LOCALITY MATTERS

Myths and Facts on the New Economy

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Abstract

This paper identifies lower costs of information transmission, falling costs of flexible production, a rising complexity of transactions and lower transaction costs of search, management and control as the key characteristics of the information age. We explore their implications for international trade and specialization and relative welfare in the new economy. Major implications are fundamental changes in economic organization, increased competition on a global scale in creating and marketing highly customized products, and the need for continuously cutting costs and improving the speed of providing products across the globe. We argue that the increasing interdependence of industries is enabled and accommodated by the improved possibilities for co-ordination and communication, offered by information services in the present information age. An efficient information service sector and a productive information infrastructure determine the ability of countries and firms to appropriate the potential benefits of the information age. The international tradability of these services themselves improves because of lower costs of information transmission. At the same time, however, key characteristics of many services such as imperfect possibilities for codification, or the need to use informal local communication channels, imply that distance is still relevant.

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1. A New Spatial-Economic Landscape

The belief in the 'death of distance' suggests that traditional location theory à la Von Thünen and Weber has lost its validity and relevance in our era of virtual communication. The emergence of the global network society (see Castells, 1996) suggests, in addition, that location is not a stand-alone choice of a firm, but is embedded in world-wide market area connections, marketing channels, information technology regimes, transport systems and telecommunications infrastructure. It is also increasingly claimed that conventional international and interregional trade may be not only determined anymore by the comparative advantage of factor inputs, but also by network access, knowledge infrastructure and product heterogeneity in the context of monopolistic competition (as advocated already in a path-breaking contribution of Dixit and Stiglitz, 1977). All such forces may have a dynamic and less predictable impact on location and allocation decisions of firms, including transport and trade flows. In more recent studies on economic development we have, therefore, also witnessed attempts to integrate trade and location issues in modern economic growth theory (see, for example, Fujita et al., 1999 and Pohl, 2001). The advent of the ICT society has meant that information is a central element in the emerging geographic landscape of our world, not only for the transmission of data or the supply of non-material services, but also for an efficient logistic handling of material commodity flows (see also Gorter and Nijkamp, 2001).

In contrast to such global connectivity trends, we also witness a renewed interest in the locality. Local (or regional) networks of firms appear to become vital in exchanging tacit knowledge by means of face-to-face contacts, as can be observed in the so-called Third Italy. Clearly, such network constellations may be incorporated in multi-layer higher-order networks. And consequently, the local-global divide is much more complicated than just a simple economic-geographic segmentation of our world. The cities or metropolitan areas play

a particular role in our global network society. Although it is often argued that the death of distance would make cities in the future almost redundant or would at least erode the traditional agglomeration advantages (scale, localization and urbanization economies), it is noteworthy that at a world-wide scale cities do not show any clear sign of decline. Cities are still the center of economic activity and have managed to reinforce their position (see also Glaeser et al., 1992, Glaeser, 1998 and Rauch, 1993). Despite serious concerns about social costs such as congestion, criminality and ethnic tensions, cities have demonstrated a remarkable ability and vitality to exploit economies of density, including those elements that belong to a virtual network society (such as an intense contact potential, a social protection network, a diversified high-skilled labor force or international orientation). In other words, the city offers network externalities of various kinds that are not significantly affected by the transition to a network society. On the contrary, cities tend to reinforce their position in the new economic-geographic landscape of our world and, consequently, one may wonder whether the future of our network society will be something else than a replication of the past. Despite rapid transformations in the area of ICT and in many other advanced technologies, the question is whether the future of our world will be different from the current urbanization pattern and whether new spatial-economic ramifications are likely to emerge (see also Leinbach and Brunn, 2001).

These questions are extremely relevant against the background of the current debate on the future viability of the so-called 'new economy'. The transition from the material goods economy towards a service economy and next towards a virtual or electronic economy is often denoted by the term 'new economy'. This concept introduced for the first time in Business Week in 1995 by Chris Farrell, has prompted an avalanche of debates among economists in the past years. The new economy is a network constellation in which the rapid use of ICT leads to increasing returns (see also Brynjolfsson and Hitt, 1995 and Shapiro and Varian,

1999). In the meantime many economists have expressed some doubt whether the new economy will be beneficial to all world citizens or whether it will just reinforce the existing geographic-economic power blocks. Others are afraid that the new economy will lead to a new divide among forerunners and back runners in the global economy, so that a new spatial-economic fragmentation may emerge in the global network society.

The present paper addresses several of the above-mentioned issues on the new economy from the viewpoint that 'locality matters'. After this introductory section, Section 2 will set the scene by investigating the relationship between ICT and information services. Since global competition is central to the new economy, we will focus our analysis on the relationship between ICT and international (or interregional) trade in information services, and the consequences for international (or spatial) patterns of specialization and relative welfare. In this context, we will identify the concepts that are of main importance to our paper. Then we present an analysis of the way these concepts may interrelate to and operate in growth, trade and specialization. Also, empirical questions receive some attention. In the final part we deal with the question whether our findings have implications for the organization of the new space-economy.

2. The Information Age as a New Economy

The increased use of ICT has a pervasive impact on all economies. It does not only lead to an efficiency increase in communication, but it also generates a drastic change in logistic value chains, labor relations, service provision, knowledge acquisition and management styles (see Foray and Lundvall, 1996, Kohno et al., 2000, and Lundvall, 1998). ICT is a network constellation and owes its economic importance to network externalities (see Capello, 1994) which create increasing returns and a drastic decline in transaction costs (see also van Geenhuizen and Nijkamp, 2001, and Westland and Clark, 1999).

The spatial-economic implications of ICT are still hard to foresee. The literature is rather ambiguous and comes up with different views on the future. On the one hand, there is the belief that ICT may overcome barriers of space and time, so that the space-economy becomes footloose with equal opportunities for all localities. This is supported by the 'death of distance' hypothesis and reflected in visions on 'electronic cottages' or the 'e-society' (see also Mitchell, 1995). But on the other hand, there are also scientists who argue that economic and political power centers of our world will not vanish and that the concentration of knowledge will favor the continuity of cities (see also Gillespie and Williams, 1988, and Graham, 1999). The reason is that ICT helps to execute remote control, to create a critical mass of knowledge infrastructure, to favor flexible specialization and to exploit the socio-cultural and institutional basis of agglomerations. As a consequence, ICT is an efficiency-enhancing city-centric factor in the area of customer-driven production, client-oriented management, network and knowledge innovation, or work flexibility, through which it favors economies of density in urban areas. The blend of economies of scale and of scope in the ICT sector leads to a better compliance with idiosyncratic consumer demands, as modern ICT products tend to be customized and order-based (see Reich, 2001, and Linders, 2001). The tendency of moving from high volume to high value has already occurred since the 1970s, but accelerated in the early 1990s. The key behind these changes is the advent of information, communication and computer technologies.

Reich (2001) identifies three constraints to meeting individual consumer desires that become less significant, for a large part as a result of ICT. First, the additional cost of producing highly customized products, as opposed to high volumes of identical products (mass production), has progressively disappeared in a rising proportion of industries. In fact, ICT allows easier fine-tuning of machinery, which alleviates the inflexibility of equipment towards specific information on product characteristics desired. Second, the transport cost of

both information and goods has fallen rapidly. This enables consumers to get the best deals from almost anywhere and allows for worldwide competition in the provision of goods and services. Although the fall in the cost of physical transport is for a large part directly due to progress in transportation technologies and equipments, ICT plays an important role here too. The use of computers and communication technologies have enabled a more efficient design of equipment and logistic processes, thus contributing indirectly as well as directly to falling transportation cost. Finally, the Internet combines information, telecommunication and computer technology in providing easy access to specific desired information from around the globe. This allows consumers to acquire comparative information on where to find the best alternatives. Hence, the Internet alleviates problems of incomplete and imperfect information and fosters effective global competition.

Clearly, information plays a crucial role in improving the customization of products and the competitiveness of markets. Therefore, the new economy has also become familiar as the information age. But, information has always been important. What's new now? In fact, the constraints that have been loosened by the rise of ICT all reflect more or less prohibitive scarcity of information. 'In the past' information was important mainly because of its absence and/or the inability to incorporate it in production. Due to high search costs, information was expensive to acquire and provide. Production processes also lacked the flexibility to absorb real-time information on desired product specifications.

Nowadays, the cost of acquisition and provision of information has substantially decreased. Production processes and information systems have become increasingly linked together. This allows flexible, customized production. Thus, ICT has boosted the effectiveness of information and thereby the efficiency of market exchange. Because of the 'death of distance', inherent in the information age, market exchange becomes truly global at the same time. However, the information age does not lead to customization in all possible end product

sectors. The nature of a product and the position within the product life cycle is decisive. The emergence of global competition due to easy access to product information and falling costs of transportation and logistical planning holds nearly everywhere though. The information age causes a geographical extension of markets: previously separated markets have come to overlap.

The widening of markets has different consequences for the marketing of different kinds of products. Highly standardized products, such as books or petrol, have little need and/or ability to be customized. An extension of the market intensifies price competition in the entire commodity chain. Since the products are standardized, they can be marketed from anywhere in large quantities at low marginal costs now that information provision and access has become global and logistics are getting ever cheaper. Regional price differences will be sharply mitigated, especially for standard products.

Besides standardized mass products, we can distinguish two alternative kinds of products: special or exclusive products and flexible products. Special or exclusive products are available in limited supply and their market was already more extended, and less regionally differentiated, than for standardized products. People are willing to travel further to buy a hi-fi set by Bang & Olufsen than by Samsung. The information age does not yield comparable changes in marketing for these products. It will not intensify price competition with alternative products, since special products occupy a highly stable market niche, based on status that results in low substitutability. Flexible products can be produced according to customer specifications. These products experience market widening in terms of both geography and variety (or scope). The information age causes customization as well as price competition in these products (varying from cars, through apparel to retail services).

In summary, digital technologies enable consumers to choose the best possible deal from around the globe, and producers to offer more customized products. Competition rises

and shifts from costs to value, focusing on faster marketing, better matching and higher quality, as well as prices (especially in saturated markets). Product characteristics become more suited to customer desires in many industries: the marginal utility of 'a euro spent' rises.

3. Production Systems in the New Economy

In light of the arguments given above we may conclude that the new economy raises the 'information content' in the gross value of products and transactions (cf. Reich, 2001). Information system applications are necessary to match and market customized products and to ensure precision quality. Moreover, global competition presses producers to optimize their supply chain, which is also made possible by easy access to information. This leads to international fragmentation of some parts of the supply chain while fostering regional agglomeration in others (Jones, 2000). In any case, co-ordination of logistics increases reliance on complex information systems. Developing and managing these information systems requires specialized, highly skilled labor and support services. Hence, information services are increasingly essential inputs, complementary to the production of customized, competitive end products. These information services can be provided more easily across large distances because of the developments in ICT. The importance of particularly information services[1] in the economic system of the new economy is crucial in our opinion. They are both complementary to the advent of customization in consumer goods and services and personification of the global information market place.

Fundamentally, the rise of the information age implies that cost structures change. The rising complexity of information system applications increases the necessary fixed ex-ante investments in human capital and the development of the applications. Information is costly to

[1]For convenience, we will equate intangibles to services throughout the paper. In this way, information systems and the provision of information are both amongst information services. See, for example, Hirsch (1989) Stibora

develop, but becomes much cheaper to reproduce and provide (Shapiro and Varian, 1999). Therefore, economies of scale and imperfect competition are prominent features in the intermediate information service sector (see also Markusen, 1989).

Customization of end products and vertical specialization underlie the increasing demand for specialized intermediate information services. The complexity of information systems necessitates that producer services are highly flexible to the requirements of buyers. Therefore, information services will consist of different varieties that are close substitutes in demand as well as in production technology (Stibora and de Vaal, 1995). Thus economies of scope are also important in information services. Since services are by definition flexible and heterogeneous products, the difference in strategy between economies of scale and -scope for the service provider is not as relevant, though. From the side of intermediate demand, returns to variety reflect the value placed on differentiated, customized services. For service providers, recouping the fixed investments in information development is central for competitive strategy. In order to succeed in making such high investments, capital market- and educational institutions must support the human and financial capital requirements for information system development. The availability of human capital, educational infrastructure and diversified financial markets is therefore essential to the absorption of ICT technologies and the lift-off of the new economy.

In end product sectors, the emerging information age results in a twofold development. On the one hand, advances in marketing due to the emergence of versatile and complex information systems have led to a widening of markets in standardized products. The geographical extension of these markets yields a rising importance of scale effects in competitive strategy. On the other hand, scale economies give way to economies of scope in

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and de Vaal (1995) and Linders (2001) for specific discussion of the nature and characteristics of services and information. Hill (1977) has provided the most widely accepted academic definition of services.

many final products, in which information systems are increasingly crucial for co-ordination towards customized demand. Meeting varying needs becomes the key strategy there.

In the information age markets become less predictable and the speed of adapting to changing conditions of demand becomes more important (that is, markets and transactions become more complex). Therefore, vertical integration to stabilize the market is a less tempting option compared to outsourcing support services and other inputs in order to avoid demand uncertainty (de Groot, 2001). Moreover, since economies of scale related to complex skill requirements have gained importance in these support services, outsourcing is further advanced. However, such a change in the mode of organization of production should also take into account the effects on the transaction costs of contract governance.

Summarizing, we have identified several concepts that are central to our analysis of the new economy: economies of scale, transport cost of information, returns to variety (economies of scope), outsourcing and transaction costs. Next, we will explore how these concepts interact and affect trade, specialization and welfare.

4. Analysis of the New Economy: Trade in Services and International specialization

4.1 Returns to scale and variety, transport costs and trade in intermediates

The increasing importance of trade in intermediates and the reality of imperfect competition as a crucial factor for international economic relations have motivated the rise of a strand of literature grouped together as representing 'new trade theory'. A typical collection of contributions to new trade theory can be found in Krugman (1990). The inclusion of scale economies, both internal and external, allows the formal study of the emergence of regional concentration, retainable industries and trade conflicts. An important conclusion is that free trade does not necessarily benefit all nations. Nations can change their position in the

international division of labor in favorable ways at the expense of other nations by subsidizing industries towards export competitiveness (see Gomory and Baumol, 2000).

For our purposes, the most interesting extension of new trade theory is the inclusion of transport costs in a setting of increasing returns to scale. A classic example is the article by Krugman and Venables (1995). They analyze the effect of globalization (in our terminology, the rise of the new economy) on specialization patterns between countries. Globalization is represented by a fall in the cost of transporting merchandise. The presence of external returns to scale, reflecting cost and demand linkages between sectors, stresses the central role played by trade in intermediates for the outcomes of specialization patterns. Agglomeration effects are possible for intermediate levels of transport cost. This implies that globalization does not necessarily raise real income and welfare in all regions.

This analysis, however, focuses on trade in merchandise and does not incorporate the most central aspect of the new economy: the emergence of the information age. Consequently, the effects of trade in information services on the pattern of specialization cannot be analyzed explicitly. Evidence on the rising importance of information services in intermediate demand and production supports the relevance of such analysis (see, for example, Francois and Reinert, 1995).

De Groot and Nordas (2001) provide a workhorse model to analyze the impact of the emerging information age on the international economy. Following contributions on trade in intermediate services by Francois (1990) and Markusen (1989), they show that the possibility of trade in services can drastically affect specialization patterns and welfare across countries. However, they add several features that enhance the coverage of the concepts that are at play in the rise of the information age. We take a short look at one possible chain of effects of developments in ICT on specialization patterns and welfare. First, the fall in trading costs (i.e., transport costs of information) enables more effective world scale competition in the

provision of information services. Production of these information services is subject to economies of scale. Since these services together enter as complementary inputs in the production of final products according to the principal of increasing returns to variety, changes in specialization patterns may even result in a loss of welfare in countries that lack the human capital or information infrastructure needed.

4.2 Outsourcing and transaction costs

We have mentioned the rising demand for information services as one of the changes in the new economy. Together with the increased tradability of information services, rising demand implies a larger potential market. This is a further incentive for outsourcing of these services to specialized firms on the market. Economies of scale in the production of indirect inputs can be more fully exploited by specialization on the market (see de Groot, 2001)[2].

Whether intermediate services will remain to be provided in-house or will increasingly be provided by decentralized market exchange then depends on the change in transaction costs that ensues from such a shift in the mode of governance. Before contemplating the possible effects of ICT on the relative efficacy of market versus internal provision of information services, we present a short overview of the logic of transaction cost economics.

Transaction cost economics appreciates the fact that transactions need to be aligned with varying governance structures (Williamson, 1998) in order to organize economic activity efficiently. The key insights behind this are that people have limited capabilities and lack perfect insight. Under these circumstances contractual partners tend to act opportunistically to some degree, depending on the balance of power in the transaction relation and the complexity (uncertainty) of events. For the respective partners, the extent of specificity of their assets

[2] The interdependence between rising demand and outsourcing also indicates that we should be careful to attribute the entire rise in the share of intermediate services in output to rising demand. Part of it reflects

related to the transaction determines the degree of bilateral dependencies between them. Potential conflict may thus arise surrounding an economic transaction. To prevent such conflict from undoing or upsetting opportunities to realize mutual gains, a governance structure has to be chosen that fits the characteristics of a given transaction. Not all transactions can be organized according to the governance of market exchange and still less can fully depend on the pure price mechanism of the invisible hand. Contracts are often necessary. This may even amount to the abandonment of market relations in favor of internalization into hierarchical relations.

From this point of view, all costs that arise in relation to the chosen contractual arrangements for a transaction qualify as transaction costs. All of those costs are incurred for planning, adapting and monitoring task completion in its most general form in behalf of the transaction (de Groot, 2001). We may think of costs of logistic management and organization, search costs for contractual partners, costs of devising contractual safeguards, costs of bureaucratic distortions and consequential costs from the contractual hazards of task incompletion.

In general, market provision is associated with higher contractual hazards and higher costs of control, the more specific the assets related to the transaction are. Internalization then becomes a relatively more beneficial option. Conversely, in a situation of low asset specificity the market becomes a relatively more efficient governance structure. Obviously, the opportunities for reaching economies of scale rise when assets are less specific. Market provision enlarges the scale of production relative to internal provision by pooling resources, thus realizing the opportunities for economies of scale. Furthermore, the adaptability of the market to changing conditions of demand and supply is better in such a situation.

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outsourcing of already existent activity and represents organisational rather than structural changes. Still, much of this organisational change in turn reflects structural changes in cost and demand parameters (Postner, 1990).

Transaction costs are generally related to the search for and acquisition and interpretation of information. How does ICT affect these costs? Access to information has become easier and the capacity to process information into knowledge has risen. This also implies that ICT has a significant administrative impact on the organization of economic activity. What consequences does the change in organizational capacity have for the transaction costs of market and hierarchy?

First, ICT reduces the costs of logistic planning and organization of transactions in both market and hierarchical contexts. Think for example of the costs related to stock management. This fall in transaction costs occurs across the board and reflects the productivity gains in the information infrastructure (more effective and productive information systems and networks). Second, faster and more comprehensive access to information and knowledge lowers the costs of search, control and, up to a certain degree, the extent of asset specificity. The latter needs some further illustration.

We hypothesize that in the old economy lack of information in a situation of bounded rationality caused part of the product differentiation in information services. Since the markets for information services were intransparant and geographically constrained, each producer of end products entered into close relation with only a few intermediate service providers. In this way each intermediate producer faces firm-specific demand. Asset specificity thus generated creates an unfavorable balance of power for downstream producers. Often this would amount to the internalization of these services within a vertically integrated hierarchy. The improvements in the conditions of information acquisition resulting from ICT lead to more transparent and geographically extended markets. Both customers and providers get easier access to larger markets. As a result the extent of asset specificity falls and the degree of competition rises. Concluding the second category of effects, we may say that the costs related to opportunism can be better contained because of the advent of the information age. Thus

ICT reduces the consequential costs of market provision[3] and therefore the need for devising detailed contracts of little adaptability. As a consequence, the rationale of internal provision diminishes.

Combined with the arguments of increasing market unpredictability and scale effects that we discussed earlier, all of this at least suggests that "ICT is an important driving force behind the increased tendency to outsource non-core activities. It tends to reduce transaction and transportation costs and thereby fosters the marked-mediated exchange of goods and services. The market has become more effective in providing high-powered incentives for transactions of diverse nature" (cf. de Groot, 2001). Outsourcing may complement the process of rising international trade and specialization in information services. It allows further productivity gains in the presence of scale economies and returns to variety. Final good producers are enabled to focus on core activity, while information services become available and more easily substitutable on the market, at lower prices and larger variety.

Countries that most successfully install an effective and productive information infrastructure will succeed best in bringing transport and transaction costs down. As a result, outsourcing of intermediates and productivity gains in information services and end products will be highest there. These countries stand to gain most from the changes in costs, tradability of services and specialization patterns that lie ahead in the emerging new economy.

[3] Alternatively some argue that information systems can be deliberately used to create bureaucratic distortions and serve conflicting interests and opportunistic behavior. Competitive pressure can either induce individual agents' learning efforts in order to become more competitive or to hamper and obstruct knowledge creation more effectively. Ultimately, the outcome depends on the nature of informational asymmetries and the capability of information systems to alleviate or strengthen these asymmetries. Asset specificity is a crucial variable for the ability to appropriate quasi-rents by opportunistic acts. As we have seen ICT seems to reduce such specificities somewhat, if anything. Therefore, the ultimate total effect of ICT on transaction costs tends to be beneficial.

5. Towards a Perspective on Productivity and Growth in the Information Age

In this section we first recapitulate some of the most important findings on the new economy so far. Then we try to sharpen our interpretation of transaction costs in relation to the nature of information services. Subsequently, we extend the analysis to consider the dynamic implications of the new economy.

5.1 Main insights

The analysis in this paper has attempted to argue that the best way to understand the information age is to acknowledge that cost structures have changed drastically. ICT developments have lowered the costs of information acquisition, provision and processing. These changes result in falling variable costs of customization, a geographical extension of markets and declining transaction costs. Consequently, the economic structure and organization, the way of doing business, is changing. Competition in the entire commodity chain becomes more global and transactions become more complex. Cost considerations increase the reliance on vertical specialization (outsourcing of support services) and market incentives. Because of economies of scope in marketing, conglomeration becomes an alternative strategy to cope with increased market volatility (Reich, 2001). All of this has increased the dependence on complex information systems that exploit the advantages of the information age. The information systems themselves are costly to develop. Indeed, the element of rising R&D intensity, a shift to fixed, sunk costs and complementarity to human capital creation, is an important feature of information services in the new economy.

To appropriate the productivity benefits of the new economy, the development of an effective information infrastructure is necessary. This requires the development of complicated information systems and the skills to apply them in production and marketing.

Because of the complementarity to human capital building, learning effects and the need for efficient capital markets to finance the development cost, less developed countries are at risk.

5.2 Information services and transaction costs

The analysis of the information age yields a paradox. The more efficient information infrastructure manifests itself through falling transaction costs. But the intensified competition that coincides with the new economy also pushes the economy towards more complex transactions. What, then, is the total effect on transaction costs and how should we interpret the outcome?

We adopt a two-tier approach to transaction costs to solve the paradox. This interpretation further stresses the distinction between transaction costs and trading costs. Transaction costs arise because of the need to govern transactions that emerge as a result of specialization of labor. Contracts have to be arranged between partners and information has to be collected to establish a division of tasks, execute them and control these activities (see section 4.2). The collection and absorption of information is central to transaction costs.

Two layers of information activity can be identified. At the first layer, information services serve to collect and present information and knowledge to the contractual partners as input to their management process. These services can be identified formally as transaction costs. The choice made here is to identify them as 'transaction cost related support services'. As examples of these services, think of computer services (software development and computer advice), data management services (like inventory and order documentation, and accounting in general), and consultancy (marketing advice, management advice and accountancy). At the deeper, more fundamental, second layer we find the management (top and middle management) of the contractual relation. These are the activities that absorb and process the information and knowledge provided by the first layer in order to plan, co-ordinate

and control task completion in transactions (for example stock management, financial management and strategic planning). These activities are also transaction costs[4]. They are more fundamental transaction costs, because demand for first layer intermediate services arises from the overhead service activity in this layer.

Transaction costs need to be distinguished from trading costs. Transaction costs are related to the co-ordination of interactions between contractual partners. Trading costs arise because of the physical exchanges that are part of transactions, such as the transport and storage of goods and people and the transmission of information. As such, transportation, storage, commerce and telecommunication are examples of services that qualify as trading costs.

The paradox referred to above arises because it may not be clear what role transaction costs and trading costs play in production. Economists interpret activities related to transactions as costs. This leads to the question whether these activities are productive or a mere waste? All activities, from information services and transportation to commerce and management are productive, since they fulfill a need posed by economic scarcity of information, knowledge and physical movement[5]. The key for understanding the nature of these activities is to acknowledge their indirect (or derived) productivity as intermediates in the production of end products. In this indirect productivity lies the effect of ICT. As a result of ICT, both trading costs and some second layer transaction costs have fallen. The need for middle management to co-ordinate task completion and control has diminished (de Groot, 2001). Top management can now focus more and more effectively on strategic planning, a type of transaction costs that has the highest potential indirect productivity for end production! This raises indirect productivity of (labor engaged in) these activities in terms of end products.

[4]The consequential costs of task incompletion are also transaction costs and part of this second, management layer.

Second, output scale and indirect productivity of information services (first layer transaction costs) have risen. They have become cheaper and more effective in use. As a result, they have become more important as inputs in production. Evidence on the structure of production has indeed revealed growth of the importance of information-based services in production (Stibora and de Vaal, 1995; de Groot, 1998). Labor has substituted from end products to information services (Reich, 2001).

All in all, the information age allows a relocation of transaction costs to more productive ends by reducing scarcity of information as an input and improving the effectiveness in absorbing and processing this information. We have reached the point to turn to the implications of the information age for long term economic growth. Moreover, we have yet to address the problems and strategy to be followed to find empirical corroboration or challenge of the theoretical expectations. The remainder of this section will address these subjects in general lines.

5.3 Dynamic aspects of the new economy

From empirical literature on the dynamic consequences of the new economy, a mixed picture arises. Accelerating productivity growth seems to concentrate in a small section of the economy, notably communication equipment, computer and related industries and the rest of durable manufacturing (Gordon, 2000). Still, we may state that the effects of the new economy are delayed because of the transformation of the economic structure related to the absorption of ICT developments. Productivity growth could eventually accelerate if the new economy proves to change the way of doing business across the economy: doing different things differently. We argued that the information age and the emergent importance of

[5]It will be clear that consequential costs, as part of transaction costs, are pure waste. These costs are clearly different from other transaction costs, since they are not produced but result as by-product of some failure.

complex information systems constitute a truly new economy. This argument conforms with the view of fundamental structural change, also called the 'general purpose technology'-view of ICT (Helpman, 1998). At least for an extended period of time, the productivity growth trend would shift upwards according to this view. The information age of computer and internet technology has a further potential benefit for long term growth. Much as the invention of script, the introduction of integrated computer, information and communication technologies may spur research productivity on a permanent basis. The reason is that a new information technology is even more general than all previous general purpose technologies: it can be used in the production process of knowledge itself, besides its role as a source of inspiration[6] for new developments in technology.

Recently, Bartelsman and Hinloopen (2000) offered an analysis in line with this argumentation. They argue that the use of ICT products in knowledge production raises the rate of growth in knowledge at a constant level of R&D activity. They point out several motivations for their hypothesis. First, knowledge creation benefits considerably from more efficient communication and information processing. Information and communication technologies provide researchers with a vast increase of available data. Computer technologies enable them to process and analyze data in a much more versatile and efficient fashion. Second, ICT products may contribute to wider diffusion and more easy absorption of newly developed knowledge by fostering the digital codification of knowledge. Finally, the information age may facilitate matching between demand for knowledge and supply of innovations. Faster and more comprehensive access to information and knowledge lowers the transaction costs of search and monitoring. Thus, ICT leads to more effective communication and better assessment of success during R&D. The productivity of R&D activity rises because

[6]One can argue that the same holds for electricity or the wheel. With electricity, light, motion and even measurement came to be applied in much more sophisticated ways than before. Of course, all of these are

efficient matching and interaction help ensure the effectiveness of R&D efforts. The higher productivity of knowledge creation will permanently raise overall technological development and growth in productivity.

Although they seem plausible, some interesting opposition to these arguments has arisen. First, Gordon (2000) has suggested that the advantages of ever-rising computing power are bound to meet natural limits. We are moving downward along the demand curve for computing power, in the direction of progressively lower marginal utility of new computing advances.

Second, several theorists have challenged the argument of increased diffusion and absorption of knowledge in the information age[7]. The critique centers on the discussion whether and how tacit knowledge is highly complementary to codified knowledge. It is generally accepted that ICT improves the diffusion and absorption of codified knowledge. Analysts disagree, however, on the possibility that a higher percentage of knowledge becomes codifiable and whether actors in R&D will even wish to increase codification. Probably tacit knowledge remains important to be able to absorb codified knowledge and generate new knowledge. The relevance of this argument is questioned by the statement that the increased efficiency in codifying parts of knowledge serves as a stimulus for investments in tacit knowledge too. Tacit knowledge after all allows the producers and/or users of new knowledge to better appropriate the economic benefits of this knowledge. Overall investments in and output of knowledge creation may still increase as a result of ICT. Yet, an improvement of productivity in terms of codified knowledge may just as well lead to less overall investment in knowledge creation and lower technological progress, since tacit knowledge becomes relatively expensive and free-riding on knowledge created by others increases.

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ingredients in the research process. Still, information is even more crucial for and akin to knowledge creation. It is the basic source of all knowledge.

Although interesting, the criticism of Gordon in particular is rather deterministic. He might have failed to appreciate sufficiently a fundamental feature of general purpose technologies: they change the way of doing business across the economy and thus eventually shift the demand curve for (additional complementary) innovations outward. Certainly, the information age coincides with rising complexity, which will endogenously call for more R&D to cope. A rising R&D and human capital intensity ensues and may do so without raising productivity growth. But, for now, this seems to be a derived, second-order effect. Human capacity is redirected; complex computer-outputs constitute an improvement on previous knowledge, despite the time that needs to be invested in sorting them out and interpreting them.

5.4 Empirical issues

If we want to assess the changes in services trade and specialization patterns that occur in the information age, we have to address empirical questions too. Unfortunately, empirical research in services trade is rare because of the lack of detailed international trade statistics in services. Still, sectoral studies may allow a comparison of trade in information services for a selected group of countries. Several empirical questions emerge to test the theoretical expectations regarding trade patterns.

First, we have to determine how important trade in services is and whether services trade has kept up with or even surpassed the fast pace of growth in merchandise trade over the past decades. As shown in Linders (2001), it turns out that service trade accounts for about 20 % of world trade. From 1980, the share of services in trade has risen slightly from 17%. Interestingly, the evidence shows that the share of information based business services in trade

[7] The challenge arose at a workshop on ICT, organized by the Netherlands Bureau for Economic Policy Research (CPB) and the Dutch Ministry of Economic Affairs, The Hague, in spring 2000.

has grown steadily. While the position of services has matured within the composition of global trade, some countries clearly specialize relatively to others in exporting services. The second question, therefore, is to determine patterns of relative export specialization in services across countries. The special emphasis on information services may, however, limit the scope of countries for which to acquire detailed trade patterns. An advantage of the limited scope in selecting trade flows may be that a more sensible and detailed research becomes possible into the next empirical question: what are the determinants of specialization patterns and trade flows. Given the heterogeneous nature of information services and the presence of economies of scale, intra-industry trade and trade under imperfect competition are expected to be relevant. Also, as noted before, increased complexity and interdependence of industries characterizes the new economy. Therefore, the importance of external economies of scale within the information infrastructure, due to learning and complementarity to human capital, as a determinant of trade and specialization patterns can be expected to be relevant. The challenge will be to capture these economies in empirical indicators. A crucial part of that effort will focus on the measurement of differences in transaction costs between countries, as resulting in differences in the productivity of the information infrastructure.

6. ICT, Knowledge and Locality

Knowledge is a particular good in an information economy. Although in an ICT world knowledge might in principle be accessible everywhere, we observe in reality knowledge-rich and knowledge-poor areas, depending on the investment efforts in knowledge creation, diffusion and use. Especially the creation of new knowledge is a phenomenon that is fraught with much lack of insight. Indeed, knowledge incubation is a rarely studied phenomenon, in contrast to firm incubation. Not only the presence of a knowledge infrastructure (e.g., universities, laboratories, research institutes), but also the local attitude (sense of

intellectuality, open mind, interest in knowledge transfer) play a critical role. From a regional-urban perspective also the openness of the locality is an important factor. Knowledge acquisition presupposes most likely some sort of a Schumpeterian view on the production of new insights in a competitive environment (cf. Acs and Varga, 2001).

It should be added that the local knowledge base is also of utmost importance for local economic development. In a knowledge society, many firms are critically dependent on the access to new knowledge. And therefore, knowledge is also a major locational factor of a locality (see van Geenhuizen and Nijkamp, 2001). When attracting new activities and investments, regions can follow two basic strategies, viz. competing with low costs and competing with high value-added. The latter strategy encapsulates many policy challenges. Competing with high value-added means competing with creativity, the best and latest information, the highest standards of production, and an easy access to resources and companies around the world (cf. Andersson, 1991, Kanter, 1995, Mayinger, 2001). Thus, this strategy is based upon the production and use of knowledge as an essential economic resource. Therefore, the first reason for focusing on knowledge as the outcome of learning processes is likely the better performance of knowledge-based economic growth. A second reason is the expected structural change of the economic base of many city regions in advanced economies, reflected in a transformation of the economic base from commodity-based activities in the production sector to knowledge-based activities in the broader service sector and in a move from mass production to more flexible modes of production, the latter requiring greater variation in knowledge and knowledge application (cf. Acs, 2002). Another important reason for addressing knowledge is its potential contribution to sustainable development, in terms of application of new technology and new organizational formats. A fourth and distinct reason for paying attention to knowledge and underlying its learning mechanism is the nature of policy-making itself. There is an increased uncertainty in regional policy making, caused by

factors such a policy outcomes in related policy fields, support of stakeholders involved and macro-economic developments. Policy-making becomes a learning activity in itself by including methods of policy design that take uncertainty into account (e.g., Friend and Hickling, 1997). Regional and urban policymakers, therefore, may treat knowledge and the underlying learning processes, as an essential source of economic power and competitiveness, as well as a source of sustainable development.

Knowledge is part of our modern ICT society. It is a sine qua non for its emergence and survival. It is also a tradeable good, but usually only in the form of codified knowledge. Creative knowledge or tacit knowledge is normally not for sale. It has to be generated and facilitated in favourable locations.

An important lesson is that the much-praised concept of the death of distance suggests that free market access is abundantly available all over the world and that space is a free good. This is a mistake, as space is scarce and this relative scarcity leads to significant price differences in land use. In addition since in a growing economy more material products are likely to be consumed, trade and transport will increase, and hence intense logistic efforts are needed to ensure an efficient delivery of physical goods. Despite ICT, material consumption will rise ('kilobytes cannot be eaten'). A second reason why the tyranny of space will still prevail in the future, is that there is no free access to ICT. To reap the fruits of ICT in a competitive international environment requires that one has to invest heavily in ICT (hardware, software, intellectware). In this context, also endogenous growth theory offers an important lesson: there is 'no ICT manna from heaven'. Thus, the question is under which conditions specific regions are able to attract more ICT activities than others. This will be decisive for the distribution of welfare and hence for global equity (see also Lall and Yilmaz, 2001). The answer to the above question cannot be given by simple comparative cost arguments nor by neoclassical trade theory. It requires an evolutionary perspective with a

blend of endogenous growth theory, innovation and incubation theory and new economic geography, complemented with sustainability theory.

7. Reflections on future research

Many interesting questions concerning the impact of ICT on the international economy remain. In this final section we briefly sketch the directions for future research on this subject. In particular, we recognized the importance of the information infrastructure for reaping the potential benefits of the information age. Consequently, future research will focus on the links between ICT, transaction costs and the productivity of the information infrastructure.

Information systems, physical and intangible networks and human capital base that together form the information infrastructure, can potentially revolutionalize the organization of economic activity by reducing trading and transaction costs. The productivity of the information infrastructure, however, may crucially depend on the intangible, informal network of trust and convention between economic agents. In the end, trust is the key determinant behind transaction costs (see Fukuyama, 1995) and hence for realizing the full potential of ICT for lowering these costs. This aspect strengthens the case for analysts who argue that ICT is enforcing agglomeration trends and reinforcing cities. We already mentioned the 'comparative advantage' of cities in generating the network externalities associated with ICT. Issues surrounding trust may help explain the geographical dimension of the ICT revolution. Indeed, then, the local-global divide in the information age would be much more complicated than the visions of 'electronic cottages' or the 'e-society' suggest. High value production, especially of information services, would be localized in areas with dense networks of trust and human capital. In those regions, the full potential of the information age can be reached. An efficiently operating information infrastructure yields a superior productivity of information services and human capital as inputs into the production of end products. The

question then remains whether ICT will lower trading and especially transaction costs of information services sufficiently for lagging regions to benefit from increased tradeability without falling further behind in the technological capability to attract new industries. Here, also, the question is whether ICT will largely substitute electronic networking for intensive person-to-person interaction and tacit knowledge in the provision of key information services, or will rather complement these 'handshake' institutions in localized agglomerations of high-tech activity. Sales of end products, however, would be global, as the costs of transport and information transmission have plunged.

The importance of the locality of the information revolution puts forward the need for comparative data on the issues identified above. The construction of a database in which ICT and institutional factors, such as trust, play a prominent part in a geographical context will be of central importance for further study of the development of relative welfare in the new economy.

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