upon the theme of increasing returns several times in his early works (Groenewegen 2003: 124 – 130). Especially in his "Theory of Foreign Trade", which was written between 1873 and 1877 and privately printed in 1879 on Henry Sidgwick's initiative (Whitaker 1975a: 57 – 66, 1975b: 3 – 7). In the chapter entitled "Domestic Values" Marshall investigates long term changes of supply, especially advantages of the division of labour and scale effects. In his opinion, a growing output of the whole industry does not necessarily mean a tendency for oligopoly, as Antoine Cournot stated (Marshall 1879: 202 - 204). Increasing returns could be realized by large scale businesses as well as by small and medium-sized businesses (Marshall 1879: 196, 198; see Prendergast 1992: 450 - 455). The concept of 'external economies', which Marshall presented here for the first time, is bound to spatial nearness. The mechanism of clustering is evidence that competition in economies can last a long time, even when technical or economic progresses is made by particular competitors. Small and medium-sized firms can generate theses advantages through specialization of functions (supplying industry), use of specialized work qualifications and a fast diffusion of innovation (Marshall 1879: 197 - 8). Marshall integrated these insights into the textbook "Economics of Industry", which he wrote with his wife Mary Paley between 1876 and 1879 (O'Brien 1994). The function and economic significance of localized industries is investigated in book I, chapter VIII "Division of Labour". After describing the advantages of the division of labour, the authors raise the question of whether these advantages are influenced by the size of businesses (Marshall/Marshall 1879: 49 – 59). They point out that a production process can be separated into several stages. The work of all stages can be done in a single large-scale business as well as in a group of independent firms, which are economically integrated. Both possibilities can increase the total output of an industry, which is described as the "Law of Increasing Return". Whether the increase can be better managed in a large business or in several firms of an industrial district depends on the particular conditions of every industry. Therefore, the growth of large businesses is limited in many industries.

Before I come to Marshalls 'Principles of Economics', which were published eleven years later, a look on Henry Sidgwicks 'Principles' is needed. Sidgwick and Alfred Marshall met at Cambridge University in 1867 and became friends. Later, Sidgwick taught Mary Paley and remained a close friend when Alfred and Mary Paley married and moved to Bristol in 1877 (Groenewegen 1995: 110 – 113, 144, 175 – 6, 229, 663 – 670). For this reason it can not be easily known, to what extent Sidgwick's 'Principles' were influenced by Marshall.

In his "Principles of Political Economy", Sidgwick discusses the laws of returns in a similar way to the Marshalls. Sidgwick's (1883: 151) law of increasing returns is based on population density, which increases technological invention and capital accumulation. He links this to his investigation of labour productivity in chapter IV, where he points out that economies of scale in different arrangements of firms can be obtained (Sidgwick 1883: 117). Additionally, in book II 'Distribution', he looks at the impact of different factors on the amount of profit and wages. In chapter 11 of "Kapitel", he discusses differences in income distribution caused by industrial differentiation (Sidgwick 1883: 372 - 3). They are caused by spatial patterns of various branches, which stem from local natural, social and political conditions, and even from path dependencies of different locations.

In Sidgwick's view, spatial differences of productivities, prices or returns can remain stable over a long time, although there is tendency to diminish them through competition. The tendency towards spatial equilibrium may be disturbed: "But in fact such local advantages are continually undergoing changes so rapid and extensive, as to balance - or more than balance - during a considerable period, the equalizing forces of industrial competition" (Sidgwick 1883: 388). The forms of these changes derive on the one hand from the growth pace of existing cluster; on the other hand from discoveries of new resources or production methods. The spatial economy has to be seen as an interdependent system: "In this way the successful establishment of any great centre of industry in any district has a tendency to promote indirectly the concentration of other industries in other localities" (Sidgwick 1883: 389; compare 1887: 377).

8. The diversity of competition

When Marshall returned to the localization of industries in his "Principles...", he developed his old concept further. His description of industrial districts in book IV, chapter X has been studied extensively (Becattini 1990; Bellandi 1989, 2003; Loasby 1998; Quéré/Ravix 1998; Raffaelli 2003a, b). Therefore, I would like to deal only with two aspects, the function of clusters in Marshall's theory of price and equilibrium and his statement on the differing significance of clustering for various industries.

It is well known that Marshall investigation of dynamic processes in economy separated him from the more static views of W. Stanley Jevons and Léon Walras. Marshall understands economy as the forces of supply and demand having an effect on each other in phases. While Marshall investigates economic aggregates moving in time, Walras models a static economic equilibrium. Marshall insisted that supply-side has to be viewed as a variable factor in most markets. This implies that the real conditions and changes of supply have to be taken into account.

The theoretical problems facing this approach were first touched upon by Antoine Cournot. He dealt with a market equilibrium only by assuming increasing or constant marginal costs. In case of decreasing marginal costs he supposed an unavoidable transition to a monopolistic market structure. In his view increasing returns were not compatible with a market economy. Marshall was not satisfied with this solution of the so called Cournot-problem (or 'reconciliation problem') between competition and increasing returns. As it has been shown recently, Marshall identified the

spatial structure of production as a crucial factor, which could explain both the existence of increasing returns and hindrances which prevent a monopolization of the market (Hart 1991, 2003, Prendergast 1992, Marchionatti 1992).

Marshall has developed this concept in his "Principles...", in Book IV 'Production or Supply'. Here Marshall discusses various influences on the cost curve of the supply-side, before linking this with the demand-side and to general theory of price and equilibrium in Book V. First, Marshall investigates as classical Political Economy the law of decreasing return in agriculture (chapter 2 and 3). He then observes influences of population development on labour supply (chapter 4 to 6) as well as saving as a determining factor of capital accumulation (chapter 7). The following five chapters are devoted to the manufacturing industries. Marshall sees the law of increasing returns as dominant in this field, which he substantiates in six steps. First, he states organization as a crucial stage in economic systems and characterizes differentiation and integration as basic principles of the the labour process (chapter 8). Secondly, he looks at the principle of differentiation more in detail (chapter 9). Sub-dividing the labour process into short and standardized sequences is the basis for a specialization of work qualifications and machinery. Thirdly, this leads to the question of which form of ownership these advantages can be used for. Marshall confronts the advantages of scale and specialization in a single company with the advantages that come out of the interaction between companies in a single branch or in the whole economy. Therefore, different configurations of size and number of companies seem to be possible. Forthly, it is important to distinguish between internal economies of single firms and external economies which depend on the general progress of an 'industrial environment'. For the latter, Marshall assumes the higher gains of productivity (Marshall 1890: 375, 506, 661). Fifth, Marshall combines theses two types of economic advantages with two organizational alternatives. A large number of small firms in a single industry is able to produce the same advantages from the division of labour as any large-scale enterprise (Raffaelli 2003a: 67 - 72). Due to this, Marshall describes advantages of localized industries (chapter 10) as equal to the advantages of large-scale enterprises (chapter 11). Brian J. Loasby (1999: 184) accurately pointed out, that Marshall's model of the industrial district stands alongside the pin-making factory of Adam Smith. Sixth, Marshall summarizes by saying that the law of increasing returns is inforced by the average cost curve of the manufacturing industries. Marshall closes with this result his inquiry of the long lasting influences of the supply side.

In summary, Marshall's most important insight in his price theory is his foundation of a dynamic character of equilibrium ('moving equilibrium'). Competition and monopoly do not exclude each other. The tendency to monopoly is neutralized time and again by the appearance of new entrepreneurs. These opposing tendencies may occur in a market economy, because competitors are bound into a spatial-temporal context. Marshall deals with the long-term supply on the level of particular industries and their production structure, especially the spatiality of their production structure. Therefore, clustering of industries is a crucial clue in Marshallian economics in finding reasons for the existence of increasing returns on the one hand and a diversity of enterprises and markets, which delay the tendency for monopoly, on the other.

9. A tendency to internalisation

Finally, a look at Alfred Marshall's prediction for the future of industrial clustering is useful. He often used his theoretical tools to produce statements on real economic tendencies, as he did so in this case. Marshall's concept let it be assumed that a decreasing relevance of industrial clustering is based either on lower realization of increasing returns or on a higher internalization of production activities in a large-scale enterprise. Marshall poses this question at various times in his work.

In the "Principles..." Marshall (1890: 38 f., 329) separates the contemporary pattern of clustering from the early modern localization of industry. New methods of transportation and communication made a larger market area accessible. As a result, the advantages of spatial concentration grew. Production techniques and firm size were the most important factors in this rise of industrial clustering in early capitalism.

For Marshall, clustering is dependent on particular forms of economic processes. He chose the highly standardized and mechanized processes of the cotton industry and the wool industry in England as examples for industrial districts in the 'Principles'. These production processes were combined with efficient transaction and communication between local firms. For instance, in the "compact industrial district" of the cotton industry in Lancashire, manufacturers, users of machinery and even producers and traders of textiles were all in close contact (Marshall 1919: 599 – 603; 1923: 218). Additionally, Marshall (1890: 328 – 338) refers to the metal industries in North- and Mid-England and the potteries in Staffordshire, where a strong differentiation of products, a broad mix of technologies and and various sizes of firms exist. The characteristics of industries, including its spatial patterns, change with the historical shift of technologies and products. According to Marshall (1890: 339 - 344) the general advantages of large-scale enterprises will be expand as innovation and a scientific development gain importance in economy. While small enterprises are restricted to incremental innvotations, large-scale enterprises are better prepared for radical innovations. The increasing expenditure for innovation processes makes it harder for small enterprises (Marshall 1890: 341 f., 345 f.).

Following these observations, Marshall assumes a rise of the large-scale enterprise almost in the first edition of the "Principles...":

> *"There is no rule of universal application; but the struggle between the solid strength of steady-going firms with large capitals on the one hand, and the quick inventiveness and energy, the suppleness and power of variation of their smaller rivals on the other, seems inclined to issue in the large majority of cases in the victory of the former"* (Marshall (1890: 376).

Within these structural changes, the scope for industrial clustering is getting smaller. These assumptions were thirty years later confirmed in "Industry and Trade", where the scenery of industrial production had dramatically changed. Here Marshall investitgates conditions of spatial change in greater detail, differentiating between countries and industries. Marshall (1919: 167 - 170) states a growing relevance of mechanization and standardization, which decreases the relation to local suppliers and local work qualifications. Large-scale entreprises are increasingly able to work independently of their industrial environment:

> *"(...), the importance of internal economies has increased steadily and fast; while some of the old external economies have declined in importance; and many of those which have risen in their place are national, or even cosmopolitan, rather than local"* (Marshall 1919: 367).

Especially in the case of the United States, which had the pioneer role in this change, Marshall identifies a drop of localizing forces. Consequently, transport costs alone are becoming the most important factor for locational decisions in the future (Marshall 1919: 150 f.).

This overview underlines the fact that for Marshall, spatial structures of the economy were undergoing a historical change. Whilst in his view spatial concentration is linked to firm size and the integration of work processes, a decline of industrial clustering is probable.

Because Marshall takes spatial production structures as a source for increasing returns, a decrease of clustering should distort the shape of competition. Although Marshall mentions some of these dangers, he failed to discuss the consequences for his theory of price and equilibrium.

10. Conclusion

The laws of return for the three factors of production - labour, capital and country - expresses that a return, whether increasing, constant or decreasing, can be achieved with one additional factor unit. In manufacturing industries the spatial concentrations of interacting firms within a region can contribute to an increasing return. This link had been already made by early classical economists like William Petty, Daniel Defoe and George Berkeley. They described spatial proximity between firms as a source for a higher productivity. In particular, Defoe showed regional specialization within a national economy as an competitive advantage. Later Adam Smith mentioned an positive impact of spatial structures on the economic growth.

This line of this reasoning was broken by Ricardian economics in the 1820s. In Ricardo's homogeneous economic space, constant returns are reached everywhere; within a national economy there is neither a possibility for increasing returns nor for the clustering of industries. In contrast, engineers like Charles Babbage and Andrew Ure, who reflected on the economic consequences of machineries in Great Britain during the 1830s, took scale effects to be the crucial advantage of the factory system. They described these effects both within companies and within clusters of spatial concentrated firms. Their contribution was taken further by J. S. Mill, J. Ramsay McCulloch and Karl Marx. Especially the latter understood increasing returns as a necessity of modern economies and touched upon this in his 'Capital', citing clustering of industries as an organizational factor for this aim.

Finally, these different theoretical and empirical insights were brought together by Alfred Marshall, who rated increasing returns as an important economic fact. He considered productivity in a long term time frame as variable. Increasing returns, which may have an important impact on market prices, can be generated within firms and even through a cluster of firms within a region. In this manner, Marshall linked the clustering of firms with the theory of price and equilibrium and worked out a solution to the so-called Cournot problem. Additionally, Marshall summed up the advantages of localization and collected insights from many empirical studies in his "Principles...".

As this article shows, investigations into spatial concentrations of firms have lead to observations of increasing returns in economics in many ways. The systematic contribution of the economics of clusters is obviously a foundation of economic productivity. Although this insight has been repeatedly neglected, new approaches in economic geography and regional economics have led to its renaissance since the 1980's.

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