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The rise of the entrepreneurial economy and the future of dynamic capitalism

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ABSTRACT

A major shift in the organization of developed economies has been taking place: away from what has been characterized as the managed economy towards the entrepreneurial economy, or what Kirchhoff (1994) has called dynamic capitalism. However, the factors underlying this observed shift have not been identified in a systematic manner. The purpose of this paper is to analyze the main factors leading to this shift and implications for public policy. In particular, we find that technological change is a fundamental catalyst underlying the shift from the managed to the entrepreneurial economy. However, it was not just technological change but rather involved a multitude of factors, ranging from the demise of the communist system, increased globalization, corporate reorganization, increased knowledge production and higher levels of prosperity. Recognition of the causes of the shift from the managed to the entrepreneurial economy implies a shift in public policy directions. Rather than to focus directly and exclusively on promoting new firms and small firms, it may be that the current approach to entrepreneurship policy is misguided. The priority should not be on entrepreneurship policy but rather a more pervasive and encompassing approach, policy consistent with an entrepreneurial economy, in order to foster dynamic capitalism.

1. Introduction

It has been nearly a quarter of a century since Bruce Kirchhoff's (1989, p. 161) prescient analysis of the shift towards an entrepreneurial economy: "There is growing interest in dynamic modeling of capitalism as recent experience has demonstrated the importance of innovation in shaping the structure and growth rate of capitalist nations." As Kirchhoff suggested, for a long time developed economies could be characterized as what Audretsch and Thurik (2001) subsequently termed a managed economy. The inventions of the division of labor, economies of scale and scope, paid labor and the fine-tuned cooperation between man and machine following the industrial revolution led to the rise of the large multinational enterprise. This enterprise was clearly the dominant form of organization until the 1980s. Statistical evidence, gathered from both Europe and North America, points towards the increasing presence and role of large enterprises in the economy in this period (Caves, 1982; Brock and Evans, 1989; Chandler, 1990). This was the era of mass production, when economies of scale and scope seemed to be the decisive factor in dictating efficiency. This was the world described by Galbraith (1956) in his theory of countervailing power, where the power of 'big business' was balanced by that of 'big labor' and 'big government'. Stability, continuity and homogeneity were the cornerstones of the managed economy (Audretsch and Thurik, 2001). Rising levels of prosperity absorbed the goods and services created by the typical multinational enterprise in this managed economy.

Before the fall of the Berlin Wall and the ensuing wave of globalization, the conventional wisdom predicted that small firms would wither away. In particular, with the rise of mainframe computing, it was predicted that this technology would be something of a final blow for small-scale operations (Audretsch, 2007b). Small firms were viewed as something Western countries needed to ensure decentralized decision making, obtained at the unfortunate cost of efficiency. Studies from the United States in the 1960s and 1970s revealed that small businesses produced at lower levels of efficiency than larger firms (Pratten, 1971; Weiss, 1976). Small firms were also paying lower salaries: empirical evidence from both North America and Europe found a systematic and positive relationship between employee compensation and firm size (Brown and Medoff, 1989). Based on R&D measures, small businesses accounted for only a small amount of innovative activity (Acs

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and Audretsch, 1990; Chandler, 1990; Scherer, 1991; Audretsch, 1995). The relative importance of small firms and self-employment had been declining over time in both North America and Europe (Scherer, 1991; Wennekers et al., 2010), in a sense fulfilling what Schumpeter (1942) had already predicted in the 1940s.

However, this managed economy has been replaced by the entrepreneurial economy. The managed economy is defined as an economy where economic performance is positively related to firm size, scale economies and routinized production and innovation. By contrast, the entrepreneurial economy is defined as an economy where economic performance is related to distributed innovation and the emergence and growth of innovative ventures (Kirchhoff, 1994; Audretsch and Thurik, 2000, 2001). This replacement did not just happen in a few regions, such as Silicon Valley and the Research Triangle in North Carolina, or a single country, such as the United States, but rather in most developed countries (Drucker, 1985; Baumol, 2002; Wennekers et al., 2005; Acs, 2006; Baumol et al., 2007; Audretsch, 2007b; The Economist, 2010a). Whereas the managed economy was characterized by a divergence of institutions and policy approaches to the underlying economic problem of that era, maximizing the efficiency and productivity of large scale production while minimizing any negative externalities from a concentration of economic power, the entrepreneurial economy is characterized by a convergence of institutions and policy approaches designed to facilitate the creation and commercialization of knowledge through entrepreneurial activity.

The recognition of the emergence of the entrepreneurial economy helped to trigger policy debates to promote entrepreneurship through "entrepreneurship policy". Governments, spanning the local, city, regional, national and even supranational levels, such as the EU, began a vigorous and targeted effort to spur the startup of firms and subsequent growth and survival.

This shift towards an entrepreneurial economy involves a move towards a more dynamic form of capitalism (Kirchhoff, 1994). Although Audretsch and Thurik (2000, 2001) identify how the manifestations and characteristics of the managed economy differ from those characterizing the entrepreneurial economy, the exact reasons triggering the shift from the managed to the entrepreneurial economy remain scattered (Audretsch, 2007b; Baumol et al., 2007). The purpose of the present paper is to explain why the shift from the managed to the entrepreneurial economy has taken place in the framework of a model. Also, some implications for public policy are given. In our model technological change is the crucial element of the explanation. However, as we will emphasize, the impact of technological change in leading to a shift from the managed to the entrepreneurial economy has been imbedded in a myriad of supporting factors, including increased globalization, corporate reorganization, increased knowledge production and higher levels of prosperity.

2. A model of the shift to the entrepreneurial economy

The present paper follows the tradition of Kirchhoff (1994) and his focus on the key role that entrepreneurship plays in generating innovation and economic growth by explicitly identifying those factors associated with the rise of information and communication technologies (ICT) influencing the shift from the managed to the entrepreneurial economy. While information and communication technologies can have different meanings for various contexts, the definition commonly applied by the OECD is useful. The OECD considers the ICT sector to consist of "a combination of manufacturing and services industries that capture, transmit and display data and information electronically" (OECD, 2002).

Our emphasis is on the explanation of why the rise of the entrepreneurial economy occurred, given that it took place around

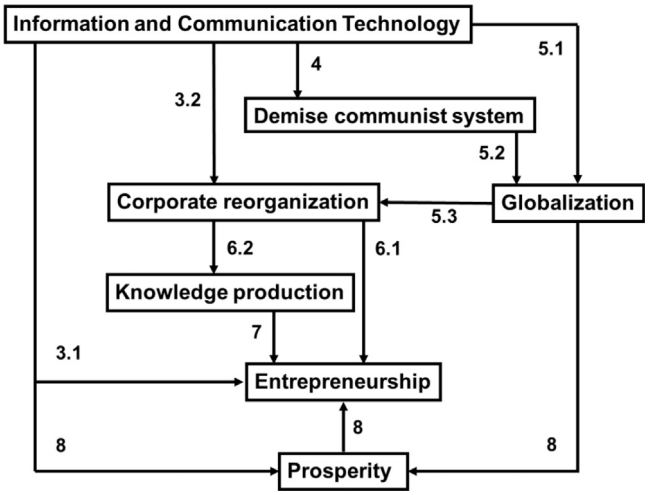

Fig. 1. Factors underlying the shift to the entrepreneurial economy. The arrow numbers refer to the sections below.

the late 1980s/early 1990s (Wennekers et al., 2010). Hence, we will not deal with later major developments like the rise of China and the multiple crises of 2008 onwards. Fig. 1 summarizes the links identified and analyzed in this paper. The starting point for this shift was the shock of the ICT revolution emerging in the 1970s (Castells, 1996), which not only triggered numerous intermediate changes but also ultimately led to the entrepreneurial economy. The numbers associated with the arrows refer to the corresponding sections in this paper that address each link explaining the shift from the managed to the entrepreneurial economy.

ICT can be considered a general-purpose technology (Helpman, 1998; Jorgenson, 2001). The introduction of technologies of that type has a deep impact on industrial organization. This is the subject of Section 3 of the present paper. In Section 4, we show that these introductions can even lead to major changes in the worldwide political configuration.

The character of this globalization wave created new restrictions and opportunities for multinational corporations. Section 5 addresses the causes and consequences of globalization as it manifested itself over the last two decades. Section 6 concerns the new business model of large American and European corporations that resulted from the pressures of the ICT revolution and globalization. This new model was the result not only of the distance-destroying capacity of ICT but also of the political opportunity and determination to deregulate world trade (Thurow, 2002).

Making and using knowledge is the most important consequence of the decline of physical capital as the source of competitive advantage of developed industrialized economies (Archibugi and Lundvall, 2001; Foray, 2004). Knowledge production and its transformation into economic value are addressed in Section 7.

The final role of entrepreneurship results from the massive spurt in economic growth resulting from the introduction of ICT, the expansion of participation in the global economy (i.e., the absorption of the labor reserve of the emerging economies) and the reallocation of economic activities. The ensuing unprecedented high levels of economic prosperity in the formerly industrialized countries led to demand characteristics favorable to an entrepreneurial organizational structure. This is the subject of Section 8.

Our last section provides implications for public policy. The traditional approach to entrepreneurship policy has a primary and exclusive focus on promoting new firms and small firms. However, considering the forces underlying the shift away from the managed economy and the emergence of the entrepreneurial economy suggests that a considerably broader approach may be more effective, and in particular, one that re-orients all institutions towards

promoting entrepreneurial behavior (Stam and Nooteboom, 2011). Rather than a simple focus on specific instruments to promote new firms and small firms, this new role calls for a fundamental, all-encompassing re-thinking of public policy that spans all dimensions of the economy, which is not termed entrepreneurial policy but rather policy for the entrepreneurial economy. The organization of our section on the implications for public policy is derived from that of Kirchhoff (1994), who discriminates between three dimensions to foster dynamic capitalism: removing barriers to entry, facilitating resource mobility and stimulating international competition. Although we cannot know the future content of dynamic capitalism, as the results of creative destruction are unpredictable, we can provide recommendations for policy to foster dynamic capitalism and maintain a prosperous entrepreneurial economy in the future.

3. Information and communication technology

Although Karl Marx, in his analysis of technological determinism, may not have been the first, he certainly was among the most prominent scholars to make a link between technology and institutions, broadly considered. The most prolific technological change over the last decades involves the rise of ICT. Modern information technology begins with the invention of the transistor at Bell Labs in 1947, which was the basis of the Nobel Prize in Physics in 1956 (Shurkin, 2006). The transistor replaced the vacuum tube in computers and televisions and enabled the transistor radio. The next major milestone in information technology was the co-invention of the integrated circuit by Texas Instruments in 1958 and Fairchild Semiconductor in 1959, which for example enabled the hand held calculator. The third invention was the microprocessor invented in 1971 by Intel, which was a major input to the subsequent development and diffusion of the microcomputer in the 1970s and the personal computer in the 1980s (by a.o. IBM and Apple). In the 1990s the era of computer networking and more in particular the internet started (Castells, 1996; Fransman, 2002). The impact of technological change as characterized by the advent of ICT on organizational structure has shifted the competitive advantage away from larger scale organizations to smaller scale organizations and inter-organizational alliances. The arrows labeled 3.1 and 3.2 in Fig. 1 depict this shift. We discriminate between its influence on entrepreneurship, i.e., new and small firms and on corporate reorganization, i.e., all changes in the world of large companies such as outsourcing, R&D activities, etc.

3.1. The rise of ICT and entrepreneurship

There are a number of reasons why ICT has made entrepreneurship, in the form of new firms and small firms, more competitive. The first involves the role of entrepreneurial firms and the emergence of new technologies. Any change in economic regime based on a radical new technology is accompanied by the arrival of numerous small firms (see Kassicieh et al., 2002; Spencer and Kirchhoff, 2006; Romig et al., 2007). Klepper (1996), for example, has documented that in the early stages of the life cycles of industries, small and new firms tend to play an important role. Jovanovic and Rousseau (2005) present examples from the advent of the electricity and IT industries and their effects on the US economy, and more recently, Brynjolfsson and McAfee (2011) show that there has never been a better time to be a talented entrepreneur than in the current ICT revolution, as evidenced with entrepreneurial firms like Google, Facebook and Skype. These effects are due to the new technology, which creates new markets (e.g. the plethora of software applications) while also destroying incumbent market positions (for example the traditional telecom providers) and the entry barriers typical for the older technology and its market (Schumpeter, 1942; Henderson and Clark, 1990; Spencer et al., 2008). Therefore, the entry into new industries in the initial stages of the life cycle is facilitated (Tirole, 1989). In addition, in the early stages of new markets, price elasticity is low because of the novelty of the product (Parker, 1992). The small size of the typical entrant is not a disadvantage because there is no competitive pressure to fight the battle of scale economies. These new entrants in emerging industries might enter the ranks of the economy's leading firms, driving out long established incumbents (Kirchhoff, 1989), which is what occurred with the rise of new ICT-driven industries (Louca and Mendonca, 2002).

3.2. ICT and corporate reorganization

However, even though the life cycle model explains the relative competitive advantage of small and new firms in new industries triggered by new technologies, there are two additional reasons specific to ICT that have reduced the competitive advantage of large firms. First, ICT tools and open access to the Internet created a worldwide platform for relations between firms irrespective of their size. The marginal costs of communication dropped (Shapiro and Varian, 1999; Brousseau and Curien, 2006). Small firms in particular need these relationships to compensate for their narrow set of competencies and limited scope for investments in human, social and financial capital (Nooteboom, 1994). The second reason concerns scale effects in transaction costs (Nooteboom, 1993) when firms engage in deals, attempt to do so or wish to monitor them. Transaction costs are higher for small firms compared to large firms. This has to do with the fixed costs involved in establishing information systems for search, evaluation, control and enforcement. These fixed costs consist of necessary hardware and software and mastering their use. The arrival of ICT tools, which are generally inexpensive, small and easy to use, combined with practically free access to the Internet, has almost eliminated the fixed cost component of the transaction costs of any deal. Therefore, the fixed cost component of communications declined.

Thus, the ICT revolution was both accompanied by the arrival of numerous new small firms and abolished some advantages of firm size, leading to corporate reorganization. This has been evidenced in the continued restructuring and decline in size of many long established multinationals (see also Section 6.1), and the rise of micromultinationals – businesses with fewer than a dozen employees that sell to customers worldwide and often draw on worldwide supplier and partner networks (Varian, 2011). While the archetypal firm in the managed economy was one of a small number of megafirms with huge fixed costs and thousands of employees, ICT enables the birth of small multinationals with low fixed costs and a small number of employees each. Both models can conceivably employ similar numbers of people overall, but the latter one is likely to be more flexible.

4. ICT and the demise of the communist system

A third factor conducive to entrepreneurship comes from the demise of Soviet communism. This section will demonstrate that this demise is, in part, attributable to the advent of ICT. The early theories about the demise of the Soviet Union (i.e., the generic non-viability of the socialist economic system, the rise of a popular revolution against the system, the existence of foreign pressures, and the betrayal at the very top of the Communist Party) are contested by Kotz and Weir (1997), who show that although these theories played an important role in the collapse of the system, the main dismantling factor was the combination of a series of hasty economic reforms and that a powerful group coming from the

party-state elite became capitalists along the way. How could this result have occurred after seventy years of an allegedly successful regime? It seems that the role of ICT and its inevitable relationship with democracy and economic growth are behind the demise of the Soviet system (Shultz, 1985; Shane, 1994; Robinson, 1995; Kedzie, 1997; Brown, 2009).

By the late 1970s, the Soviet Union was already lagging behind in ICT compared to the Western world (Robinson, 1995). The technical intelligentsia, which under Stalin labored in prison laboratories and later in secret scientific institutes and even towns, could not keep up with its counterparts. As a consequence, the gaps in efficiency, quality and development between the Soviet economy and the Western economies grew. Moreover, the Soviet economy had begun to stagnate (Shane, 1994; Kotz and Weir, 1997; Brown, 2009). After a period of minor attempts to improve economic performance, a new leader, Mikhail Gorbachev who came to power in 1985, experienced pressure for change from below and undertook a series of structural reform policies aimed at renewing Soviet socialism (Gorbachev, 1987; Kotz and Weir, 1997). Gorbachev sought to take advantage of the tools of a market economy without destroying socialism by capitalizing on ICT while maintaining control over information (Shane, 1994). However, this strategy was unworkable, as participation in the ICT revolution inevitably increases information flows outside of state control, leading to the 'Dictator's dilemma' (Shultz, 1985), according to which authoritarian regimes have to choose between ensuring economic growth and maintaining social control.

During the late 1980s and early 1990s, the Soviet system was no longer isolated from the rest of the world. The international flow of e-mails provided Soviet intellectuals and media with information from the West (Kedzie, 1997). Through access to new mass media based on advanced ICT, Soviet citizens were able to see the advantages and opportunities of capitalism. An increasing amount of information about the Western lifestyle became available in the Soviet Union through ICT (Ganley, 1996). In particular, most members of the party-state elite became aware of the gap between the way they lived under the socialist system and the way their counterparts lived under the capitalist system (Kotz and Weir, 1997). Brown (2009) calls them "within-system reformers". Similarly, deeply rooted socialist beliefs were undermined by most new media outlets that not only criticized the Soviet system but also promoted views opposing socialism (Kotz and Weir, 1997). Furthermore, access to information allowed the Soviet people to discover that much of what they had been taught about Soviet history was false (Shane, 1994).

Because ICT allows people not only to be well informed but also to discover business opportunities, its use became increasingly relevant in the West, while it began to produce frustration under the Soviet system from the mid-1980s onwards. ICT was only accessible to members of the party-state elite (Kedzie, 1997). Scientists, engineers and inventors who were frustrated by the constraints of the Soviet system also became entrepreneurs in the process, and in the early 1990s, the new group of Soviet capitalists emerged, primarily from the party-state elite (Kotz and Weir, 1997). Most of the available business opportunities at that time were in domestic and international trading and financial speculation (Kotz and Weir, 1997). Such activities require effective connections and, as Kotz and Weir (1997) argue, the party-state elite was expected to be the most likely group to have such connections.

Believing that communism and democracy could be made complementary, Mikhail Gorbachev set in motion structural reform policies. These perestroika policies had three main dimensions: glasnost or openness (less censorship and greater freedom of information and thought); radical economic reform; and the democratization of political institutions. In part perestroika failed because it was never really implemented (Boettke, 1993). Above we contended that his economic reforms revolved around the absorption of ICT, that the use of ICT is at odds with the control of information and the central planning methods and that their use for entrepreneurial activities remained restricted to the (former) party-state elite.

5. Globalization

Although the shift from the managed to the entrepreneurial economy is partly attributable to technological change, and in particular the advent of ICT, this is not the sole factor or reason for the shift. A second factor involves the process of globalization. As with all grand concepts, a definition of globalization is elusive and elicits criticism. The term is generally connected to the (rapid increase of) free movement of goods, capital, people and ideas around the globe. That domestic economies are globalizing is a cliché makes it no less true. In fact, the shift in economic activity from a local or national sphere to an international or global orientation ranks among the most vigorous changes shaping the current economic landscape (Dreher et al., 2008). The present section concerns two drivers of globalization and one consequence for corporate organization, i.e., outsourcing activities of large companies that have affected the world economy over the last two decades (arrows labeled 5.1, 5.2 and 5.3 in Fig. 1).

5.1. ICT and globalization

Globalization did not occur exogenously or independently with respect to ICT. Rather, ICT itself facilitated the emergence of contemporary globalization (Castells, 1996; Cairncross, 1997). The advent of the microprocessor, combined with its application in telecommunications, has altered the economic meanings of national borders and distance. The resulting new communication technologies triggered a virtual spatial revolution in terms of the geography of production, with products like computers and mobile phones being invented, designed, produced and marketed in completely different places. According to The Economist (1995), "The death of distance as a determinant of the cost of communications will probably be the single most important economic force shaping society in the first half of the next century." The telecommunications revolution has successfully reduced the cost of transmitting information across geographic space to virtually zero. Moreover, the microprocessor revolution has made it feasible for nearly everyone to participate in global communications, via e.g. email, mobile telephony and internet phone services.

5.2. The demise of the communist system and the rise of globalization

Globalization would not have occurred to the degree that it has if the fundamental changes were restricted to the advent of technological changes. It demanded a political revolution in significant parts of the world to reap the full benefits from these technological changes. During the Post-World War II period, most trade and economic investments were confined to Europe and North America, and later, a few of the Asian countries, such as Japan and the Asian Tigers. Trade with countries behind the iron curtain was restricted and in some cases prohibited. Even trade with Japan and other Asian countries was highly regulated and restricted. Similarly, investments in politically unstable countries in South America and the Middle East resulted in episodes of national takeovers and confiscation where the foreign investors lost their investments (Penrose et al., 1992). Such political instability rendered foreign direct investment outside of Europe and North America particularly risky and of limited value.

The fall of the Berlin Wall in 1989 and the subsequent downfall of communism was a catalyst for stability and accessibility to parts of the world that had been inaccessible for decades. The Soviet empire quickly vanished, along with its friendship prices and raw material subsidies. Within a few years, it became possible not just to trade with but also to invest in countries such as Hungary, the Czech Republic, Poland, and Slovenia, as well as China and Vietnam. Moreover, also the non-communists part of the world became accessible as a trading and investment partner after opening its economy in the early 1990s. As Thurow (2002, pp. 25–26) noted, "As long as communism was believed to be a viable economic system, there were limits to global capitalism whatever the technological imperatives. Capitalism could not go completely global because much of the globe was beyond its reach. Forty percent of humanity lived under communism."

5.3. Globalization and corporate reorganization

Although the most salient feature of globalization involves interactions and interfaces among individuals across national boundaries, the more traditional measures of transnational activity reflect an upward trend in global activities. These traditional measures include trade (exports and imports), foreign direct investment (inward and outward), international capital flows, and inter-country labor mobility. The overall trend in all of these measures has been strongly positive. The world trade of goods and services increased five-fold between 1985 and 2007 and more than doubled since 1996 (OECD, 2008, 2009). A specific manifestation of globalization involves (inward) foreign direct investment, which has increased for all world countries from an average of 0.5 trillion dollars in the last decade of the last century to 1.5 trillion in 2006 in real terms. The increase in global FDI was also not solely the result of greater participation by countries previously excluded from the world economy. In the European Union, (inward) FDI as a percentage of gross fixed capital formation increased from an average of 12% for the last decade of the last century to 18% in 2006. For the US, this percentage remained constant (7%), whereas for the UK, it nearly doubled from 18% to 34%. The stock of FDI for all world countries as a percentage of gross domestic product increased from an average of 8% in the last decade of the last century to 25% in 2006 (UNCTAD, 2007). Offshoring, i.e., outsourcing across international borders, accounts for a large share of the increase in global FDI. Both captive offshoring (moving activities abroad but keeping them inside the company) and outsource offshoring (moving activities abroad to firm outside the company) contribute to this increase (UNCTAD, 2004; EIM, 2009). A combination of location, internationalization and ownership advantages (Agarwal and Ramaswami, 1992) may explain whether and how outsourcing takes place. Cost reductions, the availability and quality of input factors and growth potential are among the most important drivers of offshoring (Nachum and Zaheer, 2005).

6. Corporate reorganization

The pressures of globalization and the ICT revolution led to waves of reorganizations in the world of large corporations that provided the essence of the managed economy. Corporate reorganization involves the changing internal and external organization of corporations, demonstrated by for example increased outsourcing and offshoring, and reorganized value chains. This has led to new business models of large corporations (Brynjolfsson and Hitt, 2000), and more quantitatively, to downsizing of established corporations and increases in the number of new firms. In this section we will focus on the effects on entrepreneurial activities in 6.1 and knowledge-based activities in 6.2.

6.1. Corporate reorganization and entrepreneurship

Confronted with lower cost competition in foreign locations, many European and North American firms resorted to substituting capital and technology for labor, reorganizing the production chain towards subcontracting along with shifting (parts of) production to lower-cost locations. This practice has resulted in waves of corporate downsizing throughout Europe and North America. This substitution has generally preserved the viability of many of the large corporations (Audretsch and Thurik, 1999). For example, between 1979 and 1995, over 43 million jobs were lost in the United States as a result of corporate downsizing. This number includes 25 million blue-collar jobs and 18 million white-collar jobs. Similarly, the 500 largest US manufacturing corporations cut nearly five million jobs between 1980 and 1993, or one-quarter of their work force. Although at its most intense in the late 1980s and early 1990s, this wave of corporate downsizing has continued (Burke and Cooper, 2000) despite the obvious downsides (Dougherty and Bowman, 1995). Large firms have not only reduced their employment in general but decreased R&D investments in particular, with small firms increasing their share in total private R&D (Mowery, 2009). Reorganizing production by subcontracting non-core activities is not just a large corporation phenomenon: a recent study (EIM, 2009) shows that 17% of all small and medium-sized companies in the European Union are engaged in subcontracting activities, and 7% are involved in international subcontracting. This corporate reorganization opened up opportunities for spin-offs and new roles for small firms (Klepper and Thompson, 2010).

Outward foreign direct investment from developed countries is a manifestation of outsourcing and offshoring (Friedman, 2005), which corresponds to displaced employment in the home country. The displaced employment of skilled workers provides an opportunity for (nascent) entrepreneurs to redeploy those workers by creating value in a newly formed organization. Numerous studies have documented the reduction of employment in mature and traditional industries, which are outsourcing and offshoring production to lower cost countries (Audretsch, 2007b; EIM, 2009). Similarly, a rich literature has documented the extent to which entrepreneurial new firms are spawned from opportunities provided by displaced workers (Thurik et al., 2008). Thus, as globalization spreads, employment tends to stop increasing and even decreases in large, incumbent firms, generating entrepreneurial opportunities for new firms and small firms.

6.2. Corporate reorganization into knowledge-based economic activity

As Friedman (2005) made popular in his book, The World is Flat, an important implication from the impact of the twin horns of the ICT revolution and globalization has been an erosion of firm competitiveness. Losses in firm competitiveness are manifested by a tradeoff between concomitant declines in profitability and market share, ceteris paribus. In terms of the labor market, the impact of the twin forces of the ICT revolution and globalization trigger a tradeoff between wage levels and levels of employment in high cost OECD countries, ceteris paribus (Mankiw and Swagel, 2006). Outsourcing of lower value added economic activity to lower cost countries has been pervasive within the OECD countries. For example, outsourcing in Germany has resulted in a shift away from employment in lower skilled manufacturing production towards knowledge-based and higher skilled economic activity (Zurner, 2010). Companies in Germany, such as Volkswagen have increasingly shifted economic activity within Germany away from

low-skilled manufacturing towards knowledge-based economic activity. An important implication of this trend towards reorganization is that the lower skilled workers find it more difficult to maintain or find work in OECD countries, while knowledge-based workers enjoy a strong demand, resulting in a divergence of unemployment rates between highly skilled and unskilled workers (Mankiw and Swagel, 2006).

7. Knowledge production

The policy response to globalization, both in public policy debates and in the economics literature, was to shift the source of competitiveness and growth away from physical capital and towards knowledge and ideas. In the policy debates, this shift was made clear in the Lisbon Mandate, and in the economics literature, it emerged as the critical factor underlying economic growth in the new growth theory or models of endogenous growth (Lucas, 1988; Romer, 1990). Endogenous growth theory assumes that an economy automatically benefits from its investments in new knowledge. The notion is that knowledge behaves like a public good that an entire economy can use. Although Solow was credited with suggesting that knowledge "falls like manna from heaven", in the endogenous growth models, knowledge can be interpreted as blowing over from the neighbor. This use by more than one firm or economic agent is particularly conducive to economic growth.

In the knowledge production function approach (Griliches, 1979), firms exist exogenously and then engage in the pursuit of new knowledge as an input into the process of generating innovative activity. Knowledge as an input in a production function is inherently different from the more traditional inputs of labor, capital, and land. Although the economic value of the traditional inputs is relatively certain, knowledge is intrinsically uncertain, and its potential value is asymmetric across economic agents (Audretsch et al., 2000).

Although there is, of course, a great deal of evidence that knowledge (R&D stock, human capital) leads to growth, some countries seem to benefit from investments in new knowledge to a greater extent than others. The knowledge spillover theory of entrepreneurship provides insights into how investments in knowledge are a source of entrepreneurial opportunities (Audretsch and Lehmann, 2005; Acs et al., 2009). The theory starts from the assumption that, given constant individual characteristics, entrepreneurial decisions are driven by the context, in particular by the knowledge intensity of the context. Therefore, entrepreneurship is not only exogenously driven by individual characteristics, but it is also driven by the endogenous response to opportunities created by the context (Audretsch, 2007a; Acs et al., 2009, 2010). Due to the non-rivalrous nature of knowledge as an asset, it may spillover such that the producers of knowledge are unable to appropriate the entire value of their knowledge for themselves. These spillovers serve as a source of opportunities for other firms and individuals seeking to start new businesses. The knowledge spillover theory of entrepreneurship states that entrepreneurial activity is greater in the presence of higher investments in knowledge. This argument is supported by Audretsch and Lehmann (2005) and Kirchhoff et al. (2007), among others, who show that regions with greater investments in new knowledge also have higher startup rates. Block et al. (in press) show that a high rate of entrepreneurship facilitates the process of turning knowledge into new-to-the-market innovation but has no effect on the relationship between knowledge and new-to-the-firm innovation.

8. Prosperity and entrepreneurship

In the sections above, we describe how the ICT revolution, together with globalization as the governing principle of economic behavior and spurred on by the demise of the communist system, led to expanded space for entrepreneurship through new organizational structures and a greater emphasis on knowledge as a production factor. Both investments in ICT (Mankiw et al., 1992; Jorgenson and Stiroh, 1999; Jorgenson, 2001) and globalization (Dollar and Kraay, 2004; Crafts, 2004) are found to be drivers of economic growth, leading to high levels of prosperity. Higher levels of prosperity lead to a more service-oriented economy (Bryson et al., 1997), a differentiation in consumer demands (Piore and Sabel, 1984) and a shift in occupational preferences (Uhlaner and Thurik, 2007). All three, independent of organizational and knowledge-based restructuring, lead to increased room for entrepreneurship. First, the increase in the service orientation of developed economies is due to relatively high income elasticities of personal and social services combined with their relatively low labor productivity. Second, the increase in individual wealth has led to a growing differentiation of consumer preferences, and hence, business opportunities (Brock and Evans, 1989). The advantages of low prices made possible by the exploitation of the scale and scope of the typical multinational enterprise of the managed economy lost their meaning in the face of consumers' preference for variety. Third, the supply side of entrepreneurship is influenced by the drivers of occupational choice. High levels of prosperity will give prominence to immaterial motivations such as autonomy and self-realization. These motivators are at the heart of entrepreneurial choice. It has been shown that, in spite of long and intense working hours under a high level of uncertainty, the self-employed have higher job-satisfaction levels than employees (Blanchflower and Oswald, 1998; Millan et al., 2013; Lange, 2012).

9. Implications for public policy

Recognizing the ubiquitous nature of the shift from the managed to the entrepreneurial economy leads us to rethink the appropriate policy response. This regime shift helped to trigger an awakening in policy debates to promote entrepreneurship through "entrepreneurship policy". Governments, spanning the local, city, regional, national and even supranational levels, such as the European Union, began a vigorous and targeted effort to spur the startup and growth of new firms. An important implication of the present paper is that focusing on entrepreneurship policy ignores the pervasiveness and prevalence of the forces triggering the shift from the managed to the entrepreneurial economy. Given the pervasiveness of this shift, promoting new firms or their post-entry performance is too narrow of an interpretation of the appropriate policy response. Rather than develop an entrepreneurship policy, the appropriate policy response is to develop policy for the entrepreneurial economy. The impact of technological change and its many mediators on entrepreneurship is so complex and pervasive that the policy implications are beyond those of just creating entrepreneurship policy to supplement existing policy avenues. The ascendance of entrepreneurship policy was certainly consistent with the characterization that the entrepreneurial economy had superseded the managed economy. However, the identification of the factors underlying why this shift actually occurred leads to a rethinking of the policy conclusion. Rather than a narrow focus on promoting new firms and small firms, the appropriate response of public policy should be to re-think the policy approach in a broad and pervasive sense so that the focus is not on developing entrepreneurship policy but rather on policy enabling dynamic capitalism, in which entrepreneurship plays a key role (Audretsch and Thurik, 2000, 2001; Acs, 2006). This largely overlaps with Kirchhoff's (1994) plea for dynamic capitalism, which is self-renewing if properly supported by appropriate public policy. He proposed a basic set of three guidelines for such a public policy (Kirchhoff, 1994, pp. 199–206). First, government policies should

remove barriers to entrepreneurial entry. Second, government policies should facilitate the mobility of resources, especially labor and capital. Third, government policies should open up the national economy to international competition.

The difference between entrepreneurship policy and policy for the entrepreneurial economy is that the former leaves most institutions and policies unchanged. The focus of entrepreneurship policy is on creating instruments that will directly promote the startup of new firms and the performance, typically in terms of growth and survival, of those entrepreneurial new firms. This approach leaves most of the incumbent institutions and policies that do not directly address new firms and their performance unchanged (see also Bridge, 2010). By contrast, policy for an entrepreneurial economy leaves virtually no aspect of institutions or policy unchanged. These aspects can be influenced through many channels (Audretsch et al., 2007; Stam and Nooteboom, 2011). Fig. 1, which attempts to capture the essence of the many links between the advent of the ICT revolution and the emergence of entrepreneurship as a central element in the modern economy, including the many mediating effects, also implies that the policy implications are beyond those of creating entrepreneurship policy with an exclusive focus on the promotion of new firms and small firms. Let us build on Kirchhoff's (1994) three guidelines for a policy for dynamic capitalism to propose recommendations for a policy for an entrepreneurial economy.

9.1. Barriers to entry

Entry provides a threat to the market positions and ensuing profitability of incumbent firms. The threat of entry, a central element in the theory of contestable of markets (Baumol et al., 1982), is an important driver of investments in innovation by incumbents to stay ahead of and prevent the entry of competitors. Government policies should reduce barriers to entrepreneurial entry to stimulate incumbents to innovate and to allow newcomers to develop and diffuse innovations. Traditionally, this approach involves the domain of competition policy. Traditional competition policy has been pre-occupied with static efficiency and should more explicitly account for dynamic efficiency (Audretsch et al., 2001), which allows for the further development and diffusion of ICT, welfare-enhancing corporate reorganizations, and knowledge production. Labor market regulations should also be re-evaluated in this context. One poignant example is the enforcement of non-compete agreements, which prohibit employees from using knowledge gained in one firm from leaving that firm and using this knowledge in a competing firm. Although such agreements may have constituted sensible public policy in the managed economy (e.g. in the US, Canada and most European countries) by enhancing the ability of incumbent firms to appropriate costly investments, Samila and Sorenson (2011) provide compelling empirical evidence showing that the enforcement of non-compete agreements constrains (potentially) innovative entrepreneurs. Finally, the recent revival of industrial policy (The Economist, 2010b) should also be received with suspicion, especially when it reinforces the position of vested interests and/or creates additional barriers for new entrants. These dangers are quite realistic: it is much easier to involve established businesses in the process of designing industrial policy, than to involve (potential) new entrants, with the intended or unintended effect that the previous are much better served by industrial policies than the latter (see Nooteboom and Stam, 2008).

9.2. Resource mobility

The mobility of resources, especially the mobility of labor, is a necessary condition for the recombination of resources (the essential process for innovation) and the diffusion of useful innovations. Pension and social security schemes are often attached to particular employers in a particular country, and in this way limit the mobility of employees between established organizations and new firms. The design of these schemes made sense in a managed economy in which employees were expected to spend most of their working life with one or a few employers, but not in a highly flexible entrepreneurial economy. Pension plans and health insurance should be designed as the property of the worker, not the employer. Portable pension plans and health insurance enable the mobility of labor. In a similar way, labor market regulation should enable the flexibility of labor, both within organizations (internal flexibility, which is especially relevant for entrepreneurial employee activity, see Stam et al., 2012) and between organizations (e.g. with making employment protection legislation less strict; see Bosma et al., 2009; Autio, 2010). Of course, individual preferences for financial and employment security should also be taken into account by developing labor market institutions that cushion temporary unemployment and stimulate investments in knowledge and skills that improve the job market positions of workers or the chances of a successful entrepreneurial career. Another issue that was not central in Kirchhoff (1994) but has gained prominence with the rise of globalization is policy that enables the international migration of skilled labor. Immigration policy has been shown to be of major relevance for high tech entrepreneurship and the growth of high tech clusters (Saxenian, 2006; Gaonkar et al., 2010). This immigration policy should be designed not only to ease the recruitment of high skilled labor by incumbents but also to enhance the creation of new firms by these immigrants.

9.3. International competition

Perhaps government policies to isolate a domestic economy from foreign firms are less prevalent at present than in the 1980s and 1990s. But, an equal international playing field for established and new firms is still far from reality. However, such a market exchange perspective misses the central point: a country that is unable to harness the forces of creative destruction created by entrepreneurial activity, as Kirchhoff (1994) suggested, is likely to suffer from reduced innovative activity and subsequently lower rates of economic growth and employment creation. Sustaining prosperity in a global economy necessitates continued discovery activities by entrepreneurs in new and established firms and the ability to scale up promising activities. On the one hand, a country's current competitive advantage is unlikely to be its competitive advantage over 20 years. However, on the other hand, firms in a national economy are more likely to be able to compete on international markets if they build on local knowledge and skill bases. Discovering the best activities with which to compete on international markets in the near future necessitates trial and error by ambitious entrepreneurs to make new combinations of existing knowledge and skills (see Rodrik, 2007; Stam and Nooteboom, 2011). For example, governments should not only fund the development of knowledge at the scientific frontier, but should also stimulate the application of this knowledge in practice. Every region and country should discover what it can and cannot produce profitably based on its resident knowledge at the frontier of e.g. biomedical, material, nano, or computer sciences. Institutions need to be adapted locally to scale up these activities to further build and maintain these newly developed competitive advantages; at the same time, policies should keep barriers to entry low and resource mobility sufficiently high to prevent the occurrence of negative lock-ins.

Many of the institutions and policies created during the era of the managed economy may actually constrain the application of knowledge developed in established organizations and may serve

as barriers to entrepreneurship in the entrepreneurial economy. Institutional changes and policies should accommodate openness to entrepreneurial initiatives that cross the borders of countries, knowledge institutes and firms. Policies for an entrepreneurial economy should enable individuals to build and apply knowledge in new collectives, be they firms, networks, or alliances, making use of new information and communication technologies. We have provided several examples that highlight policies that may have made sense in the managed economy but are absolutely counter-productive in the entrepreneurial economy. As these examples suggest, only a fundamental rethinking of institutions and public policy will provide an adequate re-alignment as the entrepreneurial economy of this century replaces the managed economy of the previous century.

9.4. *The contribution of Bruce Kirchhoff*

A central theme and insight prevalent throughout Bruce Kirchhoff's work was the "belief that capitalist economies require new firm entry and growth to assure that innovation does not become the mechanism of increased concentration of industrial activity. Creative destruction is necessary to maintain capitalism" (Kirchhoff, 1989, p. 171). In his seminal 1989 paper, Kirchhoff clearly identified entrepreneurship as the driving force underlying innovation and economic growth: "Entry and growth of new small firms may well be indicative of creative destruction in contemporary capitalism" (p. 171). This paper has extended the key elements of Kirchhoff's thinking and ideas regarding the central role of entrepreneurship and innovation by explaining how and why the entrepreneurial economy has replaced the managed economy of previous generations. It was the gift and capacity to link the smallest unit of analysis, entrepreneurship, to the largest unit of analysis, macroeconomic performance and economic growth, that enabled Kirchhoff to provide insights to both scholars and public policy alike, and these insights are perhaps even more valid and prescient today than at the time of his writing.

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