The New Economy in Germany and the United States: Policy Challenges and Solutions.

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AICGS New Economy Study Group Team

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FOREWORD

Much has been made of the New Economy, but substantially less has been written about it, at least in a deep and systematic manner. In 2000, AICGS launched a modest but nonetheless significant attempt to remedy this state of affairs by forming the New Economy Working Group under the direction of Professor David B. Audretsch. Seeking to compare the contours of the New Economy in the United States and Germany, and to draw out meaningful policy implications for officials in both countries, members of the working group met several times to exchange observations and ideas, the fruits of which you have before you in the form of Professor Audretsch's final report. AICGS would like to express its sincere gratitude to Professor Audretsch and the other members of the Working Group for their insights into this important and in many ways determining feature of the modern political economy.

Jeff Anderson
Director of Studies

INTRODUCTION

It is a commonly accepted assumption in policy circles today that the western countries are in the midst of a fundamental economic transformation in which the "old economy," triggered by the industrial revolution, is giving way to the "new economy" of the electronic revolution. Competing "e" policy agendas – promising either to promote a new era of growth and development or stem the tide – collide in a cacophony of special interests and technical jargon. Yet this debate is founded on very limited knowledge of the transformation in question. To be sure, there has been considerable speculation about the nature of the new economy and its potential to restructure modern society; however, there has been a dearth of research on the subject. Consequently, there is little guidance for policy makers who wish to understand this transformation and shape its development.

As the two leading economies in the western world, Germany and the United States are particularly interested in understanding this transformation. The impact of the New Economy has been remarkably similar in Germany and the United States, despite very different political economies and policies. These similar impacts raise important questions about the mechanisms of transformation in western societies. Because both countries are large, high wage, open economies, they share a common vulnerability to significant shifts in the sources of economic value in their economies. These shifts affect job creation, growth and international competitiveness. Moreover, they are creating new tensions in international relations as well as new opportunities for strategic cooperation, giving rise to a mutual interest in developing a better understanding of the underlying forces of change.

Recognizing this dilemma as a part of its mission to forge a bridge of understanding across the Atlantic, the American Institute of Contemporary German Studies (AICGS) assembled a group of researchers and policy makers in Germany and the United States to identify research and policy issues posed by the transformation we have come to call the new economy. This paper, which is the product of their collaboration, focuses on three issues that form the basis for the sections that follow. The first issue relates to defining what exactly constitutes the New Economy. The second issue involves identifying the forces driving the expansion of the New Economy. The third issue pertains to research and policy questions posed by the New Economy. In addressing these issues, the authors generate several key findings:

- While a common myth is that the Internet and e-commerce constitute the New Economy, we suggest that what is new about the New Economy involves the shift to knowledge and ideas as the source of competitive advantage. There are at least four central aspects that, when taken together, constitute what we mean by the New Economy—(1) globalization, (2) the shift to knowledge and ideas as the source of competitive advantage, (3) the increased importance of regional agglomerations and clusters, and (4) the emergence of entrepreneurship as an engine of growth and development.

- The forces facilitating the expansion of the New Economy are technological change, especially ICT (information and communications technology), but also institutional change, such as reforms in the financial sector.

- New government policies are required in the New Economy. While the role of public policy in the traditional economy constrained the freedom of firms to contract, the new policy approach enables the creation and commercialization of knowledge.

While this study is able to identify the importance that New Economy plays in Germany and the United States, it raises many more questions than it answers. In particular, this study argues for a

research agenda that explicitly compares both the similarities and differences that shifting to a New Economy has impacted Germany and the United States, and which types of policies have proven to be the most effective in generating and coping with the New Economy.

Because what exactly constitutes the New Economy is controversial, the second section explicitly addresses the question, "What is the New Economy?" The answer to this question may surprise many readers who have consistently read that the New Economy is about the Internet or information and communication technologies, or even about dot.com companies. In fact, we argue that what constitutes the New Economy is something very different and more fundamental, and involves four pillars – globalization, the shift to the knowledge economy, an increased role of geographic location and clusters, and the emergence of entrepreneurship. The third section focuses on how technological and institutional change have both been impacted and shaped by the New Economy. This involves the emergence of new technologies, such as information and communication technologies, but also new institutions, such as the *Neuer Markt* in Germany. The final section of the report focuses on implications for policy and future research.

WHAT IS THE NEW ECONOMY?

What is the New Economy and how does it differ from the "Old Economy?" The distinction is found by examining the cornerstones of an economy—the inputs, outputs, institutions and mechanisms of governance. In the traditional economy, inputs or factors of production were largely natural resources (land), plants and equipment (capital), and workers (labor). These were combined to produce outputs with tangible value such as automobiles and steel. By contrast, the New Economy is driven by a very different set of factors of production—knowledge or ideas. Over the past thirty years, there has been a remarkable shift in emphasis in the U.S. economy from creating firms that are based on physical assets and products to creating firms that are based on information or knowledge assets. This change can be observed by comparing the table of contents from the 1972 edition of the *S&P Analysis Handbook* to that of the 1998 edition (A.T. Kearney, 1999). In 1972, firms that manufactured foods, machinery, equipment, and basic consumer products dominate the list. But in 1998, firms in knowledge-based industries such as computers, health care, services, and financial intermediation emerge as leaders.

The production and application of knowledge generates outputs that are innovative ideas, such as computer software or the DNA string that identifies the human genome. Because the New Economy derives its competitiveness from knowledge inputs generating innovative output, it is often assumed that the New Economy is exclusively about technology. Such an assumption is wrong because it overlooks the contribution of new ideas and creativity embedded in a broad spectrum of services and products, something that may not involve any new technology at all.

Still, new technologies are a driving force in the New Economy because they facilitate the production and application of new ideas. What is new in the economy in the late twentieth century as compared to the late nineteenth century is the very rapid increase in the diffusion of knowledge in the production of goods and services in a world of improved information, communication, and transportation links. Information processing, communication networks, and related technologies are accelerating the exchange of information and knowledge, creating a virtuous circle of innovation and growth.

Thus, in this report we suggest that the New Economy can be characterized by (1) increased globalization, (2) a shift to knowledge as the source of international competitiveness, (3) an increased role of geographic location and regional clusters, and (4) an increased importance of entrepreneurship.

None of these phenomena are new by themselves. Certainly economic activity has had historical episodes of globalization before. Knowledge as an economic input is certainly not new. Geographic clusters and entrepreneurship have existed for centuries. What is new, however, is that these four phenomena have emerged as the driving forces of economic activity in a way that

was not foreseen even a few years earlier. The literature of the postwar era clearly identifies sources of growth and competitiveness as being very different from these four cornerstones identified here.

The first New Economy sighting was no doubt California's Silicon Valley in the United States in the 1980s. At that time, long-term economic growth was generally associated with the growth of large multinational corporations, such as 3M, IBM, and DEC, which, with their large armies of engineers and scientists, seemed invincible in their ability to generate innovation and new technology. These scientists demonstrated undying loyalty to their employers forged from long-term employment and a paternalistic stance towards their employees. In the 1984 best seller by Peters and Waterman, *In Search of Excellence*, which described the business strategies of the top fifty U.S. corporations, these characteristics not only placed IBM at the top of the list, but also served as a shining example for corporate America to learn from and imitate.

The firms in the incipient New Economy of Silicon Valley provided a striking contrast, where people were quick to leave their companies to start new firms and, on occasion, even entirely new industries. While IBM was large and bureaucratic with rules and hierarchical decision-making, the firms in the emerging New Economy in Silicon Valley thrived on spontaneity, participation, openness and a general disdain for rules and hierarchy. If obedience and conformity were trademarks of firms in the Old Economy, firms in the New Economy value creativity, originality, independence and autonomy above all other characteristics.

The New Economy subsequently spread throughout the United States to other places such as Route 128 around Boston, the Research Triangle in North Carolina, and Austin, Texas. Most recently, the diffusion of the New Economy in the United States has been more pervasive, including the Washington D.C. corridor (which includes Northern Virginia and Maryland), New York, San Diego, Los Angeles, Salt Lake City, Seattle, and also smaller cities such as Madison, Wisconsin.

The expansion of the New Economy in the Unites States has been accompanied by the proliferation of a very different set of institutions than those that supported the old economy. These institutions focus chiefly on stimulating applied research, large-scale entrepreneurship, and facilitating the development of public-private networks between entrepreneurs, large and small businesses, research universities, local government, federal government, venture capital, and the non-profit sector. These institutions are a departure from the Old Economy stalwarts, which encouraged the formation of large, bureaucratic organizations such as labor unions, federal government programs, and public corporations.

Whereas the New Economy in the United States has emerged from subtle policy shifts toward long-standing cultural predilections, the emergence of the New Economy in Germany has evolved through five distinct stages. The first stage was denial. During the 1980s and early 1990s, German policymakers looked at Silicon Valley with skepticism and doubt. After all, this was the continent where in 1968 Jean Jacques Servan-Schreiber had warned Europeans to beware the "American Challenge" in the form of the "dynamisms, organization, innovation, and boldness" that characterize large American corporations. Because it was assumed that large corporations were needed to amass the requisite resources for innovation, Servan-Schreiber advocated the "creation of large industrial units, which are able both in size and management to compete with the American giants." According to Servan-Schreiber, "The first problem of an industrial policy for Europe consists in choosing fifty to 100 firms which, once they are large enough, would be the most likely to become world leaders of modern technology in their fields. At the moment we are simply letting industry be gradually destroyed by the superior power of American corporations."

Europe was used to looking across the Atlantic and facing a competitive threat from large multinational corporations such as General Motors, U.S. Steel, and IBM, not nameless and unrecognizable startup firms in exotic industries such as software and biotechnology. In fact, the Cecchini Report to the European Commission in 1988 projected that the source of economic

value from the anticipated European integration would be scale economies arising from competition and consolidation, not entrepreneurship. Emerging U.S. firms such as Apple Computer and Intel seemed interesting but did not seem to have sufficient relevance for the mainstay businesses in the automobile, textile, machinery and chemical industries, which were the existing engines of European competitiveness, growth, and employment. The high performance of Silicon Valley was generally qualified as suffering from a short-term perspective, where long-term investments and commitments were sacrificed for short-term profits.

The second stage, during the mid-1990s, was recognition. Germany recognized that the high performance of the New Economy in Silicon Valley did, in fact, deliver a sustainable long-run performance. The theory of comparative advantage that was typically evoked during this phase was that Germany would provide the automobiles, textiles and machine tools. The New Economy of Silicon Valley, Route 128, and the Research Triangle would produce the software and microprocessors. Each continent would specialize in its comparative advantage and then trade with each other. Thus, Germany held fast to its traditional institutions and policies that channeled resources into traditional moderate technology industries.

The third stage, during the second half of the 1990s, was envy. As German unemployment soared into double digits and growth stagnated, the capacity of the American New Economy to generate both jobs and higher wages became the object of envy. The United States and Germany seemed to be on divergent trajectories. The separate but equal doctrine from the concept of comparative advantage yielded to the different but better doctrine of dynamic competitive advantage. As the New Economy continued to diffuse across the United States, most policymakers despaired that German traditions and values were simply inconsistent and incompatible with the New Economy.

The fourth stage, during the final years of the last century, was acceptance. German policymakers reached a consensus that not only was the New Economy superior to the Old Economy, but that a commitment had to be forged to create a German New Economy. Gerhard Schröder defied the politics and policies of his traditional left-oriented party by supporting the movement toward privatization, deregulation, and entrepreneurship. Rather than despairing that the United States had what Germany could not attain, a broad set of policies were instituted to create a German New Economy. These German policymakers looked across the Atlantic and realized that if places such as North Carolina, Austin, and Salt Lake City could implement targeted policies to create the New Economy, cities such as Munich and Randstad could as well. After all, Germany has a number of the same advantages and traditions that the emerging New Economy regions of the United States have, such as a highly educated and skilled labor force and the existence of world-class research institutions. In addition, Germany has a long tradition of government-industry-worker partnerships that, if redirected, could be well suited to the knowledge-based New Economy.

The fifth stage will be attainment. While Germany may not be there quite yet, there are definite signs that a New Economy is emerging on the old continent. Consider the cover story of one of the most serious German weekly magazines, *Der Spiegel*, which recently proclaimed "Handys, Hightech and Reform: Good Morning, Europe—How the Old Continent is attacking the Economic Power U.S.A." For example, the amount of venture capital in Germany tripled in the 1990s, from €1.6 billion in 1990 to €5.4 billion in 1998. The *Neuer Markt*, which was launched in 1997 to provide a market like the NASDAQ for small cap stocks, had over 300 listings by September 2000. During this same period, capital volume grew to €55 billion. Still, in 1998, the share of information and communications technologies accounting for the German GDP was only 58 percent of that in the United States.

Thus, viewed from the vantage point of the mid-1990s, it appeared that the economy and institutions of the United States were diverging from those of Germany. However, this view has changed since the new century, in that what appeared to be a process of divergence only a few years earlier can now be viewed as a process of convergence. The basic argument of this report is

that the advent of the New Economy has remarkable similarities in both Germany and the United States. In particular, the distinguishing features of this New Economy, common to both Germany and the United States, involve a shift to knowledge and ideas as the source of competitive advantage. These features are the centerpiece of the strategic integration of several related phenomena: globalization, the increased importance of regional agglomerations and clusters, and the emergence of entrepreneurship as an engine of growth and development. Let us take each in turn.

Globalization

The expansion of economic activity across national borders ranks among the most profound changes shaping the current economic landscape. Over the past thirty years, the volume of world trade increased nearly 400 percent. Over the same period, global production has doubled. In the most developed countries the increase in trade has been even greater. For example, exports as a share of gross domestic product for the developed countries rose from around 18 percent in 1982 to around 25 percent by 1999. The increase in world trade is not attributable to the influence of just a few industries or sectors: it is systematic across most parts of the economy. Exposure to foreign competition has increased in every single OECD country, with the exception of Japan. Changes in global foreign direct investment (FDI) are equally dramatic, increasing by 700 percent between 1970 and 1997. The increase in global FDI also has not been solely the result of a greater participation by countries previously excluded from the world economy. As a percentage of GDP, FDI has increased for the all the advanced economies, including the Unites States and Germany.

Trans-national capital flows have also increased in the past two decades. The value of bonds and equities involved in cross-border transactions has exploded for the six largest economies. In addition, the amount of foreign exchange traded has also increased. The cross-border transactions in bonds and equities as a percentage of GDP rose in the Unites States from 9 percent in 1980 to 135.5 percent by 1995, and in Germany from 7.5 percent to 168.3 percent.

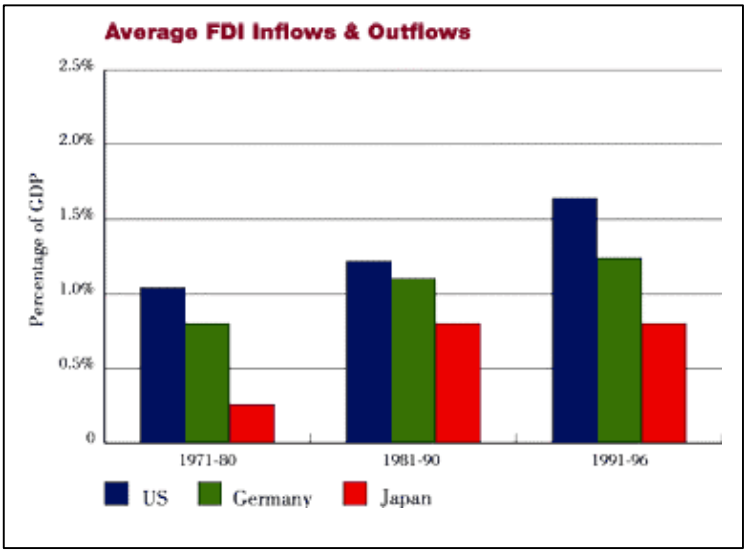


Figure 1

Globalization of economic activity has contributed to the emergence of the New Economy in two fundamental respects. First, the diffusion of information and communication technologies greatly reduces the cost of shifting standardized economic activity out of high-cost locations, such as the United States and Germany, into lower-cost locations elsewhere in the world. Second, cross-border economic activity exposes high-cost producers in the advanced economies to lower-cost competition from producers in less developed economies.

The diffusion of information and communication technologies has reduced the cost of human interaction and triggered a virtual spatial revolution in terms of the geography of economic activity. The explosion in the number of Internet hosts worldwide over the past decade reflects the most recent manifestation of this change.[2] In 1990, there were almost no hosts but by the end of the decade, there were nearly ten million. Expanded use of the Internet corresponds with a significant increase in investment in information and communication technologies over the past twenty years, which is reflected by an increasing share of capital investments in major OECD countries. For example, a recent survey in higher education in the United States revealed that in 1995, less than two-thirds of the American campus information systems were connected in a high-speed network; however, within two years, 81 percent were connected (OECD, 1998).

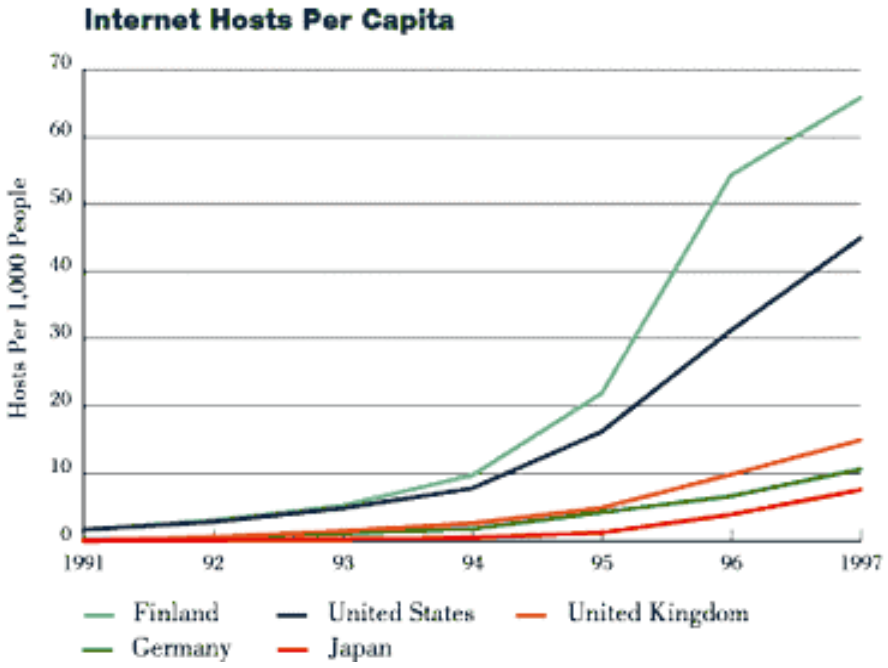


Figure 2

Globalization would not have occurred to the degree that it has if fundamental social changes were restricted to the diffusion of information and communication technologies. It took a political revolution in significant parts of the world to reap the benefits of these technological changes. The political counterpart of the technological revolution has been the increase in political and economic openness and concomitant stability in areas of the world that had previously been inaccessible. The cold war, combined with internal political instability, rendered potential investments in eastern Europe and much of the developing world risky and impractical. During the postwar era, most trade and economic investment was generally confined to Europe and North America, and later a few of the Asian countries, principally 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.

With the opening of some of these areas, the postwar equilibrium came to a sudden end. This created the opportunities associated with gaping disequilibria. Consider the large differentials in

labor costs. As long as the Berlin Wall stood and countries such as China and Vietnam remained closed, large discrepancies in wage rates could be maintained without eliciting responses in trade and foreign direct investment. The low wage rates in China or parts of the former U.S.S.R. neither invited foreign companies to build plants nor resulted in large-scale trade with the West based on access to low production costs. Investment by foreign companies was either prohibited by local governments or considered by the companies to be too risky. Similarly, trade and other restrictions limited the capabilities of firms in those countries from being able to produce and trade with western nations.

There were not only unprecedented labor cost differentials but also massive and willing populations eager to participate in the high levels of consumption that had become the norm in western Europe and North America.[3] For example, in the early part of the 1990s, the daily earnings of labor were estimated to be $92.24 in the United States and $78.34 in the European Union. This was a sharp contrast to wages in the eastern European countries: wages were only $6.14 in Poland and $6.45 in the Czech Republic. In Asia, the wage gap was even greater, where the daily earnings were $1.53 in China, $2.46 in India, and $1.25 in Sri Lanka. The potential labor force in countries like China, with 464 million workers, and India with 341 million workers, dwarfs the workforce in North America and Europe.

Of course, the productivity of labor is greater in the West, which compensates to a significant degree for such large wage differentials. Still, given the magnitude of these numbers, both trade and investment have responded to the opportunities made possible by the events of 1989.

Confronted with lower cost competition in foreign locations, producers in high-cost countries encounter five strategic options: (1) change nothing and lose profitability and market share, (2) reduce wages and other production costs sufficiently to compete with low-cost foreign producers, (3) shift production out of the high cost location and into the low cost location, (4) substitute technology for labor to increase productivity, and (5) shift into higher skilled, proprietary economic activities that involve research and development.

Some firms fell victim to the first outcome; however, most firms in OECD countries have implemented variations of alternatives two, three, four, and five. Reducing wages has helped to maintain or at least minimize job losses in some industries in some countries. However, the cost has been lower living standards for some segments of the workforce. Substituting capital and technology for labor, along with shifting production to lower-cost locations, has resulted in waves of corporate downsizing throughout Europe and North America. For example, between 1979 and 1995, more than 43 million jobs were lost in the United States.[5] This includes 24.8 million blue-collar jobs and 18.7 million white-collar jobs. Similarly, the 500 largest U.S. manufacturing corporations cut 4.7 million jobs between 1980 and 1993, or one quarter of their work force.[6] Perhaps most disconcerting, the rate of corporate downsizing has apparently increased over time in the United States, even as the unemployment rate has fallen. During most of the 1980s, about one in twenty-five workers was laid off. In the 1990s this rose to one in twenty workers. And as we write, a new wave of lay-offs is occurring in the Unites States and Europe as companies respond to cyclical events and industries continue to restructure

While restructuring has preserved the viability of many large corporations, it has triggered cries of betrayal and lack of social conscience.[7] But it is a mistake to blame the corporations – they are simply trying to survive in an economy of global competitors who have access to lower cost inputs. Similarly, much of the policy debate regarding globalization has revolved around a trade-off between maintaining higher wages and suffering greater unemployment and higher levels of employment, but at the cost of lower wage rates. There is, however, an alternative. It does not require sacrificing wages to create new jobs, nor does it require fewer jobs to maintain wage levels and the social safety net. This alternative involves shifting economic activity out of the industries where the high-cost countries of the OECD have lost comparative advantage into those industries where the comparative advantage is compatible with both high wages and high levels of employment—knowledge-based economic activity.

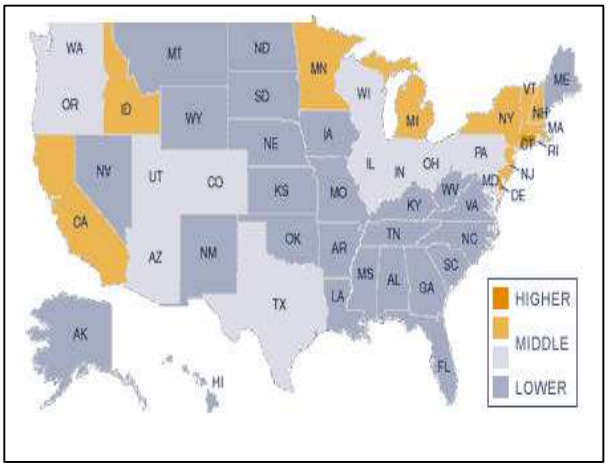
Economic activity based on new knowledge generates higher wages and greater employment opportunities. For example, employment increased by 15 percent in Silicon Valley between 1992 and 1996, and the mean income is 50 percent greater than in the rest of the country.[8] In 1997 more than 53,000 new jobs were created there and wages grew at nearly twice the national average. Moreover, the global demand for innovative products in knowledge-based industries is high and growing rapidly; yet the number of workers who can contribute to producing and commercializing new knowledge is limited to just a few areas in the world. There are many indicators reflecting the shift in the comparative advantage of the high-wage countries toward innovative activity. For example, the annual growth rate of the information sector in the United States has increased from 5 percent in 1991 to nearly 20 percent by 1998. By contrast, the rest of the economy experienced fairly steady growth at around 3 percent per year over the same period. Kortum and Lerner (1997, p. 1) document an unprecedented jump in patenting in the United States, as evidenced by the explosion in applications for United States patents by American inventors since 1985. Throughout this century, patent applications fluctuated within a band between 40,000-80,000 per year. By contrast, in 1995 there were over 120,000 patent applications. Similarly, Berman, Bound and Machin (1997) show that the demand for less skilled workers has decreased dramatically throughout the OECD, while at the same time the demand for skilled workers has exploded.

The strategic shift into higher skilled, proprietary economic activities in response to globalization requires a renewed emphasis on research and development, which in turn, is related to the emergence of regional agglomerations and clusters, and entrepreneurship.

The Emergence of Regional Agglomerations and Clusters

The emergence of regional agglomerations and clusters where both incomes and employment are expanding, such as Silicon Valley, the Research Triangle, and Cambridge in the United Kingdom may seem surprising and even paradoxical in a world increasingly dominated by global telecommunications. The conventional wisdom would have suggested that the telecommunications revolution combined with globalization would make location irrelevant. The resolution to this paradox lies in a crucial distinction between knowledge and information. Information consists of facts, such as the price of gold in Tokyo, or the weather in New York, which can be transmitted around the globe at no cost. By contrast, knowledge, and especially tacit knowledge, consists of ideas that are subjective, uncertain and difficult to explicitly write down. Many of these ideas arise as a result of face-to-face contact and interaction. Many of the most creative ideas have been the result of chance meetings at a social even in a supportive environment.

Figure 3 U.S. Patent Activity



Economic activity based on new ideas and tacit knowledge cannot be easily copied by competitors located far from the original source nor easily transferred to lower-cost countries by multinational corporations. While the processes and organizational methods required to produce television sets can be transferred from Bloomington to Mexico, it is not so easy to transfer innovative work in biotechnology around the globe. Thus, as the above figure shows, patent activity in the Unites States tends to cluster in a few states. Indiana does not rank high in terms of patent activity.

The importance of local proximity for the transmission of knowledge spillovers has been observed in many different contexts. It has been pointed out that, "business is a social activity, and you have to be where important work is taking place."[9] A survey of nearly one thousand executives located in America's sixty largest metropolitan areas ranked Raleigh/Durham as the best city for knowledge workers and for innovative activity.[10] The reason is that "A lot of brainy types who made their way to Raleigh/Durham were drawn by three top research universities… U.S. businesses, especially those whose success depends on staying at the top of new technologies and processes, increasingly want to be where hot new ideas are percolating. A presence in brainpower centers like Raleigh/Durham pays off in new products and new ways of doing business. Dozens of small biotechnology and software operations are starting up each year and growing like *kudzu* in the fertile climate."[11]

One of the driving forces in the growth of the literature on inter-firm networks grew out of observations that networks represented an organizational form that was not captured in the traditional markets as compared to hierarchies' view of industrial organization (Williamson 1985, Powell, 1990). A brief discussion of this issue will help us understand how reference to the New Economy predates the Internet and is rooted in knowledge creation and continuous innovation.

Mass production models production had facilitated the use of hierarchies and arms-length contracts as the principle forms of economic coordination in two basic ways (Piore and Sabel, 1984). First, in mass production, final products had long product life cycles with standardized inputs. Second, each stage of production could then be planned according to narrow specifications—both in terms of product and process. With such stability, firms could monitor production largely in quantitative terms—in cost and volume—and could simplify the tasks of each stage of the value chain. In this world, top managers set strategy, transferred tasks to subordinates and monitored output of the subordinates. If outside contracting was necessary, the firm could use the equivalent of spot markets, since most inputs were standardized.

As the mass production model declined, competitiveness relied less and less on economies of scale and increasingly on customization and economies of scope. The fundamental change for the firm was that the product cycle was reduced dramatically and the use of large inventories of standardized inputs was obsolete. In this world, firms had to compete in product differentiation and quality, which demanded continuous improvements and modifications in both the end product and the inputs. These changes presented a fundamental governance problem for firms: how does one monitor learning? That is, if firms were to compete in innovation and quality, then each stage of production had to have the autonomy to undertake frequent process and product innovations and detect any defects immediately. Traditional hierarchies used largely volume indicators and rigid routines to monitor subordinates. But these practices would be useless if subordinates were constantly changing the nature of the good and breaking the past routines. Moreover, such practices could only dampen incentives to innovate and learn. In turn, industries from machine tools to automobiles to computers to health care engaged in a two-fold reorganization. While firms sought to find their "flexible specialization"—be it for a final or intermediate good—and decrease their size, they also attempted to rid themselves of stifling bureaucracies by flattening their organizational structures. At the same time, they increased their outsourcing, making each segment of the value chain within the confines of a separate firm.

Yet outsourcing also complicated monitoring and coordinating relations between suppliers and customers. By trying to maintain very low inventories, any alteration in product design and

standard and any defects in products or processes would ripple throughout the value chain. Moreover, in a world of constant innovation, strategy, design, and trial-and-error processes reached across firms. Thus, suppliers and customers had to maintain very tight relationships in communicating changes and solving bottlenecks—to a point where firm boundaries became almost meaningless. But the risk was *ex post* hold-up. Traditionally, firms had guarded against such risks by forming hierarchies and using well-specified contracts. Under the new conditions, where multiple parties were essentially investing in a common project and where each was conducting several product and process experiments, it was virtually impossible to specify *ex ante* all contingencies, effort-reward parameters, and even narrow standards over the life of the investment.

From this world emerged governance structures characterized by inter-firm networks and supporting public-private institutions, usually at the regional or local level. (See also Saxenian, 1994, Locke, 1996, Kogut, 2000.) We will now outline the basic characteristics of these networks and their institutional architecture.

First, analysts have noted that inter-firm networks relied not simply on contracts but also on social capital to govern relations. While debate rages currently about the definition of social capital, it is safe to say that social capital includes informal norms of reciprocity and joint-review of one another's actions. These norms provide firms the security of sharing information with one another with minimal risk of opportunistic use of the new knowledge. They also allow firms to experiment with new techniques or products, i.e., learn, without the fear that they would be penalized if a failure occurred. Indeed, much learning comes from failure, and the challenge for inter-firm networks was to monitor "failures"—i.e., detect what kind of failures are helpful and reward the sharing of such activities.

Second, institutions played a key role in building social capital and monitoring one another's practices. Institutions often were built to provide certain collective goods—in general provision of a service that was too costly for a single firm to support, or to regulate areas that affected all firms at once. For instance, one finds in several regional economies tight links between groups of firms and educational institutions. In regions such as southern Germany and northern Italian firms, unions and local governments jointly invest in and govern vocational training centers to maintain high quality skills of employees. In regions such as Silicon Valley or Wisconsin, firms, banks, local government, and universities develop joint R&D projects and low cost management programs for constant training in new technologies and continuous improvement practices. In both Europe and the Unites States, one finds public-private commissions to set and regulate product standards and environmental laws.

A fundamental externality of such institutions is that they become forums where various public and private actors can meet regularly to build social capital and learn more about one another's practices. For instance, Saxenian notes that associations that develop and monitor common product standards serve a dual function. On the surface, they are attempting to maintain the high quality of microchips, promote competition on the basis of innovation and quality, and prevent a downward spiral of cutthroat pricing. At a deeper level, the actual deliberative processes between firms over the creation, review, revision, and monitoring of standards forces firms to constantly reveal private information about their potentials, limitations, and intentions. These processes can become reinforcing, leading to further inter-firm collaboration and risk sharing.

Another key observation by scholars is that not all regions and networks are the same. On the one hand, network analysts debate whether tightly coupled and highly dense relationships are optimal for innovation and the incorporation of new ideas. Although dense social relationships may be conducive to information sharing, some analysts have found that these relationships need to be supplemented by loose, horizontal technical ties. The reasoning is that the latter helps firms avoid lock-in effects and access new knowledge via loose links to other networks. On the other hand, the work on industrial districts suggests that high innovation is promoted when networks—

between firms and institutions—are polycentric, rather than dominated by a single set of economic and political actors or bifurcated by two opposing camps.

The foregoing has serious implications for the development of the New Economy in Germany. The work of Herrigel (1996), Sabel (1994), Deeg (1999), and Grabher (1993) on southern Germany has shown that regions such as Baden-Württemberg have developed highly flexible, polycentric networks that are supported by public-private institutions for training, R&D, and finance. Such regions have been dominated by traditional machining sectors, but have maintained their international competitiveness through constant innovation, customization, and quality. The implication is that the inherited networks and institutions can be used to produce new knowledge for machine tools as much as they can be used for producing new knowledge for software. In turn, the question for Germany is not whether it can copy Silicon Valley or Silicon Alley but how it can apply its existing social capital to new uses.

It is obvious that R&D alliances among firms have played an increasing role in the 1990s, and firms from the ICT sector were particularly important (Council of Economic Advisers, 2001). New and relatively small firms could strongly contribute to the innovation dynamics of the overall economy to the extent that information and communication technology continues to be characterized by high technological dynamics. The creation of regional and global R&D networks has been strongly facilitated by Internet technology. One cannot rule out that the expansion of the ICT sector and the growing emphasis on R&D will strongly raise the demand for skilled personnel in both Europe and the United States. The demand for unskilled labor in OECD countries is likely to decline in the Internet age since international outsourcing of services is facilitated by ICT technology.

Different degrees of responsiveness of the education and training system in the United States and Germany seem to be important, to the extent that the demand for skilled labor is increasing. While the mixed university system of the Unites States is highly flexible, the state-controlled universities in most EU countries are obviously reluctant to adjust dynamically to the new ICT world. Germany and some other European countries might, however, catch up with the Unites States once the traditional system of training and apprenticeship has been reformed to accommodate digital job profiles.

While the Old Economy in Europe was characterized by high capital industry and strongly unionized firms and sectors, the New Economy stands mostly for medium capital intensity, a high use of human capital, and the weak influence of unions. This could mean that the expansion of the ICT sector in the EU will contribute to achieving more structural flexibility in Europe. With a more resilient economy there might be improved prospects for sustained growth and new jobs. There is, however, a caveat to the extent that Germany and the EU are slow in opening up for skilled IT experts from abroad.

Compared to the United States (and Korea), most EU countries' education expenditures-GDP ratio was low in the 1990s (OECD, 2000a). The system of state universities in Europe is not as quick in adjusting to new curricula as the mixed university system in the United States. Hence, lack of skilled personnel could become a major problem of EU countries in the process of structural adjustment. Under-spending in education seems to be a particular problem in Germany, where the individual states are mainly responsible for the university system.

Entrepreneurship As An Engine of Growth and Development

1. Policymakers think it is good and have been encouraging it.
2. And there is more of it.
3. It seems to matter: structure data. Implies a more vibrant economy.
4. So, when knowledge is important, entrepreneurship is a key mechanism for diffusion.

Policymakers have adopted the view that "the right kind" of entrepreneurship gives countries a distinctive competitive advantage in the New Economy. Just a cursory look at the differences in

innovation, growth, and entrepreneurship in the United States and Germany over the past thirty years supports this proposition. For example, the number of business establishments per adult increased markedly in the United States. While changes in entrepreneurship alone have not produced a new economy in the United States, comparing U.S. data with German data suggests that these changes are a key success factor in the speed and pervasiveness of technological adaptation. And both the rate of technological adaptation and the pervasiveness of technological adaptation contribute to the rate of innovation and growth in an economy. An important implication of this analysis is that there are differences in institutional designs and policy mechanisms that affect entrepreneurship in the two countries and that these differences may have important implications for long-term economic growth and competitiveness.

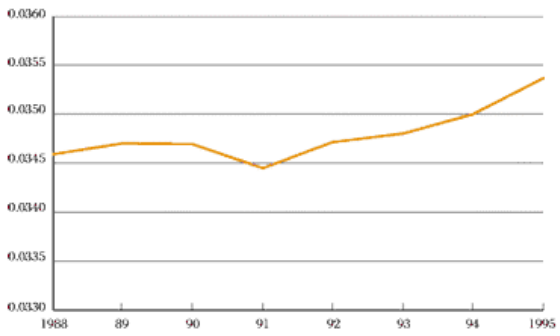


Figure 4

Entrepreneurs in the new economy are relatively young people with science or technology backgrounds. Many begin their ventures as college students, and some leave college to commercialize their scientific and technological ideas. In the Old Economy, entrepreneurs were generally older—often middle aged—and had experience working in the industry in which they launched their enterprise. This implies that compared to entrepreneurs in other types of businesses, those in research-intensive industries are more current on scientific and technological matters but have less of a business reputation, less market knowledge, less managerial knowledge and experience, and are less familiar with business cycles and competitive dynamics. This lack of reputation and general business knowledge means that errors are more likely in the New Economy but it also means that entrepreneurs are more likely to experiment by creating new ways of organizing, governing, and competing. By serving as agents of change, entrepreneurial businesses provide an essential source of new ideas and experimentation that otherwise would remain untapped in the economy.

The increasing role of entrepreneurship in the New Economy has important structural implications. A critical element of economic structure is the extent to which it is "refreshed" from time to time. Structure may appear to alter barely over time, but in one case (country or industry) this may happen at very low levels of entry and exit, and limited changes in market shares of incumbent firms, while in the other case it may be at very high levels of entry and exit, and large changes in market shares. One characteristic of the German economy may be that it has roughly an equal share of small and medium-sized firms in employment when compared to the American economy but that those firms are, on average, much older. That is, the entry and exit rates in Germany may be much lower than in the Unites States, maybe especially so in the "new economy" type of industries.

In addition to the evidence given in Section 3 that there is more (venture capital) investment in firms in early stages in the United States compared to Germany, there are other indications of less entry (and exit) in the high-tech sectors. A prominent example is of course the NASDAQ versus the *Neuer Markt*. The *Neuer Markt* started only in 1997 and proved to be a success and had already 336 listings by November 2000. However, the NASDAQ is still much more prominent and has a much longer history. Table 1 gives some figures on the entry and exit of firms on the NASDAQ. Currently, there are about 5,000 firms at NASDAQ.

Table 1 Companies joining and leaving the NASDAQ market

Year	Additions	Deletions	Net Change	Total Companies
1985	630	591	39	4,136
1986	989	708	281	4,417
1987	833	544	289	4,706
1988	464	719	-255	4,451
1989	435	593	-158	4,293
1990	405	566	-161	4,132
1991	478	516	-38	4,094
1992	612	593	19	4,113
1993	845	347	498	4,611
1994	737	446	291	4,902
1995	767	547	220	5,122
1996	992	558	434	5,556
1997	648	717	-69	5,487
1998	487	906	-419	5,068
1999	634	873	-239	4,829
2000*	569	572	-3	4,826

Note: * Data through October 2000. Source: www.marketdata.nasdaq.com/asp/Sec1AddDe1.asp

Evidence is also presented by Lehrer (2000) who shows that the percentage of young firms is much higher in the "new economy" areas in the United States (Silicon Valley) than that in Germany (Munich). In OECD (2000b, Table 2, p.18) it is shown that formalities for establishing a business are much more demanding in Germany when compared to the United States. The number of procedures and the time it takes are six and sixteen, respectively in Germany. In the Unites States there is one procedure and one week. Countries such as Australia and the United Kingdom also have only one procedure and it takes only one week. Reynolds et al. (1999) provide results of a survey showing that start-up rates in Germany are much lower than those in the United States (2.2 percent versus 8.5 percent). As a consequence the authors label Germany to be in the group of countries with "low entrepreneurial activity." A key reason given by the authors for this difference between Germany and the United States is that personal wealth creation or bankruptcy, though common consequences of entrepreneurship, are both regarded negatively in Germany. Very much related to this reason is that Germans have a relatively high-risk aversion. In addition, the authors find a lack of clarity in the "abundance" of government programs and a lack of adequate entrepreneurship education at all levels within the German education system.

If we compare the structures of the American and German economy we find that (1) the share of innovative activities in the U.S. economy is higher than that in the German economy; (2) the size class distributions of the American and German economies are difficult to compare but do not appear to be that different; (3) the American economy has more young firms in "new economy" industries and much lower entry barriers than the German economy. Given that "new economy" industries and young firms in those industries tend to grow faster, a part of the lag in performance of the German economy can be blamed on a lagging behind in shifting the economy towards new activities. This is a conclusion similar to that drawn by Klodt (1990) before the word

"new economy" became popular: the German economy has been relatively slow in making structural changes.

TECHNOLOGICAL AND INSTITUTIONAL CHANGE

Financial Intermediation in the New Economy

As we have argued in previous sections of this report, the essence of the New Economy is the shift from the production of physical goods and services to the production of knowledge and new ways of doing things. Achieving significant technical and institutional progress on a very large scale involves solving a number of coordination problems. Chief among these coordination problems is reallocating capital from activities with less future economic value to innovative activities.

The financing mechanisms used to facilitate capital allocation will depend upon the nature of the financial system, including the type and configuration of participants, technology, and regulation. The amount and type of risk each participant assumes is strongly influenced by financial regulation and enforcement, as well as related institutional arrangements such as contract law, business organization and bankruptcy law, competition law, and tax law. Studies of the diffusion of ICT suggests that the U.S. financial system appears to be doing a better job of reallocating capital to the New Economy than that of Germany or other countries in the OECD.

In general, capital allocation can be accomplished by direct financing mechanisms, intermediation financing mechanisms, or a hybrid combination of these two pure types. In direct financing, borrowers and investors trade directly either in private markets based upon personal networks, or in more public capital markets that are organized based on auction principles. Examples of direct financing include loans that are arranged on a private basis, private equity offerings, and public equity offerings.

However, direct financing can fail to allocate funds efficiently in a large, complex economy for two related reasons. The first reason is that the nature of the trade may be such that an efficient market cannot be formed or sustained. This can occur because information deficits and hazard make it difficult to evaluate and monitor financial risk. In this case, obligational markets with relational contracting may do a better job of aligning information and incentives than auction markets. Or it may be that there are not enough buyers or sellers for a particular type of trade.

The second reason is that direct financing can fail to allocate funds efficiently is that they do not allow participants to realize economies of scale. Many types of financing situations involve a transformation process in which the liquidity of the asset changes over time. Managing time inconsistencies in asset transformation require special knowledge and techniques that would be very costly to provide in direct financing. Consequently, a role for financial intermediaries emerges.

A financial intermediary, such as a bank or private financial syndicate, assumes transaction risk, pools risk, prices risk, and trades risk. Intermediaries are able to achieve expertise and economies of scale that permit them to provide finance in situations in which finance would not otherwise be available or would only be available at very high cost.

As the discussion in the previous section suggests, in order to reallocate capital from the Old Economy to the New Economy, a financial system must create incentives to solve several coordination problems. The first problem that must be solved is the provision and production of basic research. The second problem is the provision and production of applied research, and the third is the creation of firms that are capable of expropriating economic value from applied research over the long-term. Each of these problems involves knowledge production.

Knowledge production is a very complex economic activity that involves solving more information and risk management problems than are involved in producing physical assets (Polski, 2000). It is more difficult to protect the proprietary nature of knowledge production

activities than it is to protect the proprietary nature of a process for producing tangible goods and services. Evaluating the economic value of knowledge and ideas, as well as the ability of individuals to expropriate this value over time is more difficult. Moreover, there is nothing to liquidate should the investor misjudge the potential of an idea or a business model. And because the risk is greater, it is more difficult and hence more costly to manage.

These challenges suggest the need for new financial instruments and policies in the New Economy. While finance for many types of businesses in the Germany and the United States does not appear to have changed markedly over the past thirty years, there is growing evidence that suggests that there has been a significant change in early stage finance in businesses that are commercializing research and technology developed in the physical, engineering, and computer sciences.

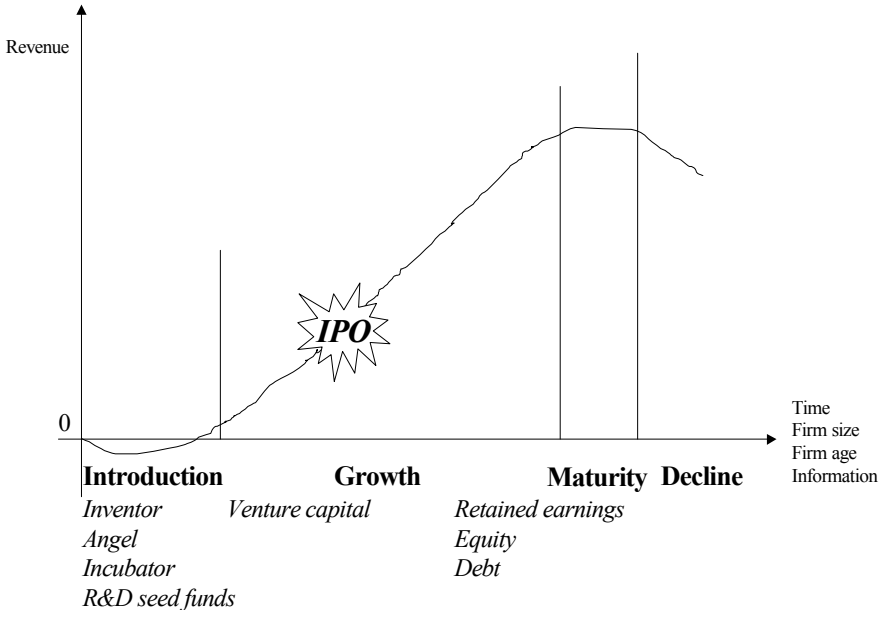
Innovative activity in the New Economy is financed through a wide variety of overlapping policy mechanisms in the public, private, and civil society sectors of the political economy. The nature and sequence of institutional finance for business start-ups includes seed financing to support the exploration of commercially viable opportunities, start-up financing for commencement of operations once an entrepreneur can demonstrate a competitive advantage, a prototype, or an impressive research staff, first stage financing for a going business to support major marketing efforts or product enhancement/expansion, second stage financing to provide working capital and fixed asset needs to support the growth of a viable firm, bridge financing to carry a firm for a short period of time until it can complete an initial public offering (IPO), and restart, emergency or sustaining financing for troubled firms. Figure 5 summarizes the relationship between the firm's life cycle and sources of finance.

In the Introduction phase, preliminary research is conducted and a formal business plan is developed to attract finance. Sources of finance include the innovator's private resources, "angels," "incubators," research grants, and R&D seed funds. Like Old Economy innovators, New Economy innovators who wish to commercialize their ideas may finance their activities with their own savings, leverage their personal assets to obtain loans from banks that they then contribute to their venture, obtain financing from friends or family, or develop a partnership with an established business. However, unlike their Old Economy peers, New Economy innovators have much more favorable access to finance provided by private or corporate venture capital funds.

Business angels are wealthy private investors who, in addition to cash injections, can provide innovators with research and management know-how they have gained through past experience. The angel finance market is informal in both the Germany and the United States. In Germany, angel financing started in the early 1990s. Today it is estimated that there are 27,000 active and 219,000 potential business angels. Total investment is about €710 million per year. In 1998, the "Business Angels Netzwerk Deutschland" (BAND) was founded, a network for business angels and innovators. BAND is the parent organization for twenty-eight separate networks.

In the United States, some new economy start-ups begin in "incubators." A business incubator is a type of economic development program that provides management assistance and access to financing, business, and technical support services with the objective of producing technology-based businesses that are financially viable and can stand on their own after two or three years. Typically, incubators are specialized and have specific criteria for selecting clients Business Incubation Association). Incubators may be organized in the private sector, the public sector, or as public-private partnerships. Today there are more than 900 incubators involving over 6,000 firms operating in the U.S. (National Business Incubation Association).

Figure 5 Sources of Finance



Introductory stage finance often includes basic research grants and research and development seed grants. Sources of research grants and seed funds include corporate, federal, and university research budgets, as well as federal and state sponsored economic development programs, philanthropic grants, and public/private partnerships. While some researchers are able to obtain multi-million dollar research grants from large public and private sources, most grants are small, ranging from $10,000 to $300,000. To do the research required to develop a prototype of a new technology often requires multiple grants over many years.

In late introductory and early growth phases when prototyping is complete, a market has been identified, and full-scale production can begin, venture capital is required. While some innovators are able to finance full-scale production themselves or from operating revenue, most require deeper pockets to realize the firm's full growth potential. Suppliers of venture capital are specialized financial intermediaries including privately organized venture funds, special units of investment banks and other institutional investors, and corporate venture funds. Traditionally, venture capitalists do not take a position in firm until first stage financing is required. For a brief period in the late 1990s, these strictures were loosened, and venture capitalists began to provide some seed funds. However, since the technology stock bubble burst and the western economies have slid into recession, this trend has reversed. It remains to be seen if venture capital will provide seed funds in the future.

While the United States leads the world in amassing and investing venture capital, Germany and the rest of the European Union are catching up. In 1999, venture capital investments in the United States totaled $45 billion, representing 37 percent of GDP while investments in the European Union reached nearly $25 billion and represented 13.5 percent of GDP (Table 2). In Germany, the volume of venture capital investment quadrupled between 1997 and 1999 from approximately $243 million to $992 million (*Bundesverband deutscher Kapitalbeteiligungsgesellschaften*).

Table 2: Venture Capital in the EU and in the U.S. in 1999
(As percent of GDP)

Financing Stage	*European Union*	*U.S.*
Early stage	3.0	14.0
Expansion stage	10.5	23.0
Overall	13.5	37.0

Source: European Commission [Com (2000) 658]

Consistently attracting large amounts of equity-based venture capital requires a reliable exit channel. While innovators may invest in their ventures for love of what they seek to achieve or to provide self-employment, and governments and philanthropists may invest in research and development in order to advance knowledge for the good of society, private investors demand a return on their investment that compensates them at a rate that is equal to or greater than alternative investments.

Exit channels include other private investors, such as large companies, or capital markets. In both cases, the United States takes the lead once again, however, Europe is making strides in catching up. Liberalization in the 1990s is permitting European firms to consolidate, creating large, global firms that rival those of the United States in their ability to finance innovation. Similarly, we also see the growth of capital markets for small and medium size enterprises (SME) in Europe in the 1990s. While the NASDAQ is the oldest, largest, and most liquid of these markets, European markets for financing young high-growth firms have gained in importance in terms of capital raised and number of companies (Table 3).

Table 3: Main Markets for Trading SME Equities
(As of June 30, 2000)

	Euro.NM					EASDAQ	AIM	Tech-MARK	NASDAQ
	Le Noveau Marché	**Neuer Markt**	**NMAX**	**Euro.NM Belgium**	**Nuovo Mercato**				
Launched	Mar 96	Mar 97	Mar 97	Ma r 97	June 99	Nov 96	June 95	Nov 99	Feb 71
Number of listed companies	**467**					**62**	**429**	**220**	**4843**
	140	281	15	16	15				
Market capitalization (billion €) (B)	**240**					**50**	**22.6**	**1006**	**5818**
	27	191	1.7	0.5	20				
Capital raised (current year, billion €)	**13.4**					**0.3**	**1.6**	**3.1**	**33.2**
	1.2	9.5	0.4	0	2.3				
Average capitalization per company (million €) (B)/(A)	**513**					**806**	**53**	**4574**	**1201**
	192	678	116	31	1340				
Capital exchanged (million €/day)	**537**					**32**	**48**	**3633**	**76680**
	37	442	5	0.2	53				
Performance of index since 30 December 1999	**+17**					**-8%**	**-11%**	**-8%**	**-3%**
	+26%	+17%	+4%	+14%	+2%				

Source: European Commission [Com (2000) 658]

In Germany, the *Neuer Markt* has developed into a major source of finance for New Economy firms. In the period 1997, when it was founded, through 2000, 338 companies have been listed in the *Neuer Markt* with a total market capitalization of about 116 billion euros. Capital raised in this market has increased from 456 billion euros in 1997 to 13,689 in 2000. In total, 23,452 billion euros had been raised in the *Neuer Markt* through 2000.

As shown in Table 4, the capital raised in the *Neuer Markt* through IPOs has increased steadily over the years. Up to 2000 about €23.4 billion have been raised.

Table 4: Capital Raised in the *Neuer Markt* since 1997
(in million €)

Year	Capital raised
1997	456
1998	1,718
1999	7,589
2000	13,689
1997-2000	23,452

Source: Deutsche Börse AG

Thus, there is considerable evidence suggesting that venture capital was scarce and virtually non-existent even as recently as the middle of the 1990s. However, by the turn of the century, German

financial institutions had changed considerably. Not only was venture capital becoming considerably more widespread, but a vital equity market for knowledge-based entrepreneurial firms had emerged as a new financial institution – The *Neuer Markt*. Only a few years earlier it was common for German experts to proclaim that "Germany will never accept shareholder value" that accompanies equity ownership. However, by the turn of the century the evidence suggests that institutions promoting knowledge-based economic activity were become a more prominent part of the German institutional landscape.

POLICY & RESEARCH ISSUES

To some extent we can draw some basic conclusions for economic policy, namely to the extent that policymakers in the United States and Europe have already developed new strategies and instruments for economic systems that are more based on knowledge intensive production and increasing trade in digital services and knowledge intensive products. Some of the contrasting approaches in Germany and the United States will be highlighted subsequently, and there are indeed some crucial differences in the policy of the United States and Germany. A common denominator is that emphasis on modernizing education has increased, that governments have become increasingly aware of the potential lack of skilled labor, and that various public-private partnerships in the field of Internet and computers were developed. Indeed there is a new international division of labor emerging, which requires policy adjustments as well as policy innovations in the United States.

Globalization is shifting the comparative advantage in the OECD countries away from being based on traditional inputs of production, such as land, labor and capital, towards knowledge. As the comparative advantage has become increasingly based on new knowledge, public policy has responded in two fundamental ways. The first has been to shift the policy focus away from the traditional triad of policy instruments essentially constraining the freedom of firms to contract—regulation, competition policy or antitrust in the United States, and public ownership of business. The policy approach of constraint made sense as long as the major issue was how to restrain large corporations in possession of considerable market power. That this policy is less relevant in a global economy is reflected by the waves of deregulation and privatization throughout the OECD. Instead, a new policy approach is emerging which focuses on making possible the creation and commercialization of knowledge. Examples of such policies include encouraging R&D, venture capital and new-firm startups. In particular, the new focus of SME policies is to promote the first type of strategy deployed by SMEs to enhance global competitiveness—innovation. Probably the greatest and most salient shift in SME policy over the last fifteen years has been a shift from trying to preserve SMEs that are confronted with a cost disadvantage due to size-inherent scale disadvantages, towards promoting the startup and viability of SMEs involved in the commercialization of knowledge, or knowledge-based SMEs.

For example, the United States Congress enacted the Small Business Innovation Research (SBIR) program in the early 1980s as a response to the loss of American competitiveness in global markets. Congress mandated each federal agency with allocating around four percent of its annual budget to funding innovative small firms as a mechanism for restoring American international competitiveness. The SBIR provides a mandate to the major R&D agencies in the United States to allocate a share of the research budget to innovative small firms. Last year the SBIR program amounted to around $1.2 billion. The SBIR consists of three phases. Phase I is oriented towards determining the scientific and technical merit along with the feasibility of a proposed research idea. A Phase I award provides an opportunity for a small business to establish the feasibility and technical merit of a proposed innovation. The duration of the award is six months and can not exceed $70,000. Phase II extends the technological idea and emphasizes commercialization. A Phase II Award is granted to only the most promising of the Phase I projects based on scientific/technical merit, the expected value to the funding agency, company

capability and commercial potential. The duration of the award is a maximum of twenty-four months and generally does not exceed $600,000. Approximately 40 percent of the Phase I Awards continue on to Phase II. Phase III involves additional private funding for the commercial application of a technology. A Phase III Award is for the infusion into and use of a product on the commercial market. Private sector investment, in various forms, is typically present in Phase III. Under the Small Business Research and Development Enhancement Act of 1992, funding in Phase I was increased to $100,000, and in Phase II to $750,000.

The SBIR represents about 60 percent of all public SME finance programs. Taken together, the public SME finance is about two-thirds as large as private venture capital. In 1995, the sum of equity financing provided through and guaranteed by public programs financing SMEs was $2.4 billion, which amounted to more than 60 percent of the total funding disbursed by traditional venture funds in that year. Equally as important, the emphasis on SBIR and most public funds is on early stage finance, which is generally ignored by private venture capital. Some of the most innovative American companies received early stage financing from SBIR, including Apple Computer, Chiron, Compaq and Intel.

Through the Small Business Innovation Research (SBIR) program, the National Institutes of Health (NIH) awarded $266 million in grants to small firms for medical and biopharmaceutical research. It was expected that the SBIR program at NIH will exceed $300 million in 1999.

In addition to the NIH, the United States Department of Defense also uses the SBIR program to fund biotechnology firms. Between 1983 and 1997 there were more than $240 million in SBIR awards for biotechnology companies from the Department of Defense. Phase I accounted for $47 million and Phase II accounted for $194 million.

The benefits of the SBIR extend beyond the impact on the individual recipient firm. The social rate of return, which incorporates this external positive impact, exceeds the positive rate of return. There was no evidence of a negative rate of return associated with the SBIR. There is compelling evidence that the SBIR program has had a positive impact on developing the U.S. biotechnology industry. The benefits are the following:

- The survival and growth rates of SBIR recipients have exceeded those of firms not receiving SBIR funding.
- The SBIR persuades scientists involved in biomedical research to change their career path. By applying the scientific knowledge to commercialization, these scientists shift their career trajectories away from basic research towards entrepreneurship.
- The SBIR awards provide a source of funding for scientists to launch start-up firms that otherwise would not have had access to alternative sources of funding.
- SBIR awards have a powerful demonstration effect. Scientists commercializing research results by starting companies induce colleagues to consider applications and the commercial potential of their own research.

Indirect promotion of new technology-based firms (NTBFs) by the German federal government has risen from DM 45.9 million in 1991 to almost DM 82 million in 1993 BMBF, 1996, 97). Similarly, Sternberg (1996) has shown that a number of government-sponsored technology policies have triggered the startup of new firms. The majority of the startup programs are targeted towards eliminating particular bottlenecks in the development and financing of new firms. Sternberg (1990) examines the impact that seventy innovation centers have had on the development of technology-based small firms. He finds that the majority of the entrepreneurs gain a number of advantages from locating at an innovation center.

The *Kreditanstalt für Wiederaufbau* (KfW), or German Reconstruction Bank, has been one of the most important institutions promoting SMEs in Germany. The KfW provides financial support for around 20,000 SMEs each year. Of these firms, 80 percent have sales of less than DM 10 million. The support of SMEs by the KfW resulted in the creation of nearly 150,000 jobs in

1992 and 40,000 jobs in 1995. Similarly, the *Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie* (BMBF) has had a series of programs to promote German SMEs.

The second fundamental shift involves the locus of such enabling policies, which are increasingly at the state, regional or even local level. The downsizing of federal agencies charged with the regulation of business in many of the OECD countries has been interpreted by many scholars as the eclipse of government intervention. But to interpret deregulation, privatization and the increased irrelevance of competition policies as the end of government intervention in business ignores an important shift in the locus and target of public policy. The last decade has seen the emergence of a broad spectrum of enabling policy initiatives that fall outside of the jurisdiction of the traditional regulatory agencies. Sternberg (1996) documents how the success of a number of different high-technology clusters spanning a number of developed countries is the direct result of enabling policies, such as the provision of venture capital or research support. For example, the Advanced Research Program in Texas has provided support for basic research and the strengthening of the infrastructure of the University of Texas, which has played a central role in developing a high-technology cluster around Austin (Feller, 1997). The Thomas Edison Centers in Ohio, the Advanced Technology Centers in New Jersey, and the Centers for Advanced Technology at Case Western Reserve University, Rutgers University and the University of Rochester have supported generic technology and provided diversified technology development involving a mix of activities encompassing a broad spectrum of industrial collaborators. Stough, Haynes and Campbell (1998) show how the emergence of the high-technology cluster around Washington D.C. was the result of public policy. There is evidence that the amount of venture capital available to new-firm startups in high-technology industries in Germany is dramatically increasing.

The amount of venture capital provided by direct investment and venture capital programs sponsored by the Federal Ministry for Education, Science, Research and Technology (BMBF) has increased from about DM 10 million in 1989 to more than DM 458 million in 1997 (BMBF, 1996). One of the most interesting examples of the strategic management of regions involves the establishment of five EXIST regions in Germany, where startups from universities and government research laboratories are encouraged (BMBF, 2000). The program has the explicit goals of (1) creating an entrepreneurial culture, (2) the commercialization of scientific knowledge, and (3) increasing the number of innovative start-ups and SMEs. Five regions were selected among many applicants for START funding. These are the (1) Rhein-Ruhr region (bizeps program), (2) Dresden (Dresden exists), (3) Thüringen (GET UP), (4) Karlsruhe (KEIM), and (5) Stuttgart (P.U.S.H!).

Cooke and Willis (1999) assess government programs promoting collaboration among SMEs with the goal of improving innovation capacity by increasing social capital through networking. They find a strong link between program-financed firms, the creation of social capacity, and enhanced innovation performance in Denmark, Ireland and Wales.

These programs promoting entrepreneurship in a regional context are typical of the strategic management of regions. While these regional policies are evolving, they are clearly gaining in importance and impact in the overall portfolio of economic policy instruments.

The international business community, when asked about the relative position of Germany in the international growth league of the New Economy, would most probably share the impression entertained by the public at large that the EU-countries, and in particular Germany, trail the U.S. economy by a good measure. That is undoubtedly true by most indicators of e-commerce and the digital economy, except for the explosive growth of the mobile telephony over the last few years.

The perception of Germany being slow in catching up with the United States in the use and diffusion of information and communications technology often extends to the existence of an outdated regulatory framework for the New Economy. While the former was true until the end of the 1990s, the later is at odds with the facts. This survey will argue to the contrary, that Germany had, by 1998, assumed a leading position by having established a coherent regulatory

infrastructure for the services of the Information Society (the term New Economy was not in use then). Moreover, the novel legal framework adopted inspired the policy debate at various EC fora with regard to legal aspects related to the Information Society and to the community framework conditions for electronic signatures. German federal legislation has thus significantly influenced the EU's policy approach to the New Economy, in particular two key European Council Directives—in short: The E-Commerce Directive and the Electronic Signatures Directive. These Directives constitute the EU's basic legal framework for Europe.

This paper is limited to regulatory policies. It does not pursue macro-economic policy implications originating in or necessitated by the emergence of the New Economy. However, in the last section an outlook will be given on a number of hot policy issues that are or will figure prominently on the German agenda for deregulation in the coming months and years.

The Early Regulatory Framework

That Germany is seen as a laggard with regard to the New Economy has its principal roots in the country's economic and social constitution, which to a large extent is based on corporatist principles. Doubts prevail that the traditional institutions of the "consensus society" can cope effectively with the need for fundamental policy reforms dictated by the rapid advance of the New Economy. Similar to the Nordic countries, the national decision-making process is governed by a concern for consensus; it is inherently slow and cumbersome and does not appear well-suited for the imperatives of the digital age. Also, policy framework conditions are often heavily influenced by large industry associations. SMEs, which represent the majority of the firms making up the New Economy sectors, and start-ups traditionally wield less influence with the government. The recent green card regulation to attract qualified New Economy talent and the creation of Bitcom, the industrial lobbying organization founded last year by Internet firms and large corporations, are informative examples of the response to such difficulties.

[Germany's policy inertia may also be linked to different ways of collective learning (and unlearning), as investigated by Frieder Nashold. Reflecting on different cultural traditions and values, Nashold distinguished three distinct modes of efficient collective learning for a society: collective learning by vision (Japan, MITI), by mission (United States) and by incremental learning (Germany and most EU-countries)].

If societal inertia is such a big obstacle to structural change of the German economy, what then contributed to the emergence of a national policy agenda in the mid-1990s conducive to the establishment of a coherent legal framework for the digital society?

Three separate though inter-related factors can be identified that fed the reform process. First, the *Standortdebatte* initiated by the government in 1993 gradually gained momentum. The ensuing public discussion shifted the focus of the national policy debate slowly away from the economic problems associated with German unification to the broader concerns of promoting the country's international competitiveness. As a result, through 1997, virtually all policy areas came up for thorough review, and many traditional ways of doing business were challenged.

Second, the long, intensive and controversial debate on the abolition of the network and voice telephony monopolies that preceded the parliamentary vote on the German Telecommunications Law in 1996, sharpened the minds of politicians, the business community and government agencies alike with respect to the importance of a competitive and deregulated telecommunications system for the German economy. Thus, the issue of national competitiveness and deregulation of the telecommunications sector was moved from the closed circles of experts to Main Street.

Third, the National Technology Council, set up by Chancellor Kohl in 1996, issued an excellent report on the requirements of preparing Germany for the Information Society. This report reflected a broad national effort of sustained consensus building among the different constituencies comprising science, business, trade unions and policy-makers. It contained approximately 100 concrete area- and subject-specific recommendations for action by these

constituencies in their respective fields of responsibility. Hence, when the new (current) government was voted into office in November 1998, it found that German society was well prepared psychologically to accept more rapid and fundamental policy reforms.

The basic legal framework set up by 1998 is still in force today. This framework comprises the following legal instruments:

- the Telecommunications Law (1996);
- the Information and Communication Services Act (1997) together with a number of ancillary acts including the Tele-Services Act;
- the Media Services Interstate Agreement (MSIA; 1997).

TV and radio are regulated separately by the Interstate Broadcasting Act, which is periodically amended to reflect new developments.

When use of the Internet and electronic business transactions began to surge at the turn of the millennium, the existing regulatory framework awoke from its "sleeping beauty" mode and actively lent support to the new dynamics of doing business electronically.

A particular feature of Germany's regulatory system for the services of the Information Society is its fragmented treatment of the supply of such services. The system distinguishes three distinct categories: tele-services, media-services and services akin to broadcasting. Tele-services are covered by the Tele-Services Act, media services by the Media-Services Interstate Agreement, and services akin to broadcasting by the Interstate Broadcasting Agreement. Unlike several other EU-countries, the German system's attribution of a service to one of the three schemes is not governed by the technical nature of the transmission facility, but by its content **and** function. This approach requires some clarification:

Tele-services are communication and information services whose essential purpose is the autonomous utilization of content by the user; they are individually and inter-actively designed on-demand services.

Media-services are designed for mass communication and characterized by their public information relevance.

Services akin to broadcasting are distinguished from media-services by their pre-programmed nature—time- and content-wise.

This threefold partition of regulation has been criticized on two major counts. First, tele-services may overlap when respective boundaries are inherently blurred. Suppliers, especially those offering novel services, faced deep uncertainty as to what regulatory regime they had to observe, until their case was somehow resolved by regulators. Second, the increasing convergence of technology expected by experts, of the telecommunications, the media and the information technology sector, will challenge the principle of regulatory separation of digital services. Such a convergence would indeed argue in favor of horizontal, i.e. cross-sectoral regulation. However, such a view seems primarily technology-driven, a notion unpalatable to most German politicians. Given the choice, the current government would probably lean towards an all-encompassing regulatory concept, which would favor a distinct separation of infrastructure and content. Such proclivity was evidenced by the government's endorsement of the EU-Council's conclusions regarding public hearings on the Commission's Green Book on the Information Society some time ago. Hence, public interest concerns such as the protection of minors, and societal values such as the protection of the environment, may continue to motivate lawmakers to stick to an overall concept based on content distinction.

The current regulatory framework, set up in 1997, represents a mixture of horizontal and vertical regulation. Both, the Tele-Services Act and the Media Services Interstate Agreement, enshrine the fundamental principle of freedom of establishment for service providers, circumscribe their responsibilities (and liabilities), and introduce the obligation that service providers must be identified. These provisions represent horizontal regulation, i.e., valid across the economy; a host of sector- and area-specific exceptions makes up the vertical elements of the

system. The fear of over-regulation that was initially anticipated by the business community proved unfounded.

Overall, the early regulatory framework of Germany for the Internet age rightly may be lauded as a piece of landmark regulation. In retrospect, the claims by Mr. Rütgers, the former Federal Technology Minister, that the paramount principle of the umbrella law (IuKDG) was "deregulation before regulation" seem exaggerated. Compared to the United States, where private sector self-governance institutions are often employed as regulatory tools to further public interests, German lawmakers at that time only made timid use of such self-regulation, reflecting the different cultural background of these countries.

The new legislation currently moving through the German parliamentary process draws heavily on a thorough evaluation of the experience gained with the IuKDG, the TSA and the DSA since 1997. In its evaluation report the current government, despite the various problems encountered, stated that the openness of the 1997 regulatory framework had served the economy well, even though the current regulatory model may be only a temporary solution for the challenges of the New Economy.

Current Amendments to the Regulatory Framework

The New Economy's apparent beneficial effects on the macro-economic performance of the United States' economy heightened European policy makers' awareness of their countries' structural rigidities, including the lacuna of not having a common regulatory framework for e-commerce legally valid across all EU-member states. The U.S. success, the general boom of the Internet, and the equity performance of dotcom-companies on international stock exchanges, all contributed to instill a new sense of urgency in Europe regarding the establishment of a common legal framework. This was being considered as the missing complement to the EU's nearly completed internal market.

As one senior economics official close to Chancellor Schröder remarked, "Traditional law-making procedure is too slow and too cumbersome for a sector in which one calendar year is equivalent to seven Internet years. To keep pace with technological developments, we have to speed up and start very early on to consult the business community!"

In the European Union it took on average of four years from the presentation of a European Commission Proposal for a resulting Council Directive to be transposed into national law by the member states. With respect to New Economy regulation, however, Germany's legislative process shifted into high gear. Only two years after the two pillars of the EU's common regulatory framework for the New Economy entered into force—the E-Commerce Directive and the Electronic Signature Directive—Germany will have translated these into national law.

Such expeditiousness was made possible by a number of developments: (1) the first mover advantage which stemmed from the experience Germany had won with the 1997 framework; (2) by closely shadowing the technical and political negotiations at Brussels by means of an intensive domestic consultation process that again included all interested parties; and (3) by the federal government building up a political consensus with the sixteen states concerning Germany's key objectives at the Brussels' negotiations. The German states have high stakes in this field, as regulatory guardians and supervisory authority of media-services, radio and TV (MSIA).

Immediately after the entering into force of the EU regulations, which established the key principles for Europe's common regulatory framework for the New Economy, the federal government began work on the necessary amendments required by the two EU-Council Directives.

Most advanced is the Digital Signature Act (DSA) that supplements the same 1997 German law. It passed the *Bundesrat* (Germany's upper Chamber of Parliament) in 2000.

The draft bill on E-Commerce (EGG), the new umbrella act, has just recently been submitted by the government to Parliament, after the cabinet signed off on it three months ago. Prospects are for a smooth ride through both chambers of Parliament.

The amendment of the Media-Services Interstate Act is still being negotiated by the federal government and the States. Pursuant to the new EU common framework, revisions will primarily reflect the impending legislative changes now being incorporated into the new DSA and the EGG.

Now, what are the major modifications being incorporated into the existing legal framework for the Internet Economy, introduced by the new legislation compared to the old regulation and the old DSA of 1997?

The EU's E-Commerce Directive establishes the freedom to freely trade commercial services of the Information Society among the member states of the Union. To this end, the Directive specifies key framework conditions for e-commerce in respect of commercial and civil law. These features are incorporated into German law by changes to the TSA, the DSA, and the MSIA. In addition, the Tele-Services Data Protection Act of 1997 will be revised to reflect new developments as well as the experience since gained with the area-specific data protection regulation concerning Internet service providers.

At the substantive level, the EGG addresses the following main points:

Establishment of the country of origin principle via the mutual recognition of national rules and regulation applicable to tele-services. This means that a service provider established in Germany, regardless of where he offers his services in the Union, is only subject to German national regulation. Because an equivalent provision holds for every single member state, this eliminates the uncertainty for service providers that prevailed before as to which national regulation had to be observed. As a result, the temptation for service providers to "forum shop," i.e. to establish their business in a location with relatively lax regulatory standards is avoided.

Establishment of the unrestricted freedom for service providers to set up shop anywhere in Europe (*Zulassungsfreiheit*). Mere registration instead of permission by the national regulator implies the opportunity of economy-wide and unconstrained competition in innovative tele-services across all countries of the Union.

Introduction of general standards of transparency armed with a number of monetary penalties for tele-services suppliers, with the aim to protect users; and of specific information obligations for **commercial** communications including for commercials, direct marketing and public relations.

Introduction of a graded system of responsibility of a service provider, for third party Internet information and other on-line services. These provisions create a common system of privileged responsibility standards across the Union.

It is in the field of responsibility of service providers that the new German legislation makes more use of private sector self-governance schemes than previously to improve confidence in e-commerce transactions. To the same end, the high level of consumer protection regulation has been maintained.

The new Law on Framework Conditions for Electronic Signatures and the related Digital Signature Ordinance is replacing the old 1997 DSA. Apart from establishing general regulations and definitions, the DSA specifies rules and designates institutions concerning the certification of service providers; details the process of accreditation; and deals with technical security and the supervisory system. In sum, the Law regulates the technical and security infrastructure for electronic signatures in Germany. The so-called qualified electronic signature attains the same legal status as a hand-written signature according to civil law. Electronic signatures, for which a foreign "qualified electronic signature" has been issued by a EU-member state, are recognized as equivalent a national to a qualified electronic signature. Therefore, the door is now wide open for the broadest utilization of electronic signatures in e-commerce across Europe.

With the DSA, important preconditions have been created for the safe electronic exchange of legal and commercial information. Digital signatures make it possible to recognize its true author and to verify that the data are not falsified. The law provides for a technical and organizational framework whose observance by users can guarantee that a digital signature is attributed to a

specific person. This provides a legal presumption that the signature and the data can be considered safe as concerns falsification. Hence, this law is a keystone in creating confidence in the use of electronic media and it is instrumental in protecting the consumer.

A few features of the new DSA are noteworthy, given Germany's inclination for bureaucracy and over-regulation:

Although the law represents horizontal regulation, applying to all sectors of the economy, the sectoral agency designated by the law as the "competent authority" to oversee the regulatory framework will be the Telecommunications Agency. Hence, duplication by creating a new organization has been avoided.

Investment in and the operation of the certification agencies will be assumed by the private sector, under competitive conditions. Also the technical testing of signature software stipulated by the law to guarantee safety standards will be performed by private firms, both subject to the supervision of the competent authority.

Though they are restricted to framework conditions, DSA and its Ordinance provide for a complete "safety infrastructure." Both represent technology-neutral regulation, and therefore the future is kept open to different kinds of innovative solutions, provided the stipulated level of security is maintained. Thus, market forces will eventually determine which technical solutions will prevail.

Summing up, several factors contributed to significantly facilitate the passing of this landmark legislation: (1) the head start Germany had with the DSA of 1997; (2) the admittedly mixed experience harvested through the use of electronic signatures by the banking sector; (3) government-sponsored research in electronic security; and (4) a broad consensus of all interested parties. Today, Germany is among the first countries of the European Union that have transposed the respective Council Directive into its national law. Together with the parliamentary passage of the EGG expected before the summer recess, the building of a modern policy framework for services of the Information Society, in particular e-commerce, will be completed in a few months.

Outlook

Currently, there are three major regulatory policy issues on the national agenda. The first is of immediate concern to companies active in the telecommunications sector, the second of intermediate interest to network industries more broadly, and the third of long-term importance for the dynamic efficiency of the German economy more generally.

Fuelled in part by the halving of its share price, the incumbent ex-monopolist Deutsche Telekom argues that its capacity to earn a decent profit is severely constrained by the regulatory system in place. Its chairman campaigns for abandoning this system in favor of a minimalist system termed "bottleneck regulation." Only access to end-users of telephony services should be regulated, the so-called last mile-problem. All other telecom markets in Germany, he insists, have matured to the degree of fostering a self-sustaining competitive environment. Deutsche Telekom's competitors, on the other hand, fear that abandoning the current systemic broad-based approach would be premature. Above all, it would engender the risk that cross-subsidization by the incumbent would creep back in again, the traces of which would be difficult to detect by bottleneck regulation due to the associated change in disclosure obligations. The Telekom chairman points to the Telecommunications Law, which stipulates that by the time mature telecom markets will have developed, the sector could be brought back under the general rules of the Competition Law, i.e., the supervisory authority of the Cartel Office.

The prejudicial nature of a changeover to bottleneck regulation or of altogether abandoning specific sectoral regulation, is of great interest to those public utilities where network effects play a central role. This holds for the railways, the electricity industry, the gas sector and water supply. Moreover, as new networking technologies become embedded in products and processes of the Old Economy, third party access may become an issue of wider concern to industry and commerce.

Since the deregulation of the German electrical power industry two years ago, the key policy issue in the development of a competitive market environment, i.e., third party access to the incumbents' power grid is unresolved. How are the terms of transmission of electricity through the proprietary network by "unfriendly" competitors, including pure traders, to be regulated and by whom? The government has nudged the four biggest companies towards a private sector agreement called *Verbändevereinbarung*. If the parties do not come up with an equitable compromise draft and private sector self-regulation eventually fails, there is a threat that the sector will be subjected to public interest regulation by law. The current approach to electricity network access regulation is tantamount to a private cartel agreement, exempted from the cartel provisions, and sanctioned by the government.

This dispute has reawakened a debate on whether each such network requires a separate regulatory framework to guarantee market access for third parties. This again was the recent approach to deregulation of the railway network. Heavily fragmented regulation, it is feared, would jeopardize the overall coherence of competition policy, of the Competition Law and of its application by the Cartel Office. Indeed, the past president of the Cartel Office, Dieter Wolf, recently reminded industry and policy-makers alike, that after its sixth revision, the German Competition Law already contains a general provision for so-called network industries. Prevention of access is now explicitly classified as a misuse of a dominant market position. This clause was patterned after the "essential facilities doctrine" developed by American competition legislation. It recently has served the Cartel Office as a guiding principle when it had to assess successive draft agreements put forward by the electricity sector.

The third issue has already been dealt with above. Accelerating convergence in the information and communications industries foreseen for the next few years is of more long-term importance. Obviously, a fragmented regulatory framework would be increasingly at odds with a convergent technological environment of the New Economy. Loss of coherence of competitive conditions would undermine the German economy's future capacity to adjust dynamically.

Overall, there has been a compelling need for new policies to answer to the novel challenge of the New Economy. In Europe, Germany was one of the leading countries in the 1990s to pioneer a coherent regulatory framework for the Information Society. Currently, the framework is being amended, primarily to reflect the EU's common framework for the digital age. The relative gap with the United States, though still in evidence, is narrowing perceptively.

Much of the policy in both Germany and the U.S. has remained based on ideas that made sense for the traditional economy but are of questionable value in the New Economy. This report has argued that the New Economy is not about any particular technology or sector, but rather involves a more fundamental shift in society where the forces of economic growth and competitiveness are being transformed. It is probably an illusion to refer to "New Economy" firms or to partition society into the "New" and "Old" economies. Rather, this fundamental shift has left no person, firm, sector or institution unaffected. This fundamental shift means that policies and strategies that were effective as recently as a decade ago have not only lost their effectiveness but actually may be counter-productive. The framework characterizing the New Economy introduced in this report suggests a research agenda for the future. This research agenda needs to identify whether the transformation to the New Economy is leading to a convergence of policies and institutions between Germany and the United States, or to a divergence, where each countries develops a unique set of policies and institutions.

ENDNOTES

[1] "The Death of Distance," *The Economist*, September 30, 1995.

[2] "Indicator Data Sources," in The New Economy Index, http://www.dlcppi.org/ppi.org/ppi/tech/neweconomy_site/sources.html (access June 1999)

[3] The data are adopted from Jensen (1993).

[4] "Markets Go Global," *The Economist*, September 20, 1997.

[5] "The Downsizing of America," *New York Times*, March 3, 1996, 1.

[6] See Audretsch (1995).

[7] As the German newspaper, *Die Zeit* (February 2, 1996, 1) pointed out in a front page article, "When Profits Lead to Ruin—More Profits and More Unemployment: Where is the Social Responsibility of the Firms?" the German public has responded to the recent waves of corporate downsizing with accusations that corporate Germany is no longer fulfilling its share of the social contract.

[8] "The Valley of Money's Delights," *The Economist*, March 29, 1997, special section, 1.

[9] "The Best Cities for Knowledge Workers," *Fortune*, November 15, 1993, 44.

[10] The survey was carried out in 1993 by the management consulting firm of Moran, Stahl & Boyer of New York City.

[11] "The Best Cities for Knowledge Workers," *Fortune*, November 15, 1993, 44.

[12] The relative small part of capital that is in the hands of some New Entrepreneurs, as it is observed by Lachmann (2000), could be symptomatic of this argument.

[13] For a comprehensive empirical analysis of small business finance in the U.S., see Berger and Udell (1998).

[14] For an analysis of these implications, see Polski (2000).

[15] As an indication of just how risky these ventures are, note that professional investors who provide seed and startup financing use extremely high discount rates, ranging from 50 percent for start-ups with a well developed product to over 80 percent for seed financing to explore the feasibility and commercial viability of a new technology.

[16] For reviews of a number of innovative federal programs designed to stimulate commercialization in research-intensive industries, see Wessner, 2000, 1999(a), 1999(b), and 1999(c).

[17] A "going business" is one that has revenues but not be profitable, a viable product, and an established organization.

[18] The National Business Incubator Association (1997) reports that 87 percent of incubator graduates are still in business.

[19] Private sector incubators include small and large corporate ventures. Public incubators include those sponsored by universities, local governments, and federal research laboratories. Technology parks are a good example of public-private partnerships.

[20] This trend is now reversing as venture capitalist funds stung by the recent decline in new economy company stock values return to investment fundamentals and demand better developed value propositions from the companies they consider for investment.

[21] For a more detailed analysis of why this might be so, see Polski (2000).

[22] Qualitative analysis suggests that there are a number of factors that constrain growth in the New Economy in the United States including financial and capital investment considerations of end users, legacy information and management control systems, decentralized governance structures, organizational skills, partner skills, and consumer skills (A.T. Kearney, 2000).

[23] These definitions of NEF and OEF roughly follow those of Larry Summers, former Secretary of the Treasury of the U.S.

[24] We recognize that ages of NM firms do vary, thus indicating potentially different stages of their life cycle. (We need to distinguish between younger and older firms in this study) For example on the NM, Mobilcom AG was founded in 1991 even though it IPOed in April 1997, Rhein Biotech GMbH was

founded in 1985 and IPOed in April 1999, and SCM Microsys Inc. was founded in 1989, and IPOed in October 1997, while most of the remaining firms on the NM are under four years old.

[25] See *The New York Times*, "By One Measure NASDAQ Stocks are Pricey Despite Drop," February 12, 2001, Business Section.

[26] See Ritter and Loughran (2000).

[27] The NM was founded in 1997 and is widely believed to be in a relatively early stage of development as an equity market.

[28] Entry and exit of firms may also indicate market fluidity.

[29] See Hall (1987) and Sutton (1997).

[30] These definitions of NEF and OEF roughly follow those of Larry Summers, former Secretary of the Treasury of the U.S.

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Appendix: Productivity growth effect of the employment share of the electronics industry

In a recent article, Fagerberg (2000) discovers changes in the manufacturing share of the electrical machinery industry to positively impact the manufacturing sector productivity growth. In Carree (2001) it is confirmed that there is a positive and significant effect of the employment share of the electronics industry SIC 3832. However, the size of the effect is much smaller than that found by Fagerberg. As a consequence, the spillover effect of the industry is also smaller. Carree (2001) finds the following regression result explaining total manufacturing labor productivity growth (using five-year periods for a sample of 20 OECD countries, 1972-77, 1977-82, 1982-87, 1987-92 and t-values between brackets):

Prod.Gr. = Year dummies – 0.146 Initial Prod. + 0.895 Share SIC 3832 + 0.729 Share SIC 383X

(3.8) (2.8) (1.4)

where "Prod.Gr." stands for the difference in the logarithm of value added per employee in 1,000 U.S. dollars for the entire manufacturing sector over a five-year period and "Initial Prod." stands for the logarithm of value added per employee in 1,000 U.S. dollars at the start of the five-year period. The "Share SIC 3832" stands for the employment share of the Electronics industry SIC 3832 at the start of the five-year period and "Share SIC 383X" stands for the employment share of the rest of the three-digit SIC 383 sector. The average employment share of both the SIC 3832 and SIC 383X industries over the 20 OECD countries and the four five-year periods was about 4 percent.