Cambridge Journal of Regions, Economy and Society 2008, **1,** 351–370
doi:10.1093/cjres/rsn002
Advance Access publication 23 June 2008

Globalization and economic geography: the world is curved, not flat

Philip McCann

Department of Economics, University of Waikato, Waikato 3240, New Zealand. pmccann@waikato.ac.nz
Department of Economics, University of Reading, Reading RG6 6AW, UK. p.mccann@reading.ac.uk

This paper analyses the argument put that the world is becoming flatter from the perspective of economic geography and spatial economics. In order to do this, we consider the variety of empirical evidence available, much of which appears to be prima facie rather paradoxical. However, it is possible to reconcile all of the seemingly conflicting the evidence by adopting the argument that the global economy simultaneously exhibits trends towards both increasing globalization and localization. Cities are increasingly seen to be the critical context for growth. Using diagrams, we demonstrate that analytically the global economy is becoming even more curved.

Key words: globalization, transactions, costs, cities, geography
JEL Classifications: F21 F23 R11 O33

Introduction

Any paper that deals with issues relating to globalization faces the problem of what exactly is meant by the term 'globalization'. The various ways in which globalization can be understood or interpreted either as a concept or a process are discussed in detail elsewhere (MacGillivray, 2006; Steger, 2003) and as such will not concern us here. Instead, this paper focuses specifically on the economic issues surrounding certain aspects of globalization. In particular, we focus on the economic geography of globalization and analyse how changes in global economic geography are related to various technological and institutional changes that are currently taking place in the economy. The particular argument I take issue with is the notion that technological changes now mean that the world is becoming more similar and less differentiated.

O'Brien (1992) announced the 'end of geography' and (Cairncross 1997) announced the 'death of distance', although the idea that technological improvements mean that geography and distance have become of little or no importance goes back to the early 1980s (Gaspar and Glaeser, 1998; Warf, 1995). In the 1980s, these arguments were also bolstered by observations of an urban–rural shift, whereby increasing numbers of people and investments appeared to be moving away from major cities and into smaller cities (Fothergill et al., 1985). In 2005, however, these increasingly popular arguments were given an enormous boost with the publication of Thomas Friedman's influential

best-selling book *The World Is Flat*. In this book and its two subsequently updated editions, Friedman (2007) argues that the world is becoming rapidly flatter. His notion of 'flat' implies that we increasingly observe greater similarity and greater homogeneity between people in different parts of the world, and he bases his argument on 10 major political economy and technological phenomena. These phenomena are the fall of the Berlin Wall, the advent of the World Wide Web, the development of work-flow software, the advent of uploading and file sharing, the advent of out-sourcing, the rise of off-shoring, the development of supply chaining, the rise of third-party dedicated internal logistics operations, the rise of information availability via search engines and the development of wireless technology. Taken together, he argues that since the year 2000 these 10 phenomena are rapidly re-shaping the world in a way that is qualitatively and quantitatively different to previous eras of globalization. While other commentators have defined the process of globalization using different time markers (Crafts, 2004; MacGillivray, 2006; Steger, 2003), Friedman's book has been singularly influential simply in terms of its popularity, and the extent to which his ideas influence thinking in the political and commercial arenas therefore requires a careful and critical evaluation.

Although many of the political and technological changes he points to began emerging one or two decades earlier, his contention is that the fundamental changes wrought by these phenomena as a group began to emerge really only since the beginning of the twenty-first century. Friedman terms the era of globalization that we are currently experiencing as Globalization 3.0 and suggests that this era began around the year 2000. Even though it is never explicitly stated in his book, the motivation for Friedman's argument is actually primarily an economic geography argument. His thesis that the world is becoming flatter is because of his implicit belief that the transactions costs associated with overcoming space have fallen dramatically. These falling spatial transactions costs are a result of both technological and institutional changes, as captured by his list of 10 crucial phenomena. However, I would argue from the perspective of economic geography that Friedman is entirely wrong and I will develop my argument on the basis of one critical error in his thesis. Spatial transactions costs have not fallen over recent years, but instead they have changed. While technological changes have indeed facilitated behavioural changes, I would argue that the behavioural changes that are occurring are very different to those posited by Friedman. The reason for this is that rather than becoming flatter, I would argue that the world has actually become more curved.

In order to develop the argument, in the next section the logic of Friedman's thesis is reviewed. We then reconsider how technological changes have recently impacted on the shape of the world. In order to do this the evidence is reviewed regarding the extent to which technological changes have changed the costs associated with engaging in activities across geographical space. For Friedman it is unambiguous; technology has reduced the costs of engaging in activities across space, thereby flattening the world. For urban economists and economic geographers, things are far from being so straightforward. On the basis of the evidence presented in the previous sections, an alternative explanation is provided as to why and how the world is becoming increasingly curved. The final sections discuss who the real winners are from this increasing curvature, and also outline a some additional conclusions.

The world is increasingly flat?

The argument that Friedman develops is based on a specific characterization of economic history and economic geography that groups processes of globalization into three major periods. The first period, which he terms 'Globalization 1.0′, he suggests takes place between Columbus's arrival in the Americas in 1492 and approximately 1800, and he argues that this era of globalization was dominated by political power, engineering power and the manpower of countries. In terms of economic geography, Friedman argues that this era shrank the world from 'size large' to 'size medium'.

According to Friedman's thesis, the second era of globalization, which he terms 'Globalization 2.0′, and which he suggests lasted from 1800 to 2000, was dominated by the power of multinational companies. In particular, it was spearheaded initially by the English and Dutch joint-stock trading companies in conjunction with the Industrial Revolution and subsequently extended by multinational enterprises from other parts of Europe and North America. This era he argues shrank the economic geography of the world from 'size medium' to 'size small'. This second phase of globalization was also split by the hiatus of the two world wars and the intervening 1930s depression, and this hiatus reveals major differences in the logic and driving forces of this second era of globalization. He argues that the first period of Globalization 2.0, corresponding approximately from the beginning of the 19th century to the eve of the First World War, was dominated by reductions in transport costs. The second phase of Globalization 2.0, corresponding to the period from the end of the Second World War to the end of the 20th century, he argues was dominated by the widespread adoption and diffusion of communications technologies, originating with the telegraph and telephone and leading to the personal computer, satellite communications and early versions of the World Wide Web. The third era of globalization, which Friedman argues began around the year 2000 and which he terms 'Globalization 3.0′, is dominated by the convergence of communications and computing technologies. In particular, the use of fibre-optic networks and advanced satellite communications, along with distributed software and Internet architectures, has changed how communications take place globally. The era of Globalization 3.0 he argues is characterized by the role played by countries in Asia, rather than Europe or North America, and dominated by the power of individuals. This third era of globalization transforms the economic geography of the world from being a 'size small' to a 'flat-world platform'.

To economic historians of various types, many of Friedman's characterizations of globalization eras would appear to rather odd. Many scholars of the early globalization eras would perceive the trading company as being paramount, with the country playing little or no role whatsoever. Business historians (Chandler and Mazlish, 2005) and analysts of multinational international business (Jones, 1996) would tend to break the 20th century alone up into four or five fundamentally different subperiods, according to changes in the modes and nature of foreign direct investment. In this approach, the recent creation of the internal European Union (EU) market in 1992 and the development of North American Free Trade Agreement in 1994 would be critical turning points. Similarly, the global rise of the Japanese multinationals in the 1970s, followed by the Korean and Taiwanese manufacturing multinationals and the Honk Kong and Singaporean service multinational in the 1980s and 1990s, would all be key turning points. Scholars focusing on global migration behaviour (Hatton and Williamson, 2005) would perceive the 1850s and 1890s as critical break points in globalization eras, driven fundamentally by individual concerns rather than any questions related to country or company. Banking historians would argue that the validity of the network between individuals was paramount right up until very recent times, with issues of country or company being of little relevance. Similarly, monetary historians would stress the ways in which changes in the nature of credit have lead to distinct eras in the globalization processes. As such, the Darien adventure, the South Seas Bubble, the abandonment of the Gold Standard, the 1930s liquidity crisis, the 1960s rise of the Eurodollar markets and the 1984 Big Bang in London (Casson and McCann, 1999) would all point to pivotal changes in the eras of globalization, none of which are fundamentally about either countries or companies. Other vantage points from which to view the history of globalization, such as the history of the oil industry and energy industry, the history of the nation state, the history of imperialism, slavery, human rights, gender, culture, politics, not to mention Marxist, structuralist or military histories, would also suggest quite different critical break points that define eras of globalization.

As well as trends towards globalization, there are also periods of anti-globalization. In economic terms, the ratio of world trade to global Gross Domestic

Product (GDP) fell during the period 1929–1950, while the ratio of foreign assets to global GDP declined from 1914 onwards and was not attained again until 1980 (Crafts, 2004). Understanding these periods during which economies were relatively closed is also critical for understanding the nature and impacts of the current era of increasing openness. Since the 1980s, the most notable feature of economic globalization is the extent to which it goes beyond previous peaks (Crafts, 2004).

Variations in the dates by which we might define eras of globalization are not of themselves a problem. Different historical characterizations are essentially a result of different theoretical perspectives. Moreover, differences are likely to be driven not only by differences in our analytical methodology but also according to differences in the objective of our analysis. As long as we are clear about our perspective and the objective of our analysis, then difficulties of interpretation should not arise. However, in the case of Friedman's argument that the *The World Is Flat*, the analytical perspective and the objective of the analysis are somewhat conflated and this leads to problems of both analysis and interpretation. While Friedman talks about the impact of technological and institutional issues on globalization, such as falling transportation costs, industrial power, information and communications technologies and the institutional role of the roles of countries, companies and individuals, his characterization of the eras of globalization is not primarily based on issues of either technology or institutions. Rather it is based on his perception of changes in the behavioural principles that govern business and economic logic during different time periods. Technological issues are only a facilitator for behavioural changes.

These behavioural principles are the reason why Friedman curiously argues for two eras of globalization between 1492 and 2000, of which the second era has two sub-eras between 1800–1914 and 1945–2000, which we will here call 2.1 and 2.2, respectively, rather than simply arguing for three eras of globalization prior to 2000 being denoted as 1.0, 2.0 and 3.0, with post 2000 being Globalization 4.0. In particular, he argues that during Globalization 1.0, the logic of behaviour was dominated by the questions—where does my country fit into global competition and opportunities? How can I go global and collaborate with others through my country? The emphasis on country as the reference point of the first era is fundamentally different to the era of Globalization 2.0. Combining the sub-eras 2.1 and 2.2, he argues that the reference point for this second era was that of the firm. As such, during this period he argues that the behavioural questions had changed fundamentally to—where does my company fit into the global economy? How does it take advantage of the opportunities? How can I go global and collaborate with others through my company? Following this behavioural logic, the reason that Friedman claims that around 2000 we entered a new era of globalization is that he perceives that the reference point from which we make ask questions and make decisions has very recently once again changed from that of the company to that of the individual. As such, the current questions Friedman perceives to dominate economic logic are—where do I as an individual fit into the global competition and opportunities of the day, and how can I, on my own, collaborate with others globally? In Friedman's hypothesis, the eras of Globalization 1.0, 2.0 and 3.0 are therefore characterized and distinguished primarily by the behavioural emphasis on the country, the company and the individual person, respectively.

Through the lens of these apparently changing behavioural perspectives, which Friedman sees as being made possible by technological and institutional changes, he then argues that the world is already embarked on a new era of globalization by which the whole world is increasingly becoming flatter. As already indicated, the notion of 'flat' in the Friedman thesis is a world with little or no differences between people in different locations. The notion of the flattening of the world is therefore a world characterized by rapidly diminishing differences, the outcomes of which are greater similarity, greater homogeneity, more equality and more individual-level democracy.

It is the contention of this paper that in terms of economics, Friedman is fundamentally incorrect.

To explain why this is the case, it is first necessary to consider how technological changes have recently impacted the shape of the world. In particular, we need to understand how technological changes have changed the costs associated with engaging in activities across space. For Friedman, it is unambiguous; technology has reduced the costs of engaging in activities across space, thereby flattening the world. For urban economists and economic geographers, things are far from being so straightforward.

Spatial transactions costs

The costs associated with engaging in and coordinating activities across space can be termed spatial transactions costs. In order to understand the ways in which spatial transactions costs have changed over recent years, we need to split spatial transactions costs themselves up into three different types. The first type of spatial transactions costs are the transactions costs associated with moving goods across geographical space. These are transportation costs. The second type of spatial transactions costs are the transactions costs associated with moving knowledge and information across geographical space. For the purposes of this paper, we will call these knowledge-information transmission costs. Both the first and second types of spatial transactions costs, namely, transportation costs and knowledge-information transmission costs are explicitly geographical in their construction in that the costs incurred always depend on the distance covered. The third type of spatial transactions costs are the transactions costs associated with moving across national borders. These tariff costs are institutional costs and the tariffs associated with a particular border crossing are not defined geographically. By this, I mean that the tariffs do not vary systematically with the distance travelled before or after arriving at a particular institutional border. As such, from the perspective of economic geography we can consider these costs to be fundamentally aspatial in construction although explicitly geographical in terms of their implementation (McCann, 2005). The impacts of falls in this third type of spatial transactions costs, namely the institutional costs, are discussed later. In this section, we will consider only the first and second types of spatial transactions costs, which are the transactions costs that are explicitly dependent on distance.

Falling spatial transmission costs

A particular subset of spatial *transactions* costs are those costs that are directly related to the costs of moving goods or information across space. These costs are dependent on communications and transportation technologies and as a combined group we can refer to these as spatial *transmission* costs.

Since the 1980s, we have seen dramatic improvements in the ability of decision makers and planners to coordinate activities across space. The primary reason for these improvements has been the enormous technological developments in information and communications technologies, and many of these issues are discussed in detail by Friedman. Information technologies employing satellite and fibre-optical technology allow for greater quantities of information to be transmitted at much lower costs than was previously possible. These developments have both increased market access for individual firms and also meant that complex operations across diverse locations can now be managed both more efficiently and effectively than was previously possible. For industries trading specifically in information, such as finance, advertising, marketing and tourism, modern information technologies provide new possibilities for the supply of information-based services across a global market space. Market access has therefore increased dramatically for huge numbers of firms trading in knowledge- and information-based services. At the same time, these improved technologies also allow decision makers to undertake the coordination of spatial arrangements of activities that were previously not possible, and this is most noticeable in the case of the increasing offshoring and out-sourcing of many types of service industry activities. This is evident in examples such as international accounting, where New York banks transfer their book-keeping requirements overnight to firms in Ireland or India, in order to have them

updated in time for the opening of the money markets the next day. Other examples include Silicon Valley firms that subcontract software development activities to firms in Bangalore India, while still maintaining daily contact and control of the Indian software development process from California. These observations all imply that knowledge-information transmission costs must have fallen dramatically over recent decades.

Similarly, there is also evidence that many of the sectors that have benefited from the geographic dispersal possibilities associated with these technologies are often sectors that are not specifically trading in information. For example, advanced communications and control technologies have been widely applied to the management of supply chains, to production and inventory scheduling control systems and to logistics and distribution operations. The types of firms that particularly benefit from these technologies are those firms requiring the precise coordination of complex networks of production and distribution operations across large geographical distances.

Comprehensive evidence across both countries and time pointing towards falling spatial transactions costs associated with the increased usage of information technology usage comes from Ioannides et al. (2007). They find that the increasing use of information and communications technologies over time generally allows for an increased dispersion of activities across space, thereby making city sizes more uniform. It appears therefore that the impacts of falling knowledge-information transmission costs have been widely felt across a broad range of sectors.

Evidence for falling spatial transmission costs is also mirrored in the case of firms involved in the movement of physical goods and commodities across space. Transportation technologies have improved dramatically over recent years. Examples of this include the rapid growth in roll-on, roll-off trucking technology, sophisticated gains in containerization technology and capacity, rapid-turnaround shipping and the increased speed and efficiency of air transport technologies. Trade in parts and components now accounts for around 30% of world manufacturing trade, and the share of imports to total inputs for US goods producing sectors has doubled to 18% over the last two decades (Venables, 2006). All of these technological developments would imply that the cost of moving goods and commodities across space has fallen significantly over recent decades. Indeed Glaeser and Kohlhase (2004) suggest that the costs of transportation for goods fell by as much as 95% during the 20th century. Currently, over 80% of US shipments occur in industries where transport costs are less than 4% of the total value (Glaeser and Kohlhase, 2004). However, whether this is primarily due to technology or markets is not entirely clear. Evidence from France (Combes and Lafourcade, 2005) suggests that most of the transport cost reductions of the last three decades appear to be primarily due to deregulation within the transport industries rather than due to technological changes.

These various observations all point to falls in the both costs of transmitting information across space and also falls in the costs of moving goods across space. According to Friedman's logic, falling spatial transmission costs lead to convergence across space. The reason is that reductions in the real costs of transmitting information and goods across space imply that geographical peripherality is becoming relatively less of a handicap to accessing global markets. Indeed, there is much evidence to suggest that such convergence is already taking place in many parts of the global economy such as Europe (Fingleton, 2003a) and USA (Higgins et al., 2006). However, there is also a great deal of evidence that points in the opposite direction (Brakman and van Marrewijk, 2008). Although there are difficult empirical issues associated with measuring convergence (Higgins et al., 2006), the rate of convergence in many arenas of the global economy appears to be either surprisingly slow, non-existent, or even negative. If we follow the Friedman thesis, these observations would appear to be paradoxical, especially when we consider the rate of development of communications and transportation technologies. Yet, the reason for these apparently paradoxical observations is that Friedman's hypothesis is incorrect. The fact that spatial *transmission* costs have fallen does

not imply that spatial *transactions* costs have fallen. Indeed, there is much evidence that suggests that while spatial transmission costs have fallen, spatial transactions costs have actually risen.

Rising spatial transactions costs

The argument that spatial transmission costs have fallen while spatial transactions costs have risen is based on one major argument and on three broad sets of empirical evidence.

The theoretical argument that spatial transactions costs have increased while spatial transmission costs have fallen is that improvements in information technologies themselves increase the quantity, variety and complexity of the knowledge handled and information produced. The increased quantity, variety and complexity of the knowledge handled and information produced itself increases the costs associated with acquiring and then transacting this knowledge across space. This is because much of the information will originally have emerged from knowledge of a non-standardized tacit nature, and the acquisition and transmission of this type of information increasingly require greater levels of face-to-face contact in order to maintain mutual trust and understanding (Gaspar and Glaeser, 1998; Storper and Venables, 2004). For many knowledge-intensive activities, the required frequency of face-to-face interaction has increased over recent years (McCann, 2007; Storper and Venables, 2004), because the time (opportunity) costs associated with not having continuous face-to-face contact have increased with the quantity, variety and complexity of the information produced. The outcome is that in equilibrium, the optimized frequency of interaction across space will have increased (Rietveld and Vickerman, 2004) for many knowledge-intensive sectors, thereby increasing the level of spatial transactions costs for any given distance over which communication takes place (McCann, 2007). The increased importance of face-to-face contact is also manifested in terms of the increasing development of customized products or services. Lower transport costs can be shown to imply that firms increasingly switch to the production of higher quality customized goods (Duranton and Storper, 2007), whose sensitivity to distance is greater than for standardized products. This is because the cost of providing a given level of service quality becomes more costly with distance (Duranton and Storper, 2007). Spatial transactions costs as a whole will therefore have increased because of the increasing importance of transacting knowledge via face-to-face contact, even though the spatial transmission costs of information have fallen. This argument is also consistent with the point made by Glaeser and Kohlhase (2004) that while the costs of moving goods have fallen dramatically, the costs of moving people have not.

This theoretical argument implies that even though spatial transmission costs have fallen, the relative advantage of proximity and accessibility has increased, and the disadvantages associated with geographical peripherality have also increased. This theoretical argument is also consistent with three broad sets of empirical evidence.

The first broad set of empirical evidence that suggests that spatial transactions costs have increased while spatial transmission costs have fallen comes from the usage patterns of information and communications technologies. Gaspar and Glaeser (1998) find that the closer people are geographical to each other the more they interact using information technologies. Moreover, the extent of this interaction is also associated with the local density of the urban area, such that large dense urban areas exhibit the greatest internal communications per head (Gaspar and Glaeser, 1998). Additional anecdotal evidence in support of this argument comes from the fact that many of the industries that are most dependent on information technologies, such as the advanced semiconductor-electronics industry (Arita and McCann, 2000, McCann and Arita 2006) and the international financial services industry, are themselves among the most geographically concentrated industries in the world. Even Internet transactions exhibit this localization behaviour (Blum and Goldfarb, 2006). While for many activities information and communications technologies and face-to-face contact are likely to be substitutes, there are also therefore many activities or roles for which information and communications technologies and face-to-face contact appear to be primarily

complements. Foreign direct investment in high knowledge-intensive activities (Nachum and Zaheer, 2005) appears to be complementary with face-to-face interaction whereas low knowledge-intensive activities use information technology as substitutes for face-to-face interaction. Even IT-services markets themselves exhibit this dual nature, with some activities being closely related to the need for face-to-face contact whereas others are largely independent of the need for face-to-face contact (Arora and Forman, 2007). Moreover, those activities for which face-to-face contact and information and communications technologies are complements appear to be those activities located in urban areas with extensive transportation infrastructure (Haynes et al., 2006). Further evidence that is suggestive of this comes from the fact that frequency of airline business travel between major cities has increased more or less in line with the growth in telecommunications usage between such cities (Gaspar and Glaeser, 1998). The fact that cities are increasingly being dominated by high human capital individuals (Berry and Glaeser, 2005) implies that the importance of engaging in face-to-face activities is positively associated with knowledge levels.

The second broad set of empirical evidence that suggests that spatial transactions costs have increased while spatial transmission costs have fallen comes from trade modelling. Empirical research on distance costs finds that distance effects are not only persistent (Disdier and Head, 2008) but also that these persistent effects cannot be explained simply by observing the behaviour of shipping costs. Using a meta-analysis, Disdier and Head (2008) find that bilateral trade exhibits an average elasticity of 0.9 with respect to distance, which implies that on average bilateral trade is nearly inversely proportionate to distance. Given that a 1% rise in the share of GDP accounted for by exports is associated with per capita income increase of up to 1% (Frankel and Romer, 1999), this average elasticity of trade with respect to distance suggests that there are very large proximity–productivity effects. Moreover, Disdier and Head (2008) find that although distance effects declined slightly between 1870 and 1950, analyses employing recent data suggest that after 1950 they began to rise again. All of these empirical observations are fundamentally at odds with the Friedman thesis.

The most likely explanation for these persistent distance effects is associated with the issue of time. Hummels (2001) and Deardorff (2003) suggest that the influence of time on trade is increasing. Time in transit is costly, being up to as much as 0.5% of the value of the goods shipped per day (Hummels, 2001). The high cost of time in transit comes partly from the costs of carrying stock and also from the likelihood that long transit times reduce the reliability and predictability of deliveries (McCann, 1998; Venables, 2006). It also makes firms slower to respond to changing demand conditions or costs levels (Venables, 2006). Since the early 1980s, the opportunity costs of time appear to have increased for both household and industrial consumers (Best, 1990; Piore and Sabel, 1984). Consumer demand requirements are becoming ever more sophisticated and exhibit an increasing preference for retail services characterized by reliability, timeliness and quality of service. Modern household and industrial consumers now require a level of service customization and delivery speed which is only possible by employing more frequent shipments of goods (McCann, 1998). This accounts for the almost universal trend towards just-in-time (JIT) type systems of shipments, which allow for total quality management principles to be applied on the basis of minimum inventory supply chains (Schonberger, 1996). Over the last three decades, these JIT logistics and distribution systems have spread progressively from the Japanese automotive industry into almost all modes of global manufacturing, retailing and distribution. Obviously, the increasing sophistication of both consumer preferences and also the advanced logistics systems responding to them are mediated by the advances in communications and transportation technologies. Airfreight accounts for a third of US imports by value and 25% of African exports (Venables, 2006), and for the USA, the value of time saved by airfreight and containerization has been estimated as some 12–13% of the value of the goods (Hummels, 2001).

Further empirical evidence suggesting the spatial transaction costs involved in shipping of goods have increased over the last two decades, comes from the analysis of logistics costs as a whole, rather than simply observations of transport costs. Logistics costs are the combined costs of all the transportation, storage and inventory-handling costs that are associated with moving goods across geographical space, and these are not only much greater than transport costs but also are related to the costs of both time and space (McCann, 1998). Firstly, logistics activities accounted for 16% of global GDP in 2000 and 18% of European GDP (Leinbach and Capineri, 2007). Moreover, during the 1990s, the growth rate for the logistics sector as a whole was of the order of 6% per annum (Leinbach and Capineri, 2007). Between 1987 and 1995, there was a 60% increase in outsourced dedicated third-party logistics operations (Chatterji and Tsai, 2006). Secondly, relative to the value of output (Shonberger, 1996), the average inventory levels for almost all manufacturing and distribution sectors in the developed world have fallen dramatically since the 1980s. This implies that the average lead times of goods–shipments have fallen over recent years, with a concomitant increase in goods–shipment frequencies. Thirdly, by carefully disentangling the various components of transport costs, Hummels (1999) demonstrates that for many sectors, the proportion of global output that is accounted for by the combination of logistics and transportation activities has not fallen over recent decades. More specifically, while the transportation cost component of bulk materials has indeed generally fallen, in the case of manufactured goods there is evidence that this proportion has actually increased over the recent decades, in spite of the improvement in transportation and logistics technologies (Hummels, 1999). Fourthly, industries that are very dependent on JIT shipments have tended to reorganize their trade patterns in favour of geographically close suppliers and customers (McCann, 1998; McCann and Fingleton, 1996). Moreover, this behaviour is even evident in industries in which the product value–weight ratios are extremely high and for which transport costs typically account for less than 1% of value (McCann and Fingleton, 1996). In other words, increasing localization behaviour is present even in the very industries that proponents of the flat world thesis would have deemed it to be entirely unnecessary.

The third broad set of empirical evidence that suggests that spatial transactions costs have increased while spatial transmission costs have fallen comes from observations of urban growth. The role of urban scale and centrality appear to be becoming ever more critical as sources of economic growth. Over the last three decades, the increasing importance played by cities as engines of national, regional and global economic growth is demonstrated by the fact that the proportion of people living in urban areas has increased in all parts of the global economy (Richardson and Bae, 2005). The number of cities in the world with a population of more than 1 million went from 115 in 1960 to 416 in 2000; for cities of more than 4 million, the increase was from 18 to 53, and for cities of more than 12 million was from 1 to 11 (Venables, 2006). By 2006, for the first time, more people in the global economy lived in urban areas than in non-urban areas (Mastercard, 2007). This unprecedented urban growth suggests that it is becoming increasingly important for firms and people to be clustered together, and in particular, for high skills and high knowledge workers and firms to be clustered together. Recent evidence suggests that not only is there an increasing share of university-educated human capital living and working in cities (Berry and Glaeser, 2005), but that this proportion of university-educated workers is also correlated with the existing human capital stock (Berry and Glaeser, 2005) and both are correlated with the growth of the city (Berry and Glaeser, 2005; Glaeser and Shapiro, 2003; Glaeser et al., 1995; Shapiro, 2006). In USA, there is no evidence of the levels of high school human capital playing any role whatsoever (Shapiro, 2006), and this supports the argument that it is tertiary educated human capital that is now crucial from a regional development perspective. Cities are increasingly being dominated by high human capital individuals as increasingly mobile workers respond to the

increasing wage premia associated with high value-added knowledge work in cities. After conditioning on individual characteristics, it is clear that wages are indeed higher in high human capital cities (Shapiro, 2006). Furthermore, US cities are found to be becoming more dissimilar in terms of their human capital composition (Berry and Glaeser, 2005) such that regional divergence appears to have superseded previous decades of regional convergence (Berry and Glaeser, 2005).

Further evidence in support of the argument that access to cities is becoming increasingly important comes from US counties (Partridge et al., 2007) and European sub-national regions (Caniels and Verspagen, 2003). In both cases, local growth is found to be directly related to an area's proximity to major urban centres. Meanwhile within Europe, investment capital and information have become more concentrated in capital cities and large urban centres during the very decades that advances in technology and deregulation trends have rendered both factors more mobile (Rodriguez-Pose, 1998). As discussed above, the reasons for this appear to be that urban areas are increasingly seen to be sources of productivity growth (Ciccone and Hall, 1996; Fingleton, 2003b) due to their role in facilitating the production of knowledge, human capital interaction (Berry and Glaeser, 2005) and the generation of innovations (Acs, 2002; Carlino et al., 2007). A doubling of city size is associated with a productivity increase of some 3–8% (Rosenthal and Strange, 2004), such that moving from a city of 50,000 to 1 of 5 million is predicted to increase productivity by more than 50% (Venables, 2006).

The results of all of these changes are that while between-country inequality has been falling over the last three or four decades (Crafts, 2004), within-country inequality has actually been increasing since the 1980s (Brakman and van Marrewijk, 2008). Allied with the fact that the rate of convergence between advanced economies has slowed down since the 1980s (Cappelen et al., 2003; Greunz, 2003), the result of the increasing importance of urban areas is that economic convergence at a continental scale coexists in many cases with increasing divergence at sub-national local and regional scales.

As well as urban scale, however, there is also increasing evidence that economic growth at the international scale is also being increasingly dominated by networks of particular major urban centres, often referred to as 'global' cities (Button et al., 2006; Sassen, 2001). These urban centres are locations which not only exhibit significant agglomeration advantages but also primarily interact with other similar globally-oriented cities in other countries, rather than with other smaller urban centres within their own countries, which tend to be oriented more towards the provision of local goods for local markets. In many sectors such as financial services (COL 2007a, COL 2007b; Mastercard, 2007), there is already much evidence that global markets are increasingly dominated by networks of global cities (Sassen, 2002) such as London, Paris, Tokyo, Sydney and New York. The increasing relative dominance of these global cities appears to be associated with the density of knowledge (Simmie, 2004) and information technology assets in the city (Button et al., 2006; Sassen, 2002). Moreover, empirical evidence suggests that the importance of major urban nodes (Limtanakool et al., 2007) within such networks is also reinforced by the existence of hubs within the global air (Burghouwt, 2005; COL, 2002), rail and marine transportation systems (Leinbach and Capineri, 2007). In addition, there is evidence that the performance of these dominant global cities is also playing an increasingly important role even with respect to their own hinterland national and continental economies (BTRE, 2004; COL, 2005a; COL, 2006a; COL, 2007c; Glaeser, 2005; HMT-DTI, 2001, 2003).

All of this evidence regarding not only the importance of urban growth but also the development of networks of global cities point to the conclusion that geographical proximity is becoming increasingly important over time, even as transportation and communications technologies improve. These observations therefore provide further indirect support for the argument that spatial transactions costs have increased while spatial transmission costs have fallen.

The three broad sets of evidence presented here, regarding firstly, the complementarity between

telecommunications technologies and accessibility, secondly, the persistence and even increase of distance effects, and thirdly, the increasing dominance of both the scale and network aspects of urban centres, all point in a very different direction to that of Friedman's flat world thesis. These three broad sets of evidence all imply that in many contexts, spatial transactions costs have increased. Using Friedman-type terminology, the world has become *steeper*, not flatter.

The world is increasingly convex

As Friedman documents extensively, there is an enormous amount of prima facie anecdotal evidence that globalization is making the world flatter. However, as we see here, adopting a more sophisticated economic interpretation implies that there is also mounting evidence that the world is becoming steeper. The global economy therefore appears to be currently characterized by two opposing trends, namely, the trends towards both globalization and localization. What are we to make of these apparently conflicting pieces of evidence and which of these two opposing trends is likely to be dominant? A careful assessment of the variety of evidence available to us supports the argument that the outcome of these two opposing will actually be different in different situations. In particular, the global economy appears to be simultaneously characterized both by global flattening and local steepening (McCann, 2005), the outcome of which is to make the world more curved, and in particular, convex. The following sections will explain this point.

The preceding sections provide a range of arguments and evidence which suggest that in many cases spatial transactions costs have increased at the same time as spatial transmission costs have decreased over recent decades. However, these apparently conflicting conclusions can be easily reconciled. Different types of changes in transactions costs have tended to take place in different types of sectors, activities and contexts, and there are regularities to the pattern of these changes. Most of the evidence for falling international and geographical transactions costs relates to trade in relatively standardized types of activities and goods. These are the sectors in which the nature and frequency of the spatial transactions undertaken have not changed fundamentally over time. This is typically the case in industries producing semi-finished or finished manufactured products at mature stages within the product cycle, or service industries characterized by relatively routine activities in which the nature of the information being transacted itself is rather standardized. In these cases, geographical peripherality appears to be less of a disadvantage than it might have been previously, and the world appears to be getting flatter. These are exactly the activities that currently dominate the present off-shoring trends (COL, 2005b), comprising largely Leamer's (2007) 'manly man' work in manufacturing. On the other hand, in sectors where demand lead times have fallen dramatically, or in industries in which there has been an increasing variety and complexity of information associated with the customization of products and services, spatial transactions costs appear to have risen. In these sectors, which correspond to Leamer's (2007) 'geek work', the world appears to be getting steeper. As such, the off-shoring or out-sourcing of these types of activities is actually less possible nowadays than might previously have been the case (COL, 2005b).

As we have already seen, many of these high value-added sectors are those that are increasingly dominated by major urban centres operating as hubs within global transportation and communication networks. The reasons for this are associated primarily with the combined existence of both localized agglomeration economies and transport economies of scale and distance (McCann, 2005). The evidence in favour of the contemporary role played by agglomeration economies in shaping economic geography is now so overwhelming that it is more or less beyond question (Venables, 2006). However, not all sectors benefit from the combination of agglomeration and transportation economies in the same way. Taking a broad view of spatial transactions costs, it appears that the output spatial transactions costs for most goods and services have fallen. At the same time, the spatial transactions costs associated with the high knowledge inputs

required for high value-added outputs have increased (McCann, 2005). This is because high-value knowledge inputs, and particularly those embodied in human capital, tend to be increasingly localized. As such, the general pattern we currently observe is one of increasing globalization of both high value-added outputs and low value-added inputs, along with an increasing localization of high value-added inputs (McCann, 2005). The result is that high value-added outputs are only produced in a limited number of locations and then sold all over the world, while low value-added outputs can be produced all over the world.[1] The combination of these two opposing forces in different contexts generates increasing convexity, and this can be explained with the help of two diagrams.

Figure 1 depicts a one-dimensional economy geography model of the global economy that spans the distance *AB*. In this particular spatial economy, there are three cities, *X*, *Y* and *Z*. Cities *X* and *Z* are larger than city *Y*, and all three cities exhibit two types of production, namely high-value goods and services *H* and low-value goods and services *L*. The associated bid-rent curves for the production of each respective goods produced by each city are denoted in Figure 1 as BR_{XH} for the high-value goods produced in city *X*, BR_{XL} for the low-value goods produced in city *X*, BR_{YH} for the high-value goods produced in city *Y* and BR_{YL} for the low-value goods produced in city *Y*, BR_{ZH} for the high-value goods produced in city *Z* and BR_{ZL} for the low-value goods produced in city *Z*. As cities *X* and *Z* are larger than city *Y*, this implies that there is both a larger local market and also more competition for each good in cities *X* and *Z* than in *Y*. The result is that at the central city market locations of *X* and *Z*, land prices are higher for the production of each good *H* and *L* than at *Y*, and the bid-rent curves for both goods *H* and *L* produced by *X* and *Z* extend further than those associated with *Y*. The economic geography of the global economy *AB* is such that the spatial production area for good *L* in city *Y*, denoted as Y_L, accounts for the less than one-third of the total economic geography of production of the low-value good *L*. Meanwhile, cities *X* and *Z* each account for more than one-third of the economic geography of production of the low-value good *L*, with the respective production areas denoted as X_L and Z_L. In addition, city *Y* also has a very small local production area Y_H for good *H*, while cities *X* and *Z* have much larger local production areas, denoted as X_H and Z_H, for the high-value good *H*. The equilibrium land prices at each location in the global economy *AB* are given by the envelope of the individual local bid-rent curves, and this is depicted in Figure 1 in bold.

Figure 2 depicts the situation in response to the types of globalizing and localizing trends discussed above. As we have seen, falling spatial transmission costs apply primarily to low-value goods. This means that the equilibrium bid-rent curves for the production of these goods becomes shallower. In

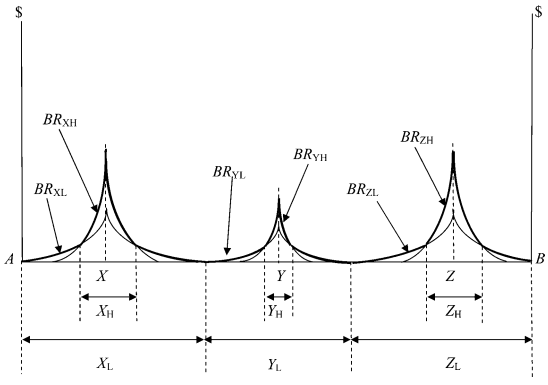

Figure 1. *A three city one-dimensional economic geography.*

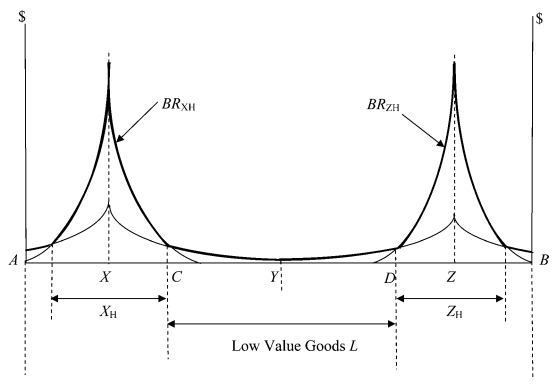

Figure 2. *Globalization, localization and economic geography.*

Figure 2, the shallower sloping bid-rent functions for the production of low-value goods and services *L* imply that such activities can be profitably undertaken in all locations. This is the spatial economics application of Friedman's thesis. However, this is not the end of the story. The reason is that the actual global distribution of production and activities depends on the interaction between this flattening effect and the other opposing localization trends discussed above. If we consider the localizing tendencies regarding the production of high-value goods and services *H*, the arguments above imply that the production of these goods and services will benefit from location-specific agglomeration economies. The existence of agglomeration economy advantages as well as increasing spatial transactions costs in the production of high-value goods and services *H* means that the land in the major urban areas *X* and *Z* is increasingly dominated by the production of these high-value goods. Cities *X* and *Z* expand outwards, the production of high-value goods is concentrated in just two locations *X* and *Z*, and the bid-rent functions associated with the production of these high-value goods become steeper. The production location *Y*, which previously had a local dominance in both the production of low-value *L* and high-value *H* goods for its own hinterland area, now disappears as an independent production centre. Instead, the whole region between *C* and *D* now continues to function simply as a location for producing low-value goods and services *L*. The interval CD corresponds with the 'flat terrain' of Leamer (2007), while *X* and *Z* correspond to the 'hills and mountains' of Leamer (2007). As Fujita et al. (1999) demonstrate, the reason for this is that when agglomeration economies are allied with falling spatial transmission costs, the existence of agglomeration economies can lead to situations in which intermediate production locations such as *Y* disappear altogether. This is partly because the previous economic raison d'etre of the former intermediate production location now disappears, and also because the low distance costs now no longer provide any possibility for 'protection' from the major urban centres and the maintenance of limited local monopoly power. In the presence of agglomeration economies, the same result can also be generated in a situation where border tariffs are reduced or removed. Therefore, the combination of both falling transport costs and falling tariffs reinforces the whole process.

The equilibrium land prices at each location in the global economy *AB* are given by the envelope of the individual bid-rent curves, and once again as with Figure 1, these are depicted in Figure 2 in bold. As we see, the envelope rental curves are now far more curved than previously. In particular, they are now far more *convex*. Assuming that land prices and labour prices are highly correlated, because of the need to maintain local real wages at competitive levels, we can assume that the envelope land price curves also closely resemble the spatial variations in both local incomes and also local productivity levels. The differences between the major centres and the relatively smaller centres will tend to increase. This is not to say that all major centres will increase relative to smaller centres, as it will also depend on the range of technologies and industries evident in particular cities, as different industries and technologies rise and fall over time. However, the arguments outlined earlier still do imply that globalization will lead to increasing differences between the fortunes of regions and cities even within the same country. This is because particular major urban centres will benefit from the increasing scale advantages associated with being nodes in global trade networks.

We can also consider the effects of these various changes in spatial transactions costs on the distribution of income and productivity. In Figure 1, if the areas denoted as X_L, Y_L and Z_L also define the borders of the individual national or regional market areas within the global economy *AB*, the transition from the environment depicted in Figure 1 to the environment depicted in Figure 2 would imply that the differences between the countries had increased, resulting in income or productivity divergence. On the other hand, if there were only two countries, whereby one country or region contained only city *X* and the other country or region just contained both cities *Y* and *Z*, the transition from

the environment depicted in Figure 1 to the environment depicted in Figure 2 would imply that the differences between the two countries had decreased, resulting in income and productivity convergence. As such, the outcomes depend in part on the definition of the spatial units, and this is known as the modifiable unit area problem (Openshaw and Taylor, 1979). Moreover, it is now accepted that either cohorts of countries or cohorts of regions can group together into convergence clubs, with rather different long run growth trajectories. Globally, however, observation of the increasing convexity of the envelope curves demonstrates that the transition from the environment depicted in Figure 1 to the environment depicted in Figure 2 is associated with increasing inequality across space. Therefore, from the perspective of economic geography, as we move to a world of falling spatial transmission costs for trade in low-value goods and routine activities while at the same time increasing spatial transactions costs for activities and trade associated with high-value goods and services, the world will becomes more convex and more unequal. The new rounds of unevenness are therefore superimposed on the previous spatial structure (Warf, 1995).

Note, however, irrespective of the areal definitions employed, the above transition from Figure 1 to Figure 2 implies that the distribution of city sizes would become more concentrated and the surviving city sizes more similar, such that the rank size exponent moves above unity. The reason is that many of the intermediate and intervening locations denoted as *Y* will disappear while the surviving locations *X* and *Z* will become more similar. Nor is this argument restricted to advanced industrialized economies, as witnessed by the rising international importance of centres such as Shanghai, Mumbai, Sao Paulo and Moscow. As such, this argument regarding the growing importance of major cities relative to other locations is also consistent with the Lucas (2000) hypothesis that the 21st century will see a rapid rise of much of what is currently the developing world. However, the arguments underlying new economic geography and new institutional economics imply that the spread effects to the developing world will continue to be relatively restricted (Crafts, 2004).

The characteristics of increasing convexity

The analysis above suggests that increasing convexity is a much more likely characterization of the economic geography of the current globalization process than is the Friedman's flattening world thesis. Moreover, it is obvious that *convex*, in the sense described here, does not necessarily imply smooth curvature, and could just as easily be characterized by spiky peaks. However, if the flat world thesis cannot be substantiated then what does an increasingly convex world imply? In order to answer this, we need to reconsider the nature of the phenomena that motivate these types of arguments.

The basic problem with the Friedman thesis is that the 10 phenomena around which he bases his argument are a mixture of causes and effects, or of inputs and outcomes. In order to simplify the argument, we can reorganize the 10 phenomena that Friedman argues have made the world flat into three different groups. The first grouping represents *institutional changes*, and in Friedman's menu this grouping comprises just the fall of the Berlin Wall. The second grouping, which represents *technological changes*, in Friedman's menu comprises the advent of the World Wide Web, the development of work-flow software, the advent of uploading and file sharing, the rise of information availability via search engines and the development of wireless technology. The third grouping represents *organizational changes*, and in Friedman's list comprises the advent of out-sourcing, the rise of off-shoring, the development of supply chaining and the rise of third-party dedicated internal logistics operations.

In terms of institutional changes, any phenomenon that has recently lead to falling tariff barriers or the opening up of new markets can be considered potential causes of a changing global economic geography. Yet, as well as the collapse of the Berlin Wall, following the arguments in the previous sections, it also makes far more sense analytically to include all institutional changes that have opened

up markets over larger spatial arenas within the global economy. The emergence of the transition economies brings some 260 million workers into the global labour market for the first time. In addition, the opening up of China brings some 760 million and the liberalization of India, another 440 million into the market (Venables, 2006). However, in terms of both competitive and regulatory issues, just as important as these phenomena is the development of trans-national free trading arenas. These institutional changes have lowered tariff barriers across a wide range of trading links and allow multinational firms to increasingly achieve economies of scale and their host countries to benefit from increased competition. As such, the creation of the EU internal market in 1992 and the formation of NAFTA in 1994 are critical moments in their own right within the global trading system, as well as heralding other similar developments such as MERCOSUR and ASEAN. Yet, as already demonstrated, in the presence of agglomeration economies, the creation of trans-national trading areas within which tariff barriers are reduced actually increases the convexity of the spatial economy rather than the flattening of it.

In terms of technological changes, on the basis of the previous arguments falling transmission costs can indeed by considered causes of recent changes in economic geography. However, as we have already seen, an exclusive focus on the transmission aspects of electronic communication is entirely insufficient to understand changes in the nature of spatial transactions costs. Once again, the combination of falling spatial transmission costs and increasing spatial transactions costs for certain activities is likely to increase the convexity of the spatial economy rather than the flattening of it.

Finally, in the case of organizational changes, the developments listed by Friedman are all rational ways that firms have adopted to take advantage of the falling spatial transmission costs associated with both the institutional changes and the new technologies. In terms of economic geography, these organizational changes are not causal phenomena in the same way that the institutional and technological changes are. Instead, they are responses and outcomes to such changes in the global economy. As such, these phenomena do not throw any light on whether the world in general is becoming flatter or more convex.

Having unpicked Friedman's logic, we are now in a position to point out one additional weakness and one additional flaw in the argument, and these relate to the role of Asia and the role of individuals.

Firstly, Friedman's emphasis on Asia is something somewhat problematic, in that it is motivated by primarily by observations of organizational changes, which we have already argued are outcomes rather than causes of global change. As Friedman correctly argues, much of the current dynamism of the global economy is in Asia, and particularly in the off-shoring centres of India and China. However, as Leamer (2007) points out, rather than the world shrinking, economic activity is dispersing. The share of Asia in global GDP had increased from something of the order of 25% in the early 1970s to over 35% by the end of the 20th century (Venables, 2006). Future movements towards free trade in this part of the world will have additional major impacts on the global economy. Yet, most of the trade of the Indian and Chinese economies is still in the form of re-exports of finished or semi-finished products produced by firms that are based in Europe and the USA. Currently over half of all Chinese manufactured exports are accounted for by foreign-owned multinational firms (Scheve and Slaughter, 2007) and in the Indian IT sector, multinationals account for two-thirds of all sales (Scheve and Slaughter, 2007). While it is true that over time these economies will generate more of their own multinational outputs, the knowledge centres controlling much of their output are primarily located in other geographical arenas, such as the EU, Japan and USA. Allied with the fact that the EU and US economies still dwarf the combined economies of both China and India, these observations would suggest that Friedman's emphasis on Asia as an example of flattening needs to be treated with caution. Moreover, the colossal population shifts from rural to urban areas and from small towns to major cities in both China and India demonstrates the increasing convexity argument

perfectly. China expects its urban population to double to more than 1 billion by 2030 (Venables, 2006).

Secondly, the cause–effect analytical confusions above also hide another basic flaw in Friedman's thesis, at least in terms of economic geography. This is his argument that in the modern era decision-making power and the dominant modes of engagement are characterized by the primacy of individuals. On the contrary, from the arguments presented in this paper, over the coming decades the dominant decision-making power in terms of economics is likely to be that of the global firm, rather than either countries or individuals. Evidence for this comes from the fact that over recent decades, the levels of output and trade that are associated with multinational firms have increased much more rapidly than the growth of global trade (McCann and Mudambi, 2005). Foreign direct investment has been growing at twice the speed of world trade, which itself has grown at twice the rate of world income. The result is that foreign direct investment grew by almost 6-fold between 1970 and 1999 (Bobonis and Shatz, 2007), with 30–40% of US trade currently accounted for by intra-firm trade flows (Lai and Zhu, 2006). Overseas investment by multinational firms is now the largest single component of worldwide stocks of foreign investment. In addition, the volume of sales of foreign affiliates is nearly twice the global level of exports (McCann and Mudambi, 2004).

More specifically, however, the dominant firms will be those particular multinational firms that are also strongly embedded in the global city knowledge networks. Evidence from patent citation data suggests that firms typically learn 80% of their knowledge within the local region and 89% within the same country (Peri, 2005). Location in knowledge centres is therefore critical for high-value activities, and the arguments in section 3 imply that this spatial knowledge concentration will be even stronger for service industries dependent on trust relations. Moreover, network analyses of trade and knowledge indicators imply that there is core-periphery hierarchical structure to international trading patterns (Kali and Reyes, 2006). The knowledge reach of technologically leading regions is already far greater than for other regions (Peri, 2005). Therefore, the combination of localized agglomeration advantages in key nodal locations, allied with economies of transportation and communication, will therefore maximize a firm's global market potential. As such, these global firms will increasingly reap the economic rents associated with knowledge assets, via genuinely global production, communication and financial networks (Coleman, 1996; Cohen, 1998; Zook, 2005). The core location of the firm is therefore critical, and firms already embedded in leading global centres will achieve the major returns from globalization. Recent simulation exercises regarding the elimination of worldwide tariffs are found to increase US exports and US multinational production by 21.7%, with these increases dominated by an increase in the number US foreign affiliates (Lai and Zhu, 2006). Global firms and global cities are becoming the dominant decision-making units, not individuals. However, the fact that distance is still a very significant trade barrier suggests that firms' international investment portfolios should themselves be adjusted for distance (Ghemawat, 2001).

In terms of economic geography, the only aspect in which individuals are becoming more empowered by the current processes of globalization is in terms of the increased ability of highly skilled individuals to move between locations in order to reap the rewards of their human capital. A rapidly widening income gap between high- and low-skilled individuals has already emerged within advanced economies (Scheve and Slaughter, 2007) and this pattern reflects the greater ability of countries, firms and individuals to earn even greater rents associated with existing technological and human capital advantages. It is well documented that the gap between the wealthiest and poorest countries has steadily increased over the last two centuries, and most of these inequality increases have taken place during the periods in which shipping costs have fallen at the fastest rates and global trade has increased at the fastest rates (Venables, 2006). Moreover, this inequality between richer and poorer countries has increased at an even faster rate over

the last two decades (Leamer, 2007). Yet nowadays, a twist on this historical observation is that modern global transport and communications technologies allied with institutional changes now also allow for a rapidly increasing migration propensity on the part of high human capital individuals. Most of these human capital movements are directed towards, and take place within, the global city (COL, 2007c) networks discussed above, and these centres benefit disproportionately from such inflows relative to other localities. High human capital individuals are now better able than ever to exploit their knowledge assets via mobility. As such, whereas increasing openness and falling trade costs were often previously associated with increasing international income disparities, nowadays the same effect is associated with international migration. In economic terms, this is the specific sense in which individuals are becoming more important than ever before. However, once again, individual earning power is associated with the increasing convexity of the global economy, not the flattening of it.

One final point is worth noting. Krugman and Venables (1995) analyse the situation where economies producer two sets of outputs, one under conditions of constant returns to scale and the other under increasing returns to scale. Under these assumptions, Krugman and Venables (1995) demonstrate that with high transport costs all countries have similar production patterns, because high transport costs act as a trade barrier, thereby encouraging local production. However, as transport costs begin fall an increasing centre-periphery divergence forms and regions in the periphery suffer declines. Finally, as transport costs fall to very low levels, convergence starts to occur. The question therefore arises as to where in this Krugman–Venables framework does the global economy currently stand?

The evidence presented here suggests that high knowledge-intensive activities are produced primarily in increasing returns to scale environments that are dependent on urban agglomeration, while low knowledge-intensive activities are produced rather more in environments of constant returns to scale. At the same time, we recall that although there is evidence that output spatial transactions costs in general have fallen, there is also evidence that they have probably not fallen by very much. Meanwhile, while output spatial transactions costs have fallen, the spatial transactions costs for many high value-added inputs have increased. The combination of these various observations implies that we are currently in the second stage of the Krugman–Venables transition process. As such, the Friedman thesis is basically incorrect, because Friedman implicitly assumes we are currently at the third stage in the Krugman–Venables transition. Once again, in economic geography terms, the implication of being at the second stage is that the world is becoming increasingly convex, not flat. Global firms are becoming the dominant decision-making units, not individuals, and networks of global cities are becoming the dominant reference point both for firms, trade and also for high human capital individuals. Whether in the future we move to the third stage of the Krugman–Venables transition, as suggested by Lucas (2000), is still very much unclear (Crafts, 2004).

Final comments

Outside of the arena of economics or economic geography, there is one behavioural area where Friedman may have a point regarding the flattening of the world, although even here it is still far from clear that this is indeed the case. This is in terms of the ways in which information and communications technologies are changing the relationships between individual action and collective action regarding social, political and environmental issues. Yet these arguments are not particularly related to six of Friedman's original list of key phenomena, namely, the fall of the Berlin Wall, the development of work-flow software, the advent of out-sourcing, the rise of off-shoring, the development of supply chaining or the rise of third-party dedicated internal logistics operations. While changes in the relationships between individual and collective action are likely to be related to the development of modern information and communications technologies in general, whether it is possible to individually

distinguish between the effects on these changing relationships of four of Friedman's list, namely, the advent of the World Wide Web, the advent of uploading and file sharing, the rise of information availability via search engines and the development of wireless technology, is a moot point. However, these issues are not the concern of this paper. Suffice to say that the world is not flat and if anything, at present it is becoming more curved.

Endnotes

[1] Note that this point is also consistent with the observation that the R&D and manufacturing of the products may not necessarily be in the same place or even the same country. The real value-added component embodied in the output good is the R&D, and the location of this will generally be tied to global knowledge centres far than the manufacturing process.

References

Acs, Z. J. (2002) Innovation and the Growth of Cities. Cheltenham, UK: Edward Elgar.

Arita, T. and McCann, P. (2000) Industrial alliances and firm location behaviour: some evidence from the US semiconductor industry. *Applied Economics*, **32**: 1391–1403.

Arora, A. and Forman, C. (2007) How local are IT services markets: proximity and IT outsourcing. *Journal of Management Information Systems*, **24.2**: 73–102.

Berry, C. L. and Glaeser, E. L. (2005) The divergence of human capital levels across cities. *Papers in Regional Science*, **84.3**: 407–444.

Best, M. H. (1990) *The New Competition: Institutions of Industrial Restructuring*. Cambridge: Polity Press.

Blum, B. B. and Goldfarb, A. (2006) Does the Internet defy the law of gravity. *Journal of International Economics*, **70.2**: 384–405.

Bobonis, G. J. and Shatz, H. J. (2007) Agglomeration, adjustment, and state policies imn the location of foreign direct investment in the United States. *Review of Economics and Statistics*, **89.1**: 30–43.

Brakman, S. and van Marrewijk, C. (2008) It's a big world after all: on the economic impact of location and distance. *Cambridge Journals of Regions, Economy and Society*, (in press).

BTRE. (2004) *Focus on Regions 3: Taxable Income, Bureau of Transport and Regional Economics*. Canberra, Australia.

Burghouwt, G. (2005) *Airline Network Development in Europe and its Implications for Airport Planning*. Utrecht, The Netherlands: Utrecht University Press.

Button, K., Stough, R. and Bragg, M. *et al* (2006) *Telecommunications, Transportation and Location*. Cheltenham, UK: Edward Elgar.

Cairncross, F. (1997) *The Death of Distance: How Communications Revolution Will Change Our Lives*. London: Orion Business Books.

Caniels, M. and Verspagen, B. (2003) Spatial distance in a technology gap model. In: Fingleton B (ed.). *European Regional Growth*, pp. 159–182. Heidelberg, Germany: Springer.

Cappelen, A., Castellacci, F. and Fagerberg, J. *et al* (2003) Regional disparities in income and unemployment in Europe. In: Fingleton B (ed.). *European Regional Growth*, pp. 323–350. Heidelberg, Germany: Springer.

Carlino, G. A., Chatterjee, S. and Hunt, R. M. (2007) Urban density and the rate of invention. *Journal of Urban Economics*, **61.3**: 389–419.

Casson, M. C. and McCann, P. (1999) Globalisation, competition, and the corporation: the UK experience. In: Whitman M (ed.). *The Evolving Corporation: Global Imperatives and National Responses*. Washington, DC: Group of Thirty.

Chandler, A. D. and Mazlish, B. (2005) *Leviathans: Multinational Corporations and the New Global History*. Cambridge: Cambridge University Press.

Chatterji, L. and Tsai, C.-M. (2006) Transport Logistics in the Global Economy: Spatial Implications. In: Kobayashi K, Lakshmanan TR, Anderson WP (eds). *Structural Change in Transportation and Communications in the Knowledge Society*. Cheltenham, UK: Edward Elgar.

Ciccone, A. and Hall, R. E. (1996) Productivity and the density of economic activity. *American Economic Review*, **86**: 54–70.

Cohen, B. J. (1998) *The Geography of Money*. Cornell University Press, Ithaca.

COL. (2002) *Aviation Services for London*. Corporation of London. London.

COL. (2005a) *The Competitive Position of London as a Global Financial Centre*. Corporation of London. London.

COL. (2005b) *Off-Shoring and the City of London*. Corporation of London. London.

COL. (2006a) *London's Place in the UK Economy 2006-07*. Corporation of London. London.

COL. (2006b) *The Importance of Wholesale Financial Services to the EU Economy 2006*. Corporation of London. London.

COL. (2007a) *The Global Financial Centres Index 1*. Corporation of London. London.

COL. (2007b) *The Global Financial Centres Index 2*. Corporation of London. London.

COL. (2007c) *The Impact of Recent Immigration on the London Economy*. Corporation of London. London.
Coleman, W. D. (1996) *Financial Services, Globalization and Domestic Policy Change*. London: Macmillan.
Combes, P.-P. and Lafourcade, M. (2005) Transport costs: measures, determinants, and regional policy implications for France. *Journal of Economic Geography*, 319–349.
Crafts, N. (2004) Globalization and Economic Growth: A Historical Perspective. *The World Economy*, **27.1**: 45–58.
Deardorff, A. (2003) Tiem and trade: the role of time in determining the structure and effects of international trade with an application to Japan. In: Stern RM (ed.). *Analytical Studies in US–Japan International Economic Relations*. Cheltenham, UK: Edward Elgar.
Disdier, A.-C. and Head, K. (2008) The puzzling persistence of the distance effect on bilateral trade. *Review of Economics and Statistics*.
Duranton, G. and Storper, M. (2008) Rising trade costs? Agglomeration and trade with endogenous transaction costs. *Canadian Journal of Economics*, **41**(1): 292–319.
Fingleton, B. (2003a) *European Regional Growth*. Heidelberg, Germany: Springer.
Fingleton, B. (2003b) Increasing returns: evidence from local wage rates in Great Britain. *Oxford Economic Papers*, **55**: 716–739.
Fothergill, S., Kitson, M. and Monk, S. (1985) Urban industrial decline: the causes of urban/rural contrasts in manufacturing employment change. London: HMSO.
Frankel, J. A. and Romer, D. (1999) Does trade cause growth. *American Economic Review*, **89.3**: 379–399.
Friedman, T. L. (2007) *The World Is Flat: A Brief History of the Twenty-First Century*, 3rd edn. New York.: Picador.
Fujita, M., Krugman, P. and Venables, A. J. (1999) *The Spatial Economy: Cities Regions and International Trade*. Cambridge, MA: MIT Press.
Gaspar, J. and Glaeser, E. L. (1998) Information Technology and the Future of Cities. *Journal of Urban Economics*, **43**: 136–156.
Ghemawat, P. (2001) Distance Still Matters: The Hard Reality of Global Expansion. *Harvard Business Review*, **79.9**: 137–147.
Glaeser, E. L. (2005) *Urban Colossus: Why Is New York America's Largest City?, Economic Policy Review: Urban Dynamics in New York*. New York: Federal Reserve Bank of New York.
Glaeser, E. L. and Kohlhase, J. (2004) Cities, regions and the decline of transport costs. *Papers in Regional Science*, **83.1**: 197–228.
Glaeser, E. L., Scheinkman, J. A. and Shleifer, A. (1995) Economic growth in a cross section of cities. *Journal of Monetary Economics*, **36**: 117–143.
Glaeser, E. L. and Shapiro, J. M. (2003) Urban growth in the 1990s: is city living back? *Journal of Regional Science*, **43.1**: 139–165.
Greunz, L. (2003) The Technology gap and European regional growth dynamics. In: Fingleton B (ed.). *European Regional Growth*, pp. 241–265. Heidelberg, Germany: Springer.
Hatton, T. J. and Williamson, J. G. (2005) *Global Migration and the World Economy*. Cambridge, MA: MIT Press.
Haynes, K., Lall, S., Stough, R. and Yilmaz, S. (2006) Network usage patterns and the substitution and complementarity effects between telecommunications and transportation: a demand-side approach. In: Kobayashi K, Lakshmanan TR, Anderson WP (eds). *Structural Change in Transportation and Communications in the Knowledge Society*, pp. 151–163. Cheltenham, UK: Edward Elgar.
Higgins, M. J., Levy, D. and Young, A. T. (2006) Growth and convergence across the United States: evidence from county-level data. *Review of Economics and Statistics*, **88.4**: 671–681.
HMT-DTI. (2001) *Productivity in the UK: The Regional Dimension*. H.M. Treasury and Department of Trade and Industry. London.
HMT-DTI. (2003) *Productivity in the UK: The Local Dimension*. H.M. Treasury and Department of Trade and Industry. London.
Hummels, D. (1999) *Toward a Geography of Trade Costs*. Mimeo, Illinois: University of Chicago.
Hummels, D. (2001) *Time as a Trade Barrier*. Mimeo, Indiana: Purdue University.
Ioannides, Y. M., Overman, H. G. and Rossi-Hansberg, E. *et al* (2007) *The effect of information and communication technologies on urban structure*, Paper presented at 54th North American Meeting of the Regional Science Association International, Savannah, Georgia USA, 7–10 November.
Jones, G. (1996) *The Evolution of International Business: An Introduction*. London: Routledge.
Kali, R. and Reyes, J. (2006) The architecture of globalization: a network approach to international economic integration. *Working Paper*. Department of Economics, University of Arkansas.
Lai, H. and Zhu, S. C. (2006) US exports and multinational production. *Review of Economics and Statistics*, **88.3**: 531–548.
Leamer, E. (2007) A flat world, a level playing field, a small world after all, or none of the above? A review of Thomas L. Friedman's The World Is Flat. *Journal of Economic Literature*, 83–126.
Leinbach, T. R. and Capineri, C. (2007) *Globalized Freight Transport: Intermodality, E-Commerce, Logistics and Sustainability*. Cheltenham, UK: Edward Elgar.

Limtanakool, N., Schwanen, T. and Dijst, M. (2007) Ranking functional urban regions: a comparison of interaction and node attribution data. *Cities*, **24.5**: 26–42.

Lucas, R. E. (2000) Some macroeconomics for the twenty-first century. *Journal of Economic Perspectives*, **14.1**: 159–178.

MacGillivray, A. (2006) *A Brief History of Globalization*. London: Robinson.

Mastercard. (2007) *Worldwide Centers of Commerce Index*, Available online at: www.mastercardworldwide.-com

McCann, P. (1998) *The Economics of Industrial Location: A Logistics Costs Approach*. Heidelberg, Germany: Springer.

McCann, P. (2005) Transport costs and new economic geography. *Journal of Economic Geography*, **5.3**: 305–318.

McCann, P. and Arita, T. (2006) Clusters and regional development: some cautionary observations from the semiconductor industry. *Information Economics and Policy*, **18.2**: 157–180.

McCann, P. (2007) Sketching out a model of innovation, face-to-face interaction and economic geography. *Spatial Economic Analysis*, **2.2**: 117–134.

McCann, P. and Fingleton, B. (1996) The regional agglomeration impact of just-in-time input linkages: evidence from the Scottish electronics industry. *Scottish Journal of Political Economy*, **43.5**: 493–518.

McCann, P. and Mudambi, R. (2004) The location decision of the multinational enterprise: some theoretical and empirical issues. *Growth & Change*, **35.4**: 491–524.

McCann, P. and Mudambi, R. (2005) Analytical differences in the economics of geography: the case of the multinational firm. *Environment and Planning A*, **37.10**: 1857–1876.

Nachum, L. and Zaheer, S. (2005) The persistence of distance? The impact of technology on MNE motivations for foreign investment. *Strategic Management Journal*, **26**: 747–767.

O'Brien, R. (1992) *Global Financial Integration: The End of Geography*. New York: Council on Foreign Relations Press.

Openshaw, S. and Taylor, P. J. (1979) A million or so correlation coefficients: three experiments on the modifiable areal unit problem. In: Wrigley N (ed.). *Statistical Applications in the Spatial Sciences*, pp. 127–144. London: Pion.

Partridge, M. D., Rickman, D. S. and Ali, K. *et al* (2007) *Employment growth in the American urban hierarchy: long live distance*, Paper presented at the 47th Congress of the European Regional Science Association, Paris, August.

Peri, G. (2005) Determinants of knowledge flows and their effect on innovation. *Review of Economics and Statistics*, **87.2**: 308–322.

Piore, M. J. and Sabel, C. F. (1984) *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books.

Richardson, H. W. and Bae, C.-H. C. (2005) *Globalization and Urban Development*. Heidelberg, Germany: Springer.

Rietveld, P. and Vickerman, R. (2004) Transport in regional science: the ''Death of Distance'' is premature. *Papers in Regional Science*, **83**: 229–248.

Rodriguez-Pose, A. (1998) *Dynamics of Regional Growth in Europe: Social and Political Factors*. Oxford: Oxford University Press.

Rosenthal, S. S. and Strange, W. C. (2004) Evidence on the nature and sources of agglomeration economics. In: Henderson V, Thisse J-F (eds). *Handbook of Urban and Regional Economics, Vol. 4*, pp. 2119–2171. Amsterdam, The Netherlands: North-Holland.

Sassen, S. (2001) *The Global City*. Princeton, NJ: Princeton University Press.

Sassen, S. (2002) *Global Networks: Linked Cities*. London: Routledge.

Scheve, K. V. and Slaughter, M. J. (2007) A new deal for globalization. *Foreign Affairs*; **86.4**: 34–47.

Schonberger, R. J. (1996) *World Class Manufacturing: The Next Decade*. New York: Free Press.

Shapiro, J. M. (2006) Smart cities: quality of life, productivity, and the growth effects of human capital. *Review of Economics and Statistics*, **88.2**: 324–335.

Simmie, J. (2004) Innovation and clustering in the globalized international economy. *Urban Studies*, **41**: 1095–1112.

Steger, M. B. (2003) *Globalization: A Very Short Introduction*. Oxford: Oxford University Press.

Storper, M. and Venables, A. J. (2004) Buzz: face-to-face contact and the urban economy. *Journal of Economic Geography*, **4**: 351–370.

Venables, A. J. (2006) Shifts in economic geography and their causes. *Federal Reserve Bank of Kansas City Economic Review*, **91.4**: 61–85.

Warf, B. (1995) Telecommunications and the clustering geographies of knowledge transmission in the late 20th century. *Urban Studies*, **32.2**: 361–378.

Zook, M. A. (2005) *The Geography of the Internet*. Oxford: Blackwell.

Received on October 3, 2007; accepted on December 21, 2007