11 Digitizing services: what stays where and why

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The spatial extension and deepening of capitalism has been a topic of interest to geographers, other social scientists, and activists since, at least, Lenin. This topic has reappeared on the public agenda recently under the rubric of 'globalization'. Once again, the spatial redistribution of economic activities is sparking enormous controversy and opinions from nearly every philosophical position. This paper considers two dimensions of this enormous topic and argues that neither dimension has received sufficient attention from geographers. The first dimension is the role of technological advancement transportation and communication technologies in a capitalist system. The second dimension is the development of a global division of labor in service provision.

In 1980, Frobel et al. hypothesized that a new international division of labor was being created within which low skilled manufacturing work, which had previously been located in the developed nations, was being transferred to developing nations to take advantage of low-waged, mostly female workers. At the time, they suggested that this was an inherently unequal exchange and that the workers in both locations were victims of this relocation. This essay will not engage the debate about the exploitation of low-wage workers in developing nations except to assert that the plight of these workers has received an enormous amount of attention from geographers, sociologists, anthropologists, professors of women's studies, and social activists. Quite naturally, in their zeal to struggle against the very real and shocking work conditions under which these workers labor, they have focused on a few industries particularly garments and shoes (industries known in the developed world for shocking labor conditions), and, to a much lesser extent, electronics. It is remarkable how social science researchers have reduced the integration of the developing nations into the global economy to garments and shoes. This fixation has had the unfortunate effect of resulting in a one-sided understanding of globalization

This essay directs attention away from these infernal mills to the two dimensions that I believe will have a far more significant effect. Consider the implications of how the rapidly evolving global transportation and communications infrastructure is tying the global economy more firmly together. The globalization of

manufacturing is being followed by a global redistribution of white-collar work, which has only recently begun. As this advances, it will lead to a fundamental geographic redistribution of work that is also nearly certain to have profound effects on the global economy. These two themes are not new as Dicken (2004) touched upon these in his lament that geography was being left out of the globalization discussion. To presage my concluding discussion I will argue that geography has been so swept into the study of clusters and the interest in cultural studies that it is missing the macroforces that are transforming the world economy.

This paper speculates on the implications of the digitization of work and the global improvement in telecommunications and transportation networks means for the creation of a global work force and, by extension, a global labor market. This will threaten those in developed nations whose skill levels are not sufficiently superior to those in developing nations to justify receiving developed nation's wages. For all economies it suggests, ceteris paribus, that workers wherever they are will be rewarded more equally.

Transportation and communication systems

Among the classical social theorists, it was Marx who was the most fascinated by transportation and communication systems for the development of capitalism. He considered them most directly in volume two of *Capital* where he recognized their centrality in reducing turnover time by increasing the velocity of all types of capital. These technologies form the arteries by which economic actors are interconnected. Their importance in terms of enabling both greater speed and greater throughput has been recognized by many (Chandler 1977; Fishlow 1965). When a new medium of communication or transportation emerges or a previous media is dramatically transformed, such as recently occurred with the transformation of telecommunication networks from analog to digital transmission, opportunities are created for entrepreneurs to utilize the new media for both organizational and spatial transformations (Fields 2004). [AQ1]

Transportation

In *The Wealth of Nations* Adam Smith recognized the importance of transportation for the development of markets. And yet, until the application of the steam engine to locomotion, for all intents and purposes, transportation was limited to either animate power or the speed provided by natural forces such as winds and currents. The steam engine began revolutions in transportation, both on land and at sea, and then eventually in the air that permitted the relocation of production sites, e.g. internal combustion engines dramatically increased the power available for locomotion and speeding the movement of goods and people.

The SC innovations are in fact sociotechnical. For example, the global maritime infrastructure was the result of a long coevolution of networks including shipping firms, freight forwarders, ports, insurers, brokers, and many other intermediaries.

Transportation technology has also affected organizational forms. Braudel (1982: 371) reminds us that in the 1400s trade was so risky and difficult that most merchants fitted out their own ships because 'the risks and the cost price relative to the cargoes transported were so great in long-distance shipping that they made transporting as a simple freight industry virtually unthinkable'. In other words, the merchant had to integrate ship ownership and operation – there was no opportunity for a division of labor. Later, the development of the shipping networks would coevolve with the increase of trade and the further development of international finance (Miller 2003: 4).

For the today's industries, the most important transportation technologies are air freight, which has grown remarkably during the last two decades, and shipping containerization, which has sped surface transport and lowered its costs and risks. Containerization is at the core of intermodalism, for example, the ability to move cargo in the same containers by sea or land. With the standardization of the shipping container's dimensions, logistical planning was simplified. As the stevedore were replaced by crane operator loading and unloading 20- and 40-foot cargo containers from specialized container ships, the delays at the ports were drastically reduced.

The intermodal shipping container provided a base for further innovations that would have significant geographical implications by reducing the friction of geography. For example, United States retailers monitor their sales in real-time permitting them to reorder goods electronically shortening lead times. The orders are not only transmitted, to say China, but they also inform the vendor the loading order. The United States delivery route for the container has been established prior to loading eliminating the need to send the products to a warehouse for storage or sorting. The container is lifted off the ship directly onto a truck that then delivers directly to a store.

The shipping container has become the critical package in world trade, and container traffic, along with air cargo, is the fundamental measure for the growth of trade. The emergence of China as the global workshop can be seen in the rapid growth in the number of containers moving through its ports. In 2003, the container throughput of Chinese ports reached 48 million ton equivalent units (TEUs), the largest number of containers traversing any nation in the world. From January through September 2004, container throughput was 43.7 million TEUs, a 27.2 percent increase over the same period in 2003. Hong Kong, which serves China, is already the busiest port in the world, but Shanghai ports serving South China are rapidly gaining on it.

Air transport was the other key transportation system and it has been growing rapidly also. Though the bulk of the finished good flows through the medium of shipping containers, for the highest value-added items that are most subject to decay or obsolescence air transport is method of choice as it is for people traveling long distances. For semiconductor chips, hard disk drives, fresh fish, and many other products that lose their value rapidly airfreight has become critical. Elaborate service infrastructures have developed to ensure that goods air transported are not delayed in their movement (Leinbach 2004). In terms of costs,

air transport has been decreasing at a rate of 3 percent per annum. For locations wishing to ascend the value-added hierarchy an international airport is a critical infrastructural requirement, whether one is exporting cut flowers from Bogota to Miami or newly packaged integrated circuits from Penang, Malaysia. The 'fastest growing market of all for air freight is in IT goods from Asia to Europe and North America, [and this represents] 40% of the total shipments by tonnage and nearly 75% by value' (Butterworth-Hayes 2005). To be a global-class industrial center, global quality infrastructure has become a requirement.

Telecommunications

The effect of communications on geography has been dramatic. For example, Febvre and Martin (1976) titled an entire chapter in their treatise on the innovation of the moveable-type printed book as *The Book as a Force for Change*. The printed book increased the volume transmitted and, by lowering the cost of reproduction, expanded the number of persons capable of accessing the knowledge and information. But, more important, the accelerated circulation of information, in the form of codified knowledge, sped the creation of new knowledge and information, forming a virtuous circle of knowledge growth that continues to this day. To illustrate, typeset books circulated the heretical views of Galileo and Copernicus far more rapidly than hand copies of an original manuscript ever could have.

Twenty-five years ago, telecommunications capacity was concentrated in the developed nations. Phone calls to India, China, or even Mexico were expensive and the quality of service was low or even extremely low. In the 1980s this began to change as telecommunications was deregulated and there was increasing pressure for improved and lower cost service. With the construction of new fiber optics undersea cables during the Internet Bubble of the 1990s, a dynamic of double-digit percentage price declines per annum for international service was set in motion.

India is an excellent example of a formerly bandwidth poor nation whose telecommunications infrastructure has improved dramatically. To illustrate, India's international submarine cable capacity grew from 31 gigabytes per second (Gbps) in 2001 to 541 Gbps by the end of 2004. In China, the cost of international service has plummeted to the point at which it was possible to buy telephone cards offering United States to China calling for about $.03 per minute. The final chapter is the coming voice-over-Internet-Protocol telephony that will create always-on connections priced at a low monthly fee. With this the cost of transferring information long distance will no longer be significant. In this respect the prediction 'death of distance' is being fulfilled (Cairncross 1997).

Telecommunications linkages, capacity, and cost will no longer be a significant differentiator in providing workers protection from competition. Moreover, the rapidity with which service can be provided means that any part of the world having customers willing to pay for bandwidth or workers who can be profitably integrated into the global economy will receive service. Of course, the telecommunications

networks transmit data and information, they do not create knowledge nor can they easily transmit tacit knowledge. Even seeing a person during a teleconference is not the same as in-person interaction, which provides the multi-channeled analog information coming from the person and the context. What the telecommunications networks do provide is an increased ability to share explicit knowledge and information.

The changing organizational and technical aspects of transportation and communication networks have provided enormous impetus to the expansion of the economy especially in terms of integrating labor into the global economy. The impacts of this expansion upon manufacturing workers is already well known. However, the most recent changes in the telecommunications infrastructure is now threatening to have a similar impact on service work, not only at the low end in tasks such as data entry, but even more interestingly on high-end service and research and development (R&D) jobs. The implications of this are examined in the next section.

The changing global geography of service work[1]

The quickening pace of relocation of services overseas, calls into question our normal thinking about what a 'service' is.[2] The ongoing transformation of the global location of service delivery is captured in Jones (2005) where he discusses how service firms are trying to transform their operations from national to functional operations in which there are global competency centers for particular functions. In the case of manufacturing, most persons would agree that it is a process that involves the transformation of a tangible good, though as Sturgeon (2002) has pointed out there is an entire industry providing manufacturing as a 'service'. In terms of the location and discharge of manufacturing, it is generally accepted that manufacturing does not necessarily require constant face-to-face contact between the producer and consumer. Manufacturing usually creates a good that can be stored, thereby allowing a physical separation of the buyer and the seller.

Services have usually been defined as the opposite of manufacturing: they are transactions of intangible, nonstorable goods, requiring that client and vendor be face-to-face while the service was being delivered. For example, Gadfrey and Gallouj (1998) define services as goods that are 'intangible, cosubstantial (e.g. they cannot be held in stock) and coproduced (e.g. very often their production/consumption requires the cooperation between users and producers).' This is obviously true when the service requires face-to-face experience, such as receiving a haircut, but also true when the 'service experience' did not require proximity, such as when a bank's client wants to check their bank balance.

[AQ2]

These definitions, though never exhaustive in prior periods, are now under great stress in the digital age that was inaugurated by the application of von Neumann's principles and actualized by the development of low cost techniques for information digitization, transmission, and processing. These new technologies have had a profound impact on the discharge of services. Paraphrasing futurists

of the 1960s, if robots were going to change the factory of the future, digitization would change the office of the future. First, the digital age allowed (or, at least, dramatically eased) the conversion of service flows into stocks of information, making it possible to store (or, more properly, productize) a service. For example, a legal opinion that earlier had to be delivered to the client in person could now be prepared as a computer document and transmitted to the client over email or, better yet, encoded into software. Easy storage and transmission allowed for the physical separation of the client and vendor as well as their separation in time. It also facilitated the separation of services into components that were standardized and could be prepared in advance (such as a template for a legal opinion) and other components that were customized for the client (such as the opinion itself) or remained nonstorable. Taking advantage of the possibility of subdividing tasks and the economies that come with a division of labor, this reduced costs by offering the possibility of preparing the standardized components with lower cost labor and, possibly, at another location or if all the necessary materials were digitized then the entire product could be produced at another location.

The second fundamental impact was the conversion of non-information service flows into information service flows. For example, sampling of tangible goods by a buyer visiting a showroom is increasingly being replaced by virtual samples delivered over the Internet. Once converted to an information flow, the service may also then be converted into a stock of information, as noted earlier, and subjected to the above mentioned forces of cost reduction through standardization and remote production.

By enabling transmission and storability, the digital age accelerated the relocation of services. The offshoring of services such as writing software was enabled by digitized storage and facilitated by the adoption of standardized programming languages. As transmission costs fell (just as digital storage costs had earlier fallen), even non-storable services, such as customer care, could be relocated. As a result, any location with the requisite labor power could become a services producer. The range of such services is massive, and includes back office services such as payroll, front-line services such as customer care and telemedicine, patent preparation, equity analysis, medical transcription, medical imaging interpretation, remote facilities management, and, of course, software services such as programming and remote IT infrastructure management.

The current emerging insertion of India into the global economy illustrates how activities that were once considered planted in the developed world are being uprooted and redistributed globally (Dossani and Kenney 2003).[3] The thesis is that the tasks being moved are not only the simple commoditized activities that most persons suspect will be relocated, but rather there are a number of high-value activities also being transferred, and that it is these that give us a far better insight into the future geography of innovation and the location of value creation.

India's entry into the global economy came through the very simple stratagem initiated by United States computer firm, Burroughs Corporation, which suggested

to its Indian affiliate, Tata Consultancy Services, that it transfer some Indian software engineers to the United States to install software. This was the genesis of 'body shopping' (Heeks 1996). Gradually, these Indian firms shifted to an offshore model where they would do the coding in India. Roughly contemporaneously in 1986 a group of American MNCs led by Texas Instruments began doing software development work in Bangalore after the government guaranteed them satellite bandwidth. Very soon, these MNCs discovered that Indians were extremely capable particularly in areas like algorithm development. In the 1990s, some of the world's largest financial institutions such as Citicorp, American Express, and General Electric Capital Corporation also established software development operations in India. General Electric and a number of other major medical imaging firms located sales, marketing, then production, and finally R&D operations in India because of the large market for fetal imaging. For a number of reasons, MNCs became increasingly acquainted with the capabilities of Indian workers.

[AQ3]

The 1990s were a tumultuous period in American capitalism as it experienced the largest stock market bubble since the 1920s. The core of the bubble was technology, communications, and, most centrally, the Internet. Given the massive databases, website development, and other chores that came with the feverish panic to create an online presence, there was a belief that the developed nations were running out of software programers. To remedy these perceived shortages, foreign programmers were welcomed into the United States even as firms became increasingly willing to offshore development work to lower-cost environments.

Increasingly, the objects of white-collar work, for example, papers, data, files, and images, were digitized or could be scanned and made digital. Though not immediately obvious, what this meant is that the information within these items was being dematerialized. Even as existing information was digitized, there was a proliferation of sensors, processors etc. that were creating an even larger sea of information to be processed and interpreted. Finally, this information could, in principle, be transferred to any location having two wires – one for electricity and the other carrying communications.

White-collar work was increasingly undertaken on digitized images on a screen. Previously a business process such as filing, researching and adjudicating an insurance claim triggered a set of actions that moved pieces of paper from one office to the next downstream to final resolution; very often generating yet more paper as it moved. Moving these papers a long distance was almost impossible in terms of prohibitive costs, risks of misplacement, and delays. These barriers entirely disappeared once the information was digitized; now the information could flow at the speed of electrons.

How deep the offshoring process will be is inherently unknowable. Consider the promise of telemedicine. If, through the use of cameras and telecommunications linkages, a doctor in an urban medical center can remotely diagnose a person in a rural American farm community, then the doctor can just as easily be in New Delhi or Buenos Aires. For example, in diagnostic endoscopy the doctor uses a digital image for guidance, why does the doctor have to be located in the

surgery? Why not in a room across the street or anywhere else in the world equipped with high-speed internet access? Often, these technical possibilities must be coupled with social innovations. These new technologies do not presage the replacement of all doctors, but, more probably, a reengineering of what the spatial and hierarchical division of labor should be. Already, x-ray and other medical images are interpreted in India for the American market. This illustration suggests that the geographical division of labor of this and many other production processes is likely to become increasingly complex.

The medical example suggests something even more interesting, namely that well-paying occupations in which high levels of discretion and skill are required, and thus have normally been considered immune to global competition may, at least, partially be in the process of becoming vulnerable to relocation. Geographers interested in labor process questions could provide important insight into how this will develop.

Discussion

Capitalism had an uncanny ability to dissolve and reorganize previous arrangements. One of its most powerful levers for melting ossified social arrangements was the application of science and technology to the workplace. Capitalism, through the medium of the entrepreneur, constantly searches for opportunities to integrate more people into its orbit, and today we are seeing the integration of both India and China. At this point, it is impossible to predict what the outcome of this process will be, but there is ample evidence that it will be profound.

Economic geography can play a central role in providing a better understanding of globalization and its implications for the global economy. There is a continuing need for theoretically informed study of globalization. There is a paucity of studies on the telecommunications and transportation infrastructures that are facilitating globalization. The remarkable emergence of China onto the global economy has received only minimal attention from geographers, this should be a very profitable vein of research and Chinese scholars are eager to cooperate with those in the West. The rise of China is already obvious, if understudied, the case of India is almost entirely unexamined, and the Indian case is probably more important, because it immediately leads one into a contemplation of what is the nature of services, or, what could be termed, 'mental' labor. Trying to better comprehend the redistribution of this mental labor globally is possibly the most interesting and possibly most profound new wrinkle in the continuing evolution of the global economy.

With such exciting topics, the growing awareness in all of the social sciences of the importance of the spatial, the interest in understanding globalization, and the intellectual ferment within economic geography provides ample grounds for optimism for the future of economic geography. To justify this optimism, economic geography must escape from the cul de sac of post-modernist (best left in architecture where it made sense), deconstructionist (best left in literature) cultural studies to reengage with studies of the real world of economic action,

otherwise it seems likely that the core topics of economic geography will be absorbed by the other social sciences and as Dicken (2004) so well sums it up, 'geography will miss the boat'.

Notes

1. This section draws heavily upon Dossani and Kenney (2003).
2. On the geography of producer services in the U.S., see, for example, Beyers and Lindahl (1996), though producer services is too narrow as a description of what is being relocated offshore.

[AQ4] 3.

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