How do Wealthy Nations Stay Wealthy? Challenges for the European Policy Agenda[1]

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[1] This paper was written for and is forthcoming in Ramon Compañó, Corina Pascu, Anna Flavia Bianchi, Jean-Claude Burgelman (eds.). 2006. *Shaping the Future of ICT in the Global Context.* Joint Research Center - Institute for Prospective Technological Studies, Technical Report EUR (pending) ISBN (pending), European Commission. The interpretative framework for this paper was originally developed by John Zysman in his contribution to the forthcoming *How Revolutionary was the Digital Revolution? National Responses, Market Transitions and Global Technology.* A BRIE/ETLA/HELSINKI Project. Stanford: Stanford University Press. We present it here in shortened and revised form. The application of this framework to the European Political Economy is based on dissertation research that Tobias Schulze-Cleven is conducting on the comparative politics of increasing labor market flexibility.

The challenge for Europe is how to stay wealthy in a rapidly evolving and ever more competitive global economy. In the digital era, the continuous evolution of the mechanisms of value creation – i.e. the engines of productivity and growth – calls into question both established company strategies and public policies. There exists broad agreement that the digital era requires adaptation, but the precise 'how and what' remain unclear. This paper has the dual objective of clarifying the character of competition in the digital era and reflecting on European attempts to build advantages in the evolving global marketplace. In short, the paper asks how wealthy nations – such as those in Europe – can stay wealthy in a global economy with ever shifting levers of advantage.

The transformation of the marketplace in the digital era changes both the traditional tools of corporate strategy and the agenda of public policy. In this global era, characterized by digital technologies that as "tools for thought" transform all activities, firms' internal functions suddenly become products to be bought in the market, products that generated premium prices suddenly become commodities, and the sources of differentiation for products and production processes evolve.[i] It is not just that there is an increased pace of change, but that the market environment is inherently less predictable. Conscious experimentation will be central to both corporate and national adaptation. Companies will have to look at their initiatives as "experiments," attempts to find their way through a maze of fundamental uncertainty. Each company effort, and the efforts of competitors, must be culled and systematically assessed for lessons. Governments must consider what an "experimental economy" will require, and how an environment can be created for individual firms and networks or clusters of firms to experiment effectively.

Our analysis of the challenges raised by the digital era will proceed in three steps. A first section will review the historical evolution of production paradigms to build the empirical basis for the framework through which we want to assess the transformations of the digital era. A second section considers the dynamics of value creation in this digital era and the evolution of business models. The third section considers what our analysis can contribute to the understanding of Europe's adjustment to the marketplace of the digital era. In that context, we will revisit the long-standing debate on the relationship between labor market flexibility and social protection.

Evolving Models of Production and Competition[ii]

The influence of the technology progress is visible in the economy through the evolution in the production and distribution of goods and services. In this section, we distinguish among historical phases that involved distinct business problems, a changing role of the "international" in the dynamics of the national economy and the role of the state in the economy.

American Dominance: Fordism and Mass Manufacture

Mass manufacture, epitomized by Henry Ford and the Model T, was the first twentieth century production revolution, though its roots lie earlier in the 19th century. In this system, large-scale manufacture implied rigidity. Fixed costs in the production line and design were high; consequently changes in products or reductions in volume were difficult and expensive. This rigidity created political, not just technical, problems. Mass manufacture is broadly understood to mean the high-volume output of standard products made with interchangeable parts being connected by using machines dedicated to particular tasks and manned by semi-skilled labor. Important features include a) the separation of conception from execution – managers design systems, which are operated by workers in rigidly defined roles that match them to machine function; b) the "push" of products through these systems and into the market; c) large-scale integrated corporations, whose size and market dominance reflect mass manufacture's economies of scale (Womack, Jones and Roos 1991).

There was a political consequence. Drops in demand were difficult to absorb for companies structured according to Fordist models, leaving the national economy rigid as well. An initial downturn in demand could cumulate into sharper economic downturns. Booms and busts implied worker dislocations, and the national economic policy counterpart of the corporate business cycle management task became the political debate about how to use public policy to cushion not only the economic dislocations but also the political dislocations associated with mass unemployment. Demand management policies, associated with the label of Keynesianism, were born. *Fordism,* an American innovation, was mass production with Keynesian demand management.

Challenges from Lean Production and Flexible Specialization

Challenges to the long dominance of American manufacturing came from two different directions. The more important challenge was the interconnected set of Japanese production

innovations, loosely called *flexible volume production* or *lean production* Coriat 1990; Jaikumar 1988). From the 1970s onwards, Japanese consumer durables began to redefine the terms of competition in global markets establishing new trajectories of innovation and new standards of quality Success in the complex assembly of a large number of component parts for principally mechanical and electro-mechanical goods set American and European industrial establishments on their heels. The Japanese lean production system seemed to allow for rapid market response by providing both the flexibility to adjust output in existing lines as well as introducing new products (Tyson and Zysman 1989). Most importantly, it seemed to deliver high quality at lower cost. While the Fordist story highlights national strategies for demand management, the Japanese story of lean production highlights the role of a "developmental" state and the interaction among the markets and producers of the advanced countries in international competition.[iii] The Japanese state actively promoted domestic development with closed markets at home, while 'free-riding' on the international system to use exports for stabilizing the domestic economy. The combination of an open international system with intense but controlled competition behind managed trade borders proved decisive in the emergence of the innovative and distinctive Japanese system of lean flexible volume production.[iv]

The second challenge to the classical American mass production model came from Europe under such labels as *diversified quality production* (Streeck 1991) and *flexible specialization* (see e.g. Hollingsworth and Boyer 1997) at about the same time. The "Third Italy" and the Germany's Baden-Württemberg were the first prominently displayed examples of an approach in which craft production, or at least the principles of craft production, survived and prospered in the late twentieth century. The particular political economy of the two countries gave rise to distinctive patterns of company and community strategies (Hirst and Zeitlin 1997). Deploying flexible machinery and skilled workforces rather than on paying low wages, firms in these countries often competed in global markets on the basis of quality not price. Being able to produce short runs of semi-custom goods, the companies in these modern versions of traditional industrial districts could command an affordable premium for their products because of their distinctive performance or quality features (Sabel 1994). They were seen to be able, in at least some markets and circumstances, to more effectively adapt to the radical uncertainties and discontinuities of global market competition than larger, more rigidly organized companies. The emphases in these discussions are the *horizontal connections,* the connections within the community or region of

peers, as distinct from the *vertical or hierarchical connections* of the dominant Japanese companies. The flexible specialization model hinges on local institutions, such as chambers of commerce, vocational training systems and public research facilities, which permit the continuous combination and recombination of local activities. Thus, the two innovative challenges to American production dominance each featured distinct roles for policy and the state.

The Transition to a Digital Age and the American Comeback: Wintelism and Cross-National Production Networks

The first chapter of the digital era can be best characterized by the emergence of *Wintelism* as a strategic stance and the rise of *Cross-National Production Networks (CNPNs)* (Borrus and Zysman 1997). *Wintelism* is a short-hand term representing the transition from an electro-mechanical to a digital era. It reflects the sudden importance of the constituent elements and components in defining the terms of competition in the markets for the final products. This meant a consequent strategic shift in competition away from the vertical control of production by final assemblers. The prominent examples from the computer industry, the *Win*dows operating system and In*tel* processors, have given the name to this new production and competition regime. *Cross-National Production Networks* was the label first applied to the consequent disintegration of the industry's value chain into constituent functions that can be contracted out to independent producers wherever those companies are located in the global economy. CNPNs are associated with an increasingly fine division of labor. The networks permit firms to weave together the constituent elements of the value-chain into new production systems that facilitate diverse points of innovation. They also turned large segments of complex manufacturing into a commodity available in the market. The rise of CNPNs marked the arrival of a truly global economy, one in which competition and the critical final markets were in the advanced countries, but production – while organized by firms from these same advanced countries – was spread across borders, principally through Asia.

Wintelism emerged as a strategic response by American producers to the Japanese production challenge during the 1980s. As the semiconductor industry joined consumer electronics and automobiles as sectors under intense competitive pressure in the late 1980s, it seemed that the fabric of advanced electronics was unraveling. At that time, the erosion of equipment suppliers to the semiconductor industry was making it more difficult for American semiconductor producers to hold market position. With the weakening position of the semiconductor makers, many feared

that final-product producers would not have access to the most innovative chip designs needed in their final products. However, suddenly, American producers rebounded. They had not reversed the loss of production advantage in electro-mechanical products, but rather, a new sort of consumer electronics product had emerged, defining a new segment of the industry. The then 'new' consumer electronics, as Michael Borrus (1997) argued at the time, were networked, digital, and chip-based. The have included products from personal computers to mobile devices. The nature of production changed dramatically from the complex mechanical or electro-mechanical assembly to electronic chip production, board stuffing, and packing the boards into boxes.

Wintelism involved both new terms of competition and a new model of production. Consider the PC; what part of the value chain confers the most value added and leverage in the market? It is not the producer of the final product, the metal box we call the PC, even if – like Gateway or Hewlett Packard – the box carries the company logo. Much of the added value is in the components or subsystems: the chipset, the screen, and the operating system. This has several implications:

1) *Producers from different nodes in the value chains compete over control of the evolution of technology and final markets.* Some component companies succeeded in shaping market segments. Prominent examples are Microsoft and Intel, which set the pace of technological evolution in the personnel computer segment, and the independent networking equipment provider Cisco, which drove the emergence of internet technology.
2) *Competition in the Wintelist era tends to be a struggle over the setting and evolution of de facto product market standards.* Components and subsystems are built to generally agreed standards that emerge in the marketplace, with the market power over those standards lodged anywhere in the value chain, including product architectures, components, and software. Open but owned standards create de facto intellectual property (IP)-based monopolies or dominant positions.
3) *As the fundamentals of Wintelism have evolved, the constituent elements of the product value chain have become modules.* While distinctive intellectual property might remain in the modules, the knowledge about how they inter-connect becomes codifiable and will be diffused.
4) *With products being built as modular systems with clearly defined components and subsystems, the actual production/manufacturing can be outsourced.* Outsourcing evolved from a tactical response aimed at cost reductions by procuring a particular component from outside the organization into cross-national production networks that can produce the entire system or final product.
5) *The core engineering skills moved from mechanical to chip-based systems that are given functionality by software.* The range of production skills to produce an optical film camera is much greater than to produce a digital camera, whether in a cell phone or not.

The Wintelist era of the 1980s and 1990s – the moment of the American comeback in electronics – turned, politically, on domestic deregulations and international agreements that created an ever more open international trade system. At home in the United States domestic deregulation and competition policy in a variety of sectors – especially telecommunications and computers – contributed to significant market competition among, and a shift in market leverage toward, component makers. These initially domestic phenomena eventually reshaped the electronics industries worldwide. Ever more extensive and dispersed networks of investment, trade and production were the first step in an evolution of complex production networks and supply chain management. The emerging production and trade structure contributed to, if not drove, the expansion of something we might loosely call Globalism.

Globalization with Borders

The classic version of the globalization story stresses how the internationalization of business – enabled by lower "transaction costs" associated with technological change – has severely constrained active government policy. In contrast, the evolution of production paradigms sketched out above suggests a different take on globalization. The paradigms' power in international competition rested on their national bases and/or explicit government action. From this alternate vantage, globalization is a story of national innovations played out on a larger stage. A sequence of new competitors, new and often unexpected loci of innovation and production, bring new processes, products and business models to the international marketplace. Indeed, the world has witnessed a "globalization with borders" (Borrus and Zysman 1997).

In the following section of the paper, we will turn to the chapter of the digital era that the world is currently entering. Again, as it was true in earlier periods, dramatic marketplace developments are cooking inside of national systems of innovation and competition, largely unobserved by the outside. They burst onto the global marketplace as unexpected competitive challenges at a seemingly increasing pace.

Value Creation in a Digital Era[v]

The current phase of the digital era is best characterized by possibilities associated with a new set of distinctive tools, tools for thought. These tools amplify brainpower by manipulating, organizing, transmitting, and storing information in the way the technologies of the Industrial

Revolution amplified muscle power (Cohen, Delong, and Zysman 2000, 7-8). The tool set rests on a conception of information as something that can be expressed in binary form, open to subsequent manipulation (see Shannon 1993). It consists of the hardware that executes the processing instructions and the software, i.e. the written programs defining the procedures and rules, that guide how the hardware equipment's information processing. In addition, it includes the data networks that interlink the processing nodes, and the network of networks, which together create a digital community and society.

The digital revolution is transformative, it has become conventional to observe, changing the character of products, processes, marketplaces and competition throughout the economy. The capabilities to process and distribute digital data multiply the scale and speed with which ideas and information can be applied. It affects both traditional goods, communication sectors, and services. Information technology has moved both inside of machines, controlling their functionality, and into the communications networks, altering not only how and at what price we talk, but how we share, store, and use information. Because the expression and manipulation of information is now possible in a common digital electronic form, a range of previously separate information and communication sectors merge or become more intimately entangled.[vi] Just as important, the knowledge component of much of industrial activity, and indeed an array of service activities, can now be formalized, codified, and embedded in equipment.

The logics of cost and functionality change. The cost of creating digital information remains fixed at often high cost, while the cost of reproducing and transmitting content in digital form drops toward zero. The consequences of often non-existent replication costs are amplified by the very nature of information goods. How do I price and value what you know and want to sell to me without me seeing it? But if I see it, and thus possess it, how can you still sell it to me? And if I can reproduce and distribute that knowledge widely at low cost, what happens to your market? New business models have to be invented; the forms of distribution and IP of older models have to be defended through contracts and courts.

All of this tells us that information technologies alter the product development, production and competition throughout the economy. It does not tell us how companies might take advantage of these changes, or how governments might support IT development and diffusion to benefit their

societies. One might list the mechanisms through which the digital tools affect business strategy, noting in turn network effects and the changing character of content products. But this approach is rather limited. Information-based tools and goods have a distinctive logic, "information rules" to use the clever phrasing and insightful arguments by Shapiro and Varian (1999). But when does that logic apply? Certainly the logic applies in the competition over internet browsers. It may apply in the case of search engines. But which elements of information goods, or digital tools or network economics apply in the case of the automobile industry? And how do we decide which issues matter in a particular setting? If we can't deduce the answers from first principles, we need an alternative strategy to understand value creation in a digital era.

Of Products, Commodities, and Differentiated Assets

These basic features of digital era profoundly affect the dynamics of competition and strategy in the global market. They change profoundly what must be done to assure real rising incomes for the community. Created market value, oversimplified, is price minus cost.[vii] If we are to locate the influence of digital tools, there are two obvious questions about value creation. First, how do digital tools and information products change the task of generating something for which consumers will pay a premium? In other words, how does a company avoid having its products become commodities? How does the company create unique or differentiated goods so that a premium price can be charged? There is an array of means: the creation of distinctive products, early market entry, and ownership of product design standards. Second, how do these tools affect the cost of providing a product or service to customers; if you cannot charge a premium, can one generate distinctive margins by being a low cost producer? The argument here is that for a firm the points at which it can exercise competitive leverage to create strategic advantageare now constantly shifting and moving.

To address these questions we need to define explicitly three notions we are generally familiar with: product, commodity, and differentiated asset.

- A *product*, whether object or service, is an item that can be bought and sold in the market.
- A *commodity* is a good or service that is exchanged in competitive markets with little advantage to any particular buyer or seller. A product becomes a commodity when it is generally available from a number of suppliers on common terms in the market

- A *differentiated asset* creates the basis for premium price, distinctive sales advantage, or cost advantage in production or distribution.

There is a constant reshuffling among products, commodities, and differentiated assets. As reshuffling occurs, business models must change as well. Globalization accelerates the reshuffling, and digital tools often are the means of accomplishing the reshuffle. Globalization represents new competitors who may transform a premium good into a commodity with low cost production or generate advantage by adding value to what seemed to be a commodity good as when the Japanese made quality a "free" good. Digital tools change the levers of advantage and value creation.[viii] The continuing reshuffle includes the transformation of internal company functions into products available on the market. There is a constant question of whether the function is a commodity that should be sourced in the market or a strategic asset that must be developed in house or in carefully nurtured supply relationships. R & D and production provide examples of internal company operations becoming either a strategic asset or a vulnerable commodity.

Traditionally an internal function differentiating a company's products from its rivals, R & D can now be sourced outside the company. The original presumption has been that product development, and the research to support that development, is at its core a strategic asset, the foundation of innovation and a powerful antidote to commodification. But even as innovation and continuous product/production improvement become more critical, major corporations are shrinking their core research departments. They are choosing to buy in R & D from universities or start-ups and spin-outs.[ix] In addition, they source from joint product development projects and technology development outposts.[x] A wide range of countries are entering the development game by investing into R & D in both public labs and in support of industrial labs, thus growing the number of points of purchase for "technology" and "development" has grown. Major firms become, at least in part, technology integrators, and not just technology developers. Firms cannot be at the cutting edge in all the technology developments that affect them, and must look outside.[xi] Firms have to decide, and continuously reassess, what elements of development are effectively high-end commodities, which technologies are strategic assets best acquired, procured on an exclusive basis or developed in house, and how to move to capture those distinctive technological assets.

Similarly, production has increasingly become a commodity in a digital era. Manufacturing firms went offshore for cost reasons or to have access to local markets, but discovered abroad a widely distributed capacity for technical and management innovation. Outsourcing led to cross-national production networks and eventually skills of supply chain management, each step making the next phase of outsourcing, i.e. the commodification of production, easier. Consequently, it may be easier for services to move offshore today than it was for manufacturers to do so twenty years ago. The required tool set consisting of computers, software, and communications are available in the market and easily transported. These are largely general-purpose tools that can be adapted to particular service tasks. How far, we may ask, will this geographic dispersion go? Can all activities be placed just anywhere? Is there any geographic stickiness to production? While acknowledging that not all production is a commodity, we need to ask these questions, both in the context of the entire production processes and each individual element of a potentially segmented process. In turn, a nation/region should ask what it could do to make itself attractive as a location for world-class manufacturing.

In a world in which services as well as manufacturing are being outsourced and old distinctions between services and manufacturing are breaking down, we need to be clear on definitions. We propose to talk of production as the general case, the organized action of making goods and services for sale, and of manufacturing as the specific case of physical production.[xii] In that case, production – the know-how, skills, and mastery of the tools required – is absolutely central to the products in the digital sector. Furthermore, we can now ask corporate strategy questions – such as what should be produced or built in house and which can be outsourced – for the new digital context.[xiii] There are at least three circumstances when in-house control of production, or elements of production, can be a strategic advantage: first, if the in-house control of production provides advantage in cost, timing of goods to market, quality, or of distribution that cannot be obtained by outsourced production; second, if knowledge about existing production processes is required to develop "next generation" product entry, whether design of the products themselves or of the processes to produce them, or put differently, in-house production mastery may be required for rapid product innovation; third, if critical intellectual property about the products themselves is so tightly woven into the production process that commodity outsourcing is tantamount to transferring product knowledge to competitors.

As noted before, the rapid entry of diverse new competitors into global markets contributes to the process of commodifying production and the transformation of "innovation / R&D" into a product that can be purchased in the market. The new entrants into markets and the ever-evolving competitive position of others, globalization, represent new opportunities, challenges and threats that come from unexpected directions. Following the early challenges posed by Japanese producers and the later rise of other Asian producers (e.g. Korea, Taiwan, Hong Kong and Singapore), now India, China, and the countries from the former Soviet Bloc all find their position in world markets. The new entrants represent both new markets and new competitors representing not only new sources of production and R & D but often new product, production, and management strategies.

Creating Differentiated Assets: Segmentation Strategies

How, then, can firms escape from the world of commodities, escape from new competitors from new places nipping at their heels? A traditional analytic approach to strategy will only be a starting point in the process of corporate adaptation. Companies will have to look at their initiatives as "experiments," attempts to find their way through a maze of uncertainty. They will need to learn how to evaluate their own experiments and interpret experiments of others. Doing so, of course, creates dilemmas. We address them in turn below.

The increasing importance of the classical approaches, branding and design, to differentiation needs to be acknowledged. They become critical, because in the digital era many electronic products are constructed from very similar modules achieving very similar functionality. Branding, the creation of an identity for a product or set of products, serves as a critical instrument to differentiate branded products from a pool of commodities. For example, amongst an array of similar products tending toward commodity, the question of whom you trust matters. Hyundai's efforts to establish the once low-end Korean cars as high quality, or GM Saturn's efforts to establish a no-trickery sales identity, are examples of an effort to create trust through branding.[xiv] Additionally, ever greater arrays of products are fashion/identity products that give expression to a customer's sense of self (often through the perception of the product through a third party). The "brand" identity in part states the "presentation of self" that the client chooses. Similarly, design takes on ever-greater importance in differentiating products that might

otherwise be fundamentally commodities. The Danes for decades have been selling the Bauhaus, the source of Danish modern product style. An extreme example of value created by design is the Danish company Bang and Olufson, which sells high-end commodity technology at extraordinarily high-price as a lifestyle good. The "brand" identity is based on its exceptional electro-mechanical characteristics and pure design.

In contrast, alternative, "new" segmentation strategies involve digital tools, the "tools for thought" that underpin the digital revolution. It remains on open – and critical – question how to use their underlying capacities to their fullest potential and capture competitive advantage or generate productivity gains in the process. Investments in training, in reorganization, and in strategic reorientation are likely to be required (Brynjolfsson and Hitt 2004). Some of the new approaches to creating value and to differentiating products have become very well known. First, and now widely understood, are those to segment the market and then attack specific segments with functionally varied, and usually distinctively branded, products. A fundamental feature of the digital era is that analytic tools of database management permit the consumer community to be segmented into sub-components, each with distinct needs and wishes. At an extreme, individuals and their particular needs can be targeted. Early on, the insurance industry moved from using computers exclusively for back office operations to using them to create customized products for particular consumers (Baran 1986). Thus collecting detailed information about customers as groups or individuals in a variety of forms, credit cards or grocery store purchases are obviously very important to companies having chosen this particular strategy.[xv] Once the market segments are defined, then digital tools help firms create functional variety in products. Standard products can be given diverse functionality. The coffee maker that automatically turns on at a particular time in the morning depends on simple digital functionality. The difference between many higher speed, higher price, printers and their slower, lower price, brethren is in the software that tells the printer how to operate (Shapiro and Varian 1999). Firms have new ways to identify who will pay how much for what, and then create products or give functionality to commodity products that people are willing to pay for.

Second, digitally rooted online sales/marketing and supply chain management alter the links between a firm and its customers as well as suppliers. The Dell story tells how innovative uses of the net that tie customers from sales through production can create dramatic advantage (Fields

2003, Kenney and Mayer 2002). And, as development and production processes are woven together to speed up the time to market and improve design choices, the lines between production, design, and development blur even more.

Let us come at this problem of the changing character of business competition from a different angle. It was long conventional to consider market competition within sectors -- defined market segments with understandable sets of competitors, terms of market entry and competition. There was the auto sector, the machine tool sector, the textile or apparel sector and the like. Then along with the dot com boom the language changed and the supposedly clever and astute began to refer to "spaces", asking what "space" are you in. Many of us, myself included, dismissed this talk as calling sectors by another name, as a clever linguistic differentiation of the dot com era from predecessors. Perhaps we did so too quickly. "Spaces" turns out to be a transition word. Now one hears of the talk of "value domains", which at first glance might seem to be the notion of spaces by a different vocabulary. But let us look more closely. The notion of "value domain" points to the array of digital functions that can be embedded in a small chunk. Canon's challenges go beyond competition from camera makers, but to the very question of how photography is used and how its tools are provided. In one sense Canon's worst competitor is Nokia.[xvi] And Nokia, which can provide music on its cell phones, faces competition from Apple iPod, expressed concretely in a new Motorola phone. That bloc of electronics encased in plastic can be a PDA, a phone, a camera, a music device, a television. It is a "value domain", in which the products, and their functionality and design, can be defined in a whole variety of ways. But how to address that value domain? Which functionalities should be given priority?

This captures an important catch with using digital tools in addressing value domains. It is just not always evident what needs to be done, what strategies and organizations are required to create value or generate productivity. What matters for productivity increases and growth is the capacity to imagine how the underlying digital technology can be used. The imagination and the applications evolve as an array of experiments, both in technology/tools and also in the organizations that employ the tools and the business models to establish new ways of creating value. Undoubtedly, many of those experiments will fail, but some will succeed. Rather than just adding up anecdotes of success and failure, we will proceed by considering three categories of experiments: work organization, the use of knowledge, and business strategy.

Reinventing Production: Work Organization and Knowledge Management

In the continuing reshuffle of the levers of advantage, the reorganization and reinvention of production represents a first category of experimentation. The introduction and application of networks that permitted easier communication and exchange of data, even in the years before the Internet, followed a clear three-step pattern. Bar and Borrus (1993) pointed out that first existing processes were automated; secondly, from the initial but automated base experiments in the use of the new networks were launched; finally, work processes were reorganized. Critical in their story is the question of where, and by whom, experimentation and learning takes place. The same processes are evident now. Consider production and the drive to outsourcing work in the service sector. Evidently the digital capacity to store and transmit information means companies can segment and distribute work geographically and organizationally. And in the current round in the United States of outsourcing service functions offshore, lower wages have been the primary driver. Kenney and Dossani (2004) have argued in the case of India, although lower costs drove the initial move offshore, which largely meant reproducing existing activity at lower cost as it did in the early days of offshoring manufacturing, many companies found that possibilities for higher quality emerged abroad. Yet management capacity of the contract producer to manage outsourced offshore projects is as critical a variable as cost in explaining the location of tasks.

When an Indian company such as Wipro opens outsourced production activities in the United States, it is clear that management skill and experience with outsourcing, experimentation with automation of existing processes, rather than the cost of labor alone underlies the move. The conclusion must be that the service sector reorganization afoot is only partly about cost, but more fundamentally about imagining and implementing new approaches to the organization of production. Sometimes for the buyer of outsourcing services, outsourcing is an excuse to avoid tough internal choices about product strategy or internal organization. Sometimes, as in finance, outsourcing obscures the possibility of delivering distinctive services. Sometimes, as in software development, outsourcing creates risks of losing intellectual property or propagating competitors. Hence the issues of who experiments and learns, what should be done in-house, what outsourced, all re-emerge with each step.

But, of course, there are also radically new production systems, such as lean production systems in the 1980s and perhaps open source software in the digital era. Open source as a principle of

organization hinges on distinct approaches to mobilization and coordination of work, not a vague voluntarism but replicable rules of participation and gain. But the principles and rules on which it rests are new. For example, it rests on foundations that turn notions of property from ones of control of the use of an object, or an objectified body of code or knowledge, into control of the processes of distribution. The collaborative work arrangements it points to are both about production of software and made possible by the digital networks (Weber 2004).

Let us turn to question of knowledge management. Knowledge, particularly theoretical knowledge, has been recognized as an essential element of the contemporary economy. Critically though it is the expression of information, data, and knowledge in digital form that is truly distinct, permitting the application of digital tools, the suite of tools for thought. In a digital form information can be formalized, stored, searched, transmitted, and used to control the operations of physical processes (Cohen, DeLong and Zysman 2000). We can put the Library of Congress onto a single digital memory stick and transmit it in flash. The complex relationships on which engines operate or planes fly can be stated as algorithms, represented in digital form. In one sense the flood of data made possible by these tools can drown the recipient, but oddly the same "tools for thought" make easier the creation of meaningful information and the generation of knowledge from that flood of data. But codified knowledge, whether stored digitally or embedded in equipment, is only a piece of knowledge that cannot stand alone. For example, how do we know in an avalanche of facts and stated relationships which ones we care about? Analytically, there are limits to both the value of piling up and searching documented knowledge and to formalizing the tacit knowledge embedded in individuals and communities of practice. Experiments with knowledge management in this information rich era force open the very fundamental question of what knowledge is. According to Nielsen and Nielsen (2006), knowledge unfolds in the iterative processes between tacit and codified forms, and optimizing knowledge in organizations is essentially an issue of optimizing these iterative processes.

There is an organizational implication of this consideration of the nature of knowledge. Internally, the company organizations required for most efficient manufacturing may not be the same as those required for effective exploitation of knowledge. In the 1980s the Japanese innovations of flexible volume production using lean, just-in-time techniques created distinctive production advantage and rocked market competition. Is there a similar revolution afoot now?

Lorenz and Valeyre (2004) claim to have identified a new learning model of corporate organization, that significantly departs from traditional craft organization, taylorist organization and lean production systems; particularly, they see this distinctive organizational form emerging in Northern Europe, principally the Nordic countries. We can only speculate as to why, pointing to experiments in work organization in an era of mass manufacturing that may be paying off in a knowledge era.

Experiments in Business Strategy

The tactical experiments – branding, design, versioning, production reorganization, and knowledge management – have to find expression in new business models, the underlying strategies for creating and capturing value. Those new business models must reflect the shifting location of leverage in creating value. The mistakes of conception and execution in many of the failed bubble-era business strategy experiments prove that this is not easy. Recall that the dotcom investment wave hinged on the notion that the network tools would "disintermediate" traditional distributors, that brick and mortar relationships would be replaced by electronic links, or that wholesale intermediaries would be eliminated by electronic markets. Often the fantasy was that new entrants, new companies, using these digital tools could displace established companies. There are some evident successes; the travel industry from travel agents through airlines is being reformed by online operations, but the venture capital community made a whole array of largely unsuccessful bets.[xvii]

By contrast, consider IBM's two fundamental shifts. IBM's first fundamental shift is from a product company wrapping its products in high value service support into a service company selling solutions that embed its products. As IBM migrated from electro-mechanical to digital information processing, it established itself as the dominant player in the market. Consequently its per unit development costs were radically lower than its competitors, making its margins substantial. That allowed "service" to be bundled into costs, offering a sense of certainty and reliability to its customers. Its market share allowed it to keep its core software, operating systems and the like, closed and privileged. That model of competition was no longer viable as the era of the mainframe and even the mini computer passed. Networks emerged supporting business services comprised of multiple networks and varied suppliers. IBM began to offer service solutions.

More generally, the IBM story points to the blurring of the distinction between services and products in a digital era. The distinction between service and product has never been very clear. Once, national accounts categories obscured the relative importance of services and production in an evolving economy (Cohen and Zysman 1987). A window washer at Nokia or G.M. is a manufacturing employee; if Ace Window Washers contracts to outsource the washing of Nokia's and GM windows the same employees are counted in the service sector. Now the blurred line between product and service becomes a matter of strategic importance. Consider accounting: Accounting is a personal service provided by accountants utilizing tools from the original double-entry bookkeeping system to computers. But if you create a digital accounting program and put it on a CD, put it in a box, call it Quicken, and allow its unlimited use by the purchaser, then you have a product. If you put the program on the Web for access with support for use on a fee basis, then you likely offer a service.[xviii]

IBM's second fundamental shift was to support "open source" software, rather than proprietary software and the development of frameworks and tools to implement solutions within that framework. Microsoft and Unix provided common platforms through which competitors could integrate their offerings, limiting IBM's leverage. Selling solutions in a multi-vendor environment suggested that a move away from closed proprietary systems might as well be to one of hyper-openness in which a capacity to define solutions, provide an integrated offering, and embed some distinctive proprietary modules would be decisive in keeping customers tied to IBM.

Assume business strategies to capture the evolving advantages of the digital era are experiments or bets with uncertainty about their success, not investments with predictable returns. Then the question is, of course, why some companies make better bets, or more effectively conduct the process of experimentation that must carry them into the future. Possibilities must be seen as just that, hypotheses about the future to be continuously evaluated.[xix] Each era, one must note, has its own uncertainties and its own risks, whether it was the weather threatening ships or technical and business concerns shaping the build-out of electricity and telephone. Entrepreneurs in each epoch confront those risks and transform the possibilities into profits and growth. What is distinctive about this era is the pervasive and continuous uncertainty, in technical terms across technologies,

infrastructures, sectors and products, and with respected to the competitive environment, as competitors reach out for the strategy that will overturn the character of industry competition.

Towards the Experimental Corporation

In short, we conceive of digital-era corporations as fundamentally experimental in character. They have to maneuver in a competitive environment, in which the "sweet spots" for corporate success are constantly changing as company internal functions become products, products become commodities, and the sources of differentiation for products and processes are constantly evolving. To deal with this fundamental uncertainty, companies need to go beyond standard planning techniques and conceive of corporate strategy as a portfolio of "experiments" akin to the business model of venture capital firms, which succeed by managing a portfolio of investments to spread risk. In their quest to create value and search for the levers of advantage as traditional notions of stable "sectors" are dissolving, companies need to develop business cases on the basis of different readings of the future's strategic landscape. Investments into these business cases will turn them into experiments. However, these experiments remain largely "contained", because they will only be pursued as long as their underlying assumptions have not been proven wrong. Constant review procedures that monitor the continued viability of both the theoretical business case and its early practical application are called for. Managers must cull and systematically assess for evidence their own company's efforts and those of its competitors. As experiments in the face of quite fundamental uncertainty, these strategic choices are not bets and gambles.[xx] Rather, the formulation of corporate strategy becomes a consciously emerging iterative process.

The European Social Model Challenged – And Sustained?

The ever-evolving marketplace of the digital era will require companies to frequently re-cast themselves, what they produce, which markets they address, how they produce and deliver the good or service, how they are organized, and indeed, with more difficulty, whom they employ and where they employ them. The flexibility to move and to move quickly is key, but that puts great pressure on communities and polities. The final section of this paper argues European traditions of social protection can be consistent with the flexibility required for successful adaptation to the global economy.

Certainly, the ability of wealthy nations to stay wealthy in the digital era turns on the capacity of companies to adapt and adjust, to steadily increase productivity even as they remain competitive in the marketplace. The capacity of the firms to create value, and to increase the value they create, must grow if they are to remain capable of creating substantial and rising incomes.

What is called for from governments? Policy, of course, has a contribution to make to assuring the resources and building the capacities for corporate experimentation and strategic adaptation in the ever-shifting global era. Necessary policies range from the innovative to the obvious.[xxi] It is conventional to stress the centrality of state action in providing the secure infrastructure of the economy, both physical such as broadband lines, road and bridges, and in terms of the political and social institutions of the marketplace. The latter is particularly important; it encompasses the rules that permit companies to innovatively deploy resources and be rewarded for successful implementation in the face of risk and imagination. Good protections of intellectual property are basic provisions in this context. Furthermore, most analysts agree that state action can play a role in supporting the availability of those resources that are important for companies' experiments. To that end, governments are often called to support the provision of a skilled workforce, i.e. the talented, trained and educated people that corporations need. Ideally, governments would also provide centers of technology development and diffusion, at which some of the valuable human capital would work to reach out to companies and build – on the basis of public-private partnership – effective centers of creative imagination in support of formulating effective strategies of value creation. All this is, perhaps, obvious.

Crucial as well is the social flexibility and adaptability, the capacity to support and absorb the continuous change that the competitive companies will require. In an era of constantly shifting advantage and sustained experimentation, national performance in the digital economy increasingly rests on the two social capacities, each of which require considerable flexibility. They are a country's ability to sustain individual and collective learning processes and to implement – in a manner that assures real rising incomes – the business, social and technological innovations generated by these processes.[xxii]

Public Policies for the Digital Era: Towards a Politics of Experimentation

But how do we achieve social flexibility? The fear is that the goal of social flexibility for economic adaptation may require the destruction of social protections. Or can social protections be the basis of flexibility? Let us consider the question by revisiting the long-standing policy debate on the relationship of labor market flexibility and social protection. In the experimental economy, high-skilled labor will be necessary but not sufficient. Importantly, it will need to be sufficiently flexible to support the continuous corporate re-organization made necessary by experimentation.

Simple economic models referenced in the policy debate tend to treat labor as a commodity, as one of two or three key inputs into the production process. Policy recommendations formulated on the basis of such models stress the necessity of increasing the efficiency of resource allocation by removing rigidities that inhibit the matching of supply and demand through the price mechanism. However, this set-up of the policy challenge as a primarily technical issue avoids engaging with the central issues of the labor market adjustment in the digital era. To argue that in the experimental economy, workers have to be ready to switch their focus (and potentially locus) of activity at high(er) rates is one thing. To get workers to accept this reality and democratically support those public policies that sustain such a labor market regime is quite another. A narrow, technical conception of increasing labor market flexibility tends to produce analyses that fall into one of two camps pitted against each other. On the one side, there are those that equate increasing flexibility with the deregulation of the labor market, the removal of employment protection rules and welfare state retrenchment. On the other side, there are those that want to protect the welfare state as a cornerstone of postwar models of European democracy, which underwrites individual rights to liberty and equality through its property of selectively de-commodifying labor (see Schulze-Cleven 2005).[xxiii]

Do we need to make a choice between establishing the flexibility needed to adapt to the evolving economy and sustaining social protections against the vagaries of the market that make economic growth worthwhile? We propose that the mechanisms of social protection can be the foundations of market flexibility.

Social Protections in Support of Labor Market Flexibility

Social protections against market dislocations, in some cases coming in the form of agricultural protections and in others coming as welfare state programs, have played an important role for legitimizing markets and facilitating resource transfers. Systems of social programs have often facilitated the evolution of different country's agriculture-based economies to the industrial powerhouses they have become today. Particularly important, they have de-politicized the social transformation associated with economic development and modernization. Social protections have both pacified the losers of economic change and provided the population with an incentive structure that supported the competitiveness of a country's economy. Often, social protection systems themselves enjoyed broad based political support. A prominent example is the set of welfare state programs, which for a long time could offer something for all stakeholders. These programs offered benefits (such as redistribution and/or insurance) for the entire population and supported businesses' attempts to adapt to changing market environments, either at the micro-level of the firm or at the macro-level by de-radicalizing the national political game.

Many welfare state programs, which were originally conceived in a pre-digital era to support older production strategies, have now become dysfunctional, undermining rather than boosting current strategies of value creation. While the success of Fordist systems required Keynesian policy buffers to offset systemic political and production rigidity, the digital era poses a new set of political and production challenges. But the basic historical lesson for the public policy challenge still holds: Systems of social protection can play an important role in supporting economic adjustment. The processes of cushioning market shocks might, under certain circumstances, facilitate the workings of the market; or, to invoke a metaphor, there is no doubt that shock absorbers in cars do actually increase the cars' driving performance. We believe that systems of social protection continue to have a role in the current era. Of course, the displaced may fear and resist, but accepting the necessities of the broader economic adjustment is always easier if one see the possibilities of one's own place in that future.

The level and distribution of social protection, who gets how much, is not the only issue. The mechanisms of providing it have distinct consequences for the operation of labor markets and the political dynamics sustaining economic adjustment. Take, for example, Japan, France and Spain. In Japan, social protection is often embedded in private employment structures. One consequence

is that firm failure is "socially too expensive", in turn often leading to continued bank financing to prop up troubled companies. Achieving flexibility in the Japanese context would require unwinding the nexus of company/finance/social protection institutions (Levy, Miura, and Park 2006). In France, apart from the formal system of government finance social protections, the economy abounds with an array of "acquired rights," situations that embed privileges from taxi licenses through café licenses to protection of job locations. Social protection is embedded in the defense of particular social and employment arrangements (Cahuc and Kramarz 2004). In Spain, from the late 1970s onwards, the level of social protection and employment security has greatly diverged between labor market insiders and ever-larger numbers of outsiders, such as the unemployed and temporary workers. In the aftermath of Spain's transition to democracy, the first government introduced a set of wage-bargaining institutions that did not permit firms to set wages reflecting firm-level differences in productivity. Combining with a legal system that constrained firms from easily shedding excess labor, these institutions led to frequent company bankruptcies, a fall in output and spiraling unemployment. When in 1984 the government made it easier for firms to fire workers, these attempts strongly increased labor market segmentation, i.e. reinforcing the bargaining power and wages of insiders while concentrating economic insecurities among rising numbers of temporary workers (Watson 2006).

At the issue's most narrow framing, we can distinguish between two fundamental ways of protecting workers' against uninsurable labor market risk, either preventing worker lay-offs through employment protection legislation (EPL) or provide unemployment benefits (UB) (Boeri 2002). More generally, social protection systems can either substitute for the market, i.e. discouraging structural change, or allow the market to allocate resources and provide security through benefits post-allocation, i.e. encouraging structural change. In Continental European countries such as Germany and France, social protection systems are structured so as to protect the job-insiders with strict employment protection rules and shield the self-employed from competition. Outsiders – while often recipients of public social assistance benefits – tend to remain unemployed with little chance of re-integration into the workforce. In contrast, universalist systems such as the Danish one, tend to allow the market mechanism to efficiently allocate resources while "embedding" its workings within an environment that provides significant levels of social security.

To gain analytic leverage on this diversity, we need to distinguish the different dimensions of social protection systems. They diverge in at least four respects:

- Who is protected;
- The level and form of protection, an issue not just about the monetary amount but a matter of whether particular jobs or positions are supported;
- The mechanism of delivery, i.e. whether services are administered or cash granted;
- The influence on the operations of adjustment in the economy.

The same level of protection for the same groups of people can be delivered in very different ways with very different consequences. And the obvious aspects of these different ways are not always the most important ones. The politically most difficult controversies are often about social identity. Often what is in dispute is not just economic well-being, the level of support, but the social place of particular groups and jobs in the economy that turns on the character and form of protection. Social protection systems are not created equal, and while some definitely act as barriers to labor market flexibility, others might actually increase both the legitimacy of a flexible labor market regime and the actual mobility of the workforce. While particular systems of social protection facilitate the social adjustment necessary for the experimental economy, others hinder it. As a result, stripping social protections represents only one possible way of increasing labor market flexibility.[xxiv]

Security, Flexibility and Skills

The capacity to reconcile market flexibility and the social principles of security hinges very powerfully on how social protection is provided, not just who receives it or how much. This is evident when we consider two different aspects of labor market adaptation. One, already noted, is the question of providing social security to facilitate market functioning, the notion that labor market flexibility can be achieved with and perhaps through social protection. The other related matter is that of training, i.e. who is trained, in what form, and paid by whom as part of labor adjustment. We use the Danish case to consider each in turn.

The Danish notion of "flexicurity", i.e. combining the promotion of labor flexibility with the provision of social security, has attracted considerable attention in Europe (Sapir 2006, Zysman 2006).[xxv] In Denmark, a Scandinavian country with a long Nordic tradition of providing social protection as part of citizenship rights, the broad social foundation of protections seem to have

contributed to sustaining a political deal that makes it is easy for companies to adjust the sizes of their workforce due to the relative lack of employment protection legislation or collectively mandated rules. It is a system that is supported broadly by the various sections of society, not least because easy firing often translates into easy hiring.[xxvi] As a result, Danish job mobility levels match those of the United States and Britain, with median job tenure in Denmark at a relatively short 4.4 years, compared to 10.7 years in Germany and 7.8 years in Sweden. Interestingly, the Danes do not seem to fear the flexibility that companies expect from them. In an OECD survey conducted in 1996, the proportion of Danish workers not strongly agreeing with the statement "my job is secure" was considerably lower in all other sampled countries (OECD 1997, quoted in Madsen 2006). It thus seems clear that far from always acting as rigidities, which hinder the workings of the market mechanism through distorting price signals and raising the reservation wage, systems of social protection can – if designed correctly – underwrite a flexible labor market regime by both increasing the legitimacy of the economic system and delivering actual outcomes.

In our view, the Danish case can act as a demonstration for the possibility of combining economic modernization with European traditions of social protection.[xxvii] In fact, the Danes might have successfully updated the production paradigm of flexible specialization for the digital era. Denmark seems to have leveraged both long-standing historical legacies and more recent reforms of established systems of social protection for creating an environment that provides companies with the flexibility to experiment and facilitates both individual and collective learning (Campbell and Hall 2006, Lundvall 2002).[xxviii] Reforms in the mid-1990s updated a set of institutions, which had sustained a high degree of fluidity in the Danish labor market during the last 70+ years, through selective decentralization and the introduction of more competitive elements into a highly cooperative system.[xxix] Consequently, the Danish policy regime has become widely known as one delivering "flexicurity" (Wilthagen and Tros 2004), i.e. combining the promotion of labor flexibility with the provision of social security.[xxx]

Encouraging Skill Investments in the Face of Labor Market Flexibility

The story, of course, is not just one of 'protection from change' but 'preparation for change'. It is well understood that the skills required by future workforces will evolve constantly over the next years,. Lifetime jobs are giving way to careers of shifting position. The knowledge one has at

entry in the workplace will not suffice. Skills, and skill training, will become all the more important as lifetime employments give way to a sequence of shifting positions.

Investment in skills is an important aspect of the ability of workers, of any sort, to adapt to changes in job requirements. It is, as we all know, a real element of labor market flexibility. Again, as with security against the dislocations of the marketplace, the absolute level of spending is only one part of the story. Again, the questions relevant to labor markets include not just whether there is investment in skills or what the level of spending is. Rather, it is important who pays, what kind of training is provided, and which obligations might be involved. Our intent here is not to propose a "correct" scheme of training, or explore the proper balance between "general knowledge" and "firm specific skills". The purpose is, rather, to emphasize that "how" training or skilling are provided is a central matter.

As a means to emphasize the importance of the mechanisms, the how of delivery, let us consider the balance between "general knowledge" and "firm specific skills". Recent research has pointed out that systems of social protection can provide workers with important incentives to invest into skill sets that are specific to companies or sectors (Estevez-Abe et al 2001). Prominent examples range from the study of certain engineering methods at the university level to the completion of narrowly defined apprenticeships. In the absence of generous unemployment insurance schemes, a rational worker would choose to invest in general skills, such as they are provided in management training. The reasoning is simple: The more general the skill set, the easier it is to find a job and minimize dependency on unemployment benefits; also, more general skill sets are less threatened to become outdated by technological change (Iversen 2005). However, the aggregation of these rational individual choices presents a collective action problem. Economies, experimental or not, need workers with highly specific skills to develop new products in support of economic growth.

Workers' incentives for skill investments are arguably becoming more important than they have always been, because employers' incentives to invest in training are likely being reduced in the new age of labor market flexibility. At least this is a possible and logical conclusion to draw from the empirical findings of another body of comparative empirical research on the political economic consequences of the positive relationship between employers' incentives for human

capital investment and the stability of employment relationships. In the digital era, experimental companies desperately need a high-skill workforce, but they continue to want their investments in human capital to pay off for them and not their competitors to which their employees might well move. A standard comparison has long been that between Germany and Britain. In Germany, a high degree of employer coordination has long sustained both industry-wide collective bargaining, which has encouraged longer job tenures through restricting the scope of worker poaching by competing companies, and a vocational training system run jointly with unions and state authorities, which provides even smaller companies with the capacities to train their new workers. In contrast, companies in the flexible British environment never successfully solved their collective action problem of investing into the broad up-skilling of the national workforce (see e.g. Thelen 2004). The respective success of national business communities in generating high-skill workforces have deeply affected the production strategies that individual companies could adopt and the types of wages they were able to pay. While German companies could embrace the strategies later described as diversified quality production and flexible specialization (Streeck 1991), British companies have tended to go the low-skill, low-cost Fordist route that very quickly brought them in direct competition with producers from newly industrializing countries (King and Wood 1999).

With shorter job tenures in the digital era, employers' human capital investment decisions are made on the basis of shorter time horizons for potential amortization. This development can have important consequences. An undesirable scenario would be the one that has played itself out on the Iberian Peninsula. With strong incentives to reduce labor costs through using temporary workers, Spanish companies are much more likely to adopt a low-wage/skill production strategy. In turn, their productivity has slipped. In contrast to the Spanish trajectory of consolidating the position of labor market insiders at the expense of ever-larger numbers of outsiders such as the unemployed and temporary workers, Portugal adopted a set of policies that facilitated employment adjustment rather than the maintenance of the wages and benefits of current workers. Although Portugal's 'flexible' strategy of low-wage economic growth has arguably limited the spread of unemployment by maintaining employment in low-skill, labor-intensive sectors such as textiles and ceramics, it has not provided a stable basis for growth in high value-added sectors. As a result, Portugal faces rising competition from new EU and other industrializing countries, which have higher-skilled workforces and lower wages (Watson 2006).

However, the contrasts between high-skill and low-skill production strategies might at least be partially over-drawn, and rather than reducing company-sponsored skill investment, shorter job tenures might merely be associated with new forms of employer-sponsored skill investments. In combination with the increasing pace of technological change that leads to accelerated outdating of skill sets, shorter job tenure rates might make unsustainable the heavy reliance on intensive skill investment at the beginning of workers' careers of German-style two to three-year apprenticeships. At the same time, efforts to frequently re-skill workers might remain viable and indeed very important, in particular as these are focused on specific tasks in the spirit of continuous employee and organizational learning. Interestingly, continuous re-skilling is another area in which Denmark excels. In contrast to other European countries' apprenticeship programs, the Danish system does not concentrate on vocational education and training at the beginning of workers' careers. According to EU statistics, Danish workers spend more time in training and skill formation programs than workers in any other member state of the European Union.[xxxi]

Again, Denmark serves to demonstrate that a tradition of social protection can be reconciled with the necessities of market flexibility. Flexibility does not require removing social protections. Consider that Denmark is the country with the highest labor market mobility and training rates on the European continent and also the OECD country with the highest level of employment policy expenditures. In cases of unemployment, the Danish system offers generous replacement levels for limited periods of time, so that individuals can search for the most suitable job for themselves rather than having to take the first available one for lack of personal financial liquidity. Furthermore, individuals, who do not find new employment within this period, are required to join training schemes to remain eligible for public support. Public expenditures for training and unemployment benefits are high, but they constitute an investment into the future of the affected individuals and the productivity of the country. In contrast to the mixed record of active labor market policy in other countries, the Danish system seems to work well, not least because companies can shape the programs to meet their local needs.

In turn, on the micro-level, Danish businesses seem to have an extended set of options for organizing their activities. In comparison to their competitors, they can grant their workers more autonomy, leaving them with more discretion for decision-making unconstrained by hierarchical

supervision systems (Dobbin and Boychuk 1999). Lorenz and Valeyre's recent analysis of European data demonstrates convincingly how a new corporate 'learning' model with these organizational features is more prevalent in those countries with universalist systems of social protection.[xxxii] Through tapping into individuals' knowledge to provide organizational flexibility, the learning model provides a good basis for experimental corporate strategy.[xxxiii] For instance, Campbell and Pedersen (2005, 25) invoke the characteristics of the learning organization in their explanation of the Danish success in niche market opportunities in the global economy. They attribute Denmark's position as a world leader in the production of wind turbines to the "incremental innovations in wind turbine technologies that Danish firms developed through close collaborations with their customers, production workers, and engineers who continuously experimented with and developed improved blade and turbine technologies over the years."

In Lieu of a Conclusion: The Agenda for Europe

This essay makes two arguments. First, countries and companies face an ever more volatile competitive marketplace. They have to maneuver in a competitive environment, in which the "sweet spots" for corporate success are constantly changing as company internal functions become products, products become commodities, and the sources of differentiation for products and processes are constantly evolving. This new "formula" for corporate success requires a social capacity for flexibility and adaptation. Second, social protections often serve as essential sources of social capacity for adaptation and change. There is not an inherent contradiction between social protections and market flexibility. The essential issues are how those protections are organized and delivered. The dilemma of many continental European countries to provide "welfare without work" (Esping-Andersen 1996, Scharpf 2001) after a history of "adjusting badly" (Manow and Seils 2000) is only one possible outcome. To the contrary, if adapted rather than abandoned, European traditions can be the basis of continued growth and productivity in a competitive marketplace.

It has always remained outside the scope of this paper to advance specific policy recommendations. Writing in the United States, we feel hesitant to prescribe solutions – for that task we defer to our European friends. In an insightful recent piece that appeared as we were editing this essay, André Sapir (2006) advances policy recommendations on the basis of an intellectual framework that seems compatible with ours. In his view, only the Scandinavian and

Anglo-Saxon variants of the European Social Model will in the end be sustainable, leaving those countries that make up two-thirds of the GDP of the entire EU-25 with a list of necessary reforms. Sapir seems to agree with us that Denmark might have valuable lessons to offer. While reforms will in the end involve a fair share of deregulation and liberalization, we strongly believe that one should not forget about the potential efficiency-enhancing benefits of pre-exiting institutions such as the systems of social protection (see e.g. Ornston and Rehn 2006). Europe has benefited from them in the past. Our analysis leads us to believe that reforming – rather than scrapping – them will best support economic adjustment in the digital era.

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[i] This section is adapted from Cohen, DeLong and Zysman (2000).
[ii] This section is adapted from Zysman (2004a, 2006). See also Zysman (2004b)
[iii] The distinctive features of the Japanese lean production system were a logical outcome of the dynamics of Japanese domestic competition during the rapid growth years, and this system was firmly in place by the time of the first oil shock in the early 1970s. For example, Japan's automobile and electronics firms burst onto world markets in the 1970s and consolidated into powerful conglomerates in the 1980s. The innovators were the core auto and electronics firms who, in a hierarchical manner, dominated tiers of suppliers and sub-system assemblers; the production innovation was the orchestration and reorganization of the assembly and component development process. The core Japanese assembly companies of the lean variety have been less vertically integrated than their American counterparts. Rather, they have been at the center of vertical Keiretsus, loosely speaking, Japanese conglomerates conventionally understood to be headed by a major bank or consisting of companies with a common supply chain linking wholesalers and retailers, that have tightly linked the supplier companies to their clients. It cannot surprise that lean production became a focus of American policy and corporate attention because it represented a direct challenge to both mass manufacturing and assumptions of American global economic policy.
[iv] The argument is simple: The relationships of production and development in the Japanese production system are so delicate that measures to steady and smooth the expansion of demand in sectors such as autos proved very important for the success of the production innovations (see Tate 1995). In Japan, public programs generated domestic rivalries

that lead to over-investment and excess capacity. This excess capacity was then "dumped" off of on international markets. Just-in-time delivery, subcontractor cost/quality responsibility and joint component development pushed on to the subcontractor considerable risks of demand fluctuations. It remains questionable if Japan's emerging auto sector could have continuously absorbed the stops and starts of the business cycle that typified Britain in the 1950s and 1960s. Would the trust relationships that are said to characterize Japan have held up? Could the fabric of small firms have survived to support just-in-time delivery and contractor innovation? Techniques to continuously reappraise demand levels and reduce unpredictability throughout the system as well as government and corporate programs to reduce the capacity break-even point in small firms only go so far.

[v] This section is adapted from Zysman (2006).

[vi] For example, print, broadcast, and communications suddenly become integrated with the possibilities of search and storage of information thrown in. Some argue that the moveable type contributed to the social revolution of the Renaissance, with the obvious question of whether the social consequences of these radical information technologies will be of similar historical scale.

[vii] Thanks to Stuart Feldman of IBM for his presentation at the Innovation Alliance: Succeeding in an Evolving Global Economy conference, Berkeley Roundtable on the International Economy, Berkeley, August 27, 2004.

[viii] Consider finance where the application of sophisticated mathematical tools to the creation of financial products and online transactions replace the ties to our local banker, transforming distinctive advantages into commodities and creating a new basis for premium products.

[ix] Many of the engineering schools are rooted in science based engineering, solving engineering problems by working with fundamental principles. The Bayh-Dole Act pushed universities into "marketable" technologies developed with federal funding. An array of mechanisms, from licensing through facilitating "spin-offs" to institutions for joint development, have been established at the major technology universities to facilitate ties to industry. In addition, companies turn to the start-ups or spin-out the development of particular elements of products or services, because they feel that many projects are best developed outside the traditional hierarchy of a major company. Firms from Intel through Nokia to IBM establish mechanisms, including their own investment companies, support startups as an approach to technology development and an alternative to internal development.

[x] Companies set up joint product development projects with other companies, basically combining technology strengths. They also establish technology development outposts both to monitor developments and to tap into distinctive pools of talent and technology around the world.

[xi] Often disruptive technologies, which are capable of supporting newcomer entry into the market, are difficult to develop by established companies in-house (see Christensen 1997).

[xii] "Manufacture: To make or process (a raw material) into a finished product, especially by means of a large-scale industrial operation. To make or process (a product), especially with the use of industrial machines. To create, produce, or turn out in a mechanical manner. To concoct or invent; fabricate. To make or process goods, especially in large quantities and by means of industrial machines." Source: The American Heritage® Dictionary of the English Language, Fourth Edition (Houghton Mifflin Company, 2000).

[xiii] The critical question, once we acknowledge that software production is a form of manufacturing, is what are the most effective ways of organizing software production. For this discussion, the list begins with the conventional questions of whether to outsource, of where, geographically, to locate software development. The story becomes interesting when we ask whether to choose conventional hierarchical production structures typified by Microsoft or new alternatives such as the commercialization of Linux products developed in an open source model.

[xiv] On-line the issue of trust is even more important. Here the possible anonymity of the market participants, the difficulty of imagining recourse to a virtual participant, makes trust essential. It is that problem which E-bay has so cleverly addressed.

[xv] The result, of course, is a policy struggle about what information can be gathered, shared and combined. The wishes of companies and governments to assemble information from diverse sources into consumer profiles or threat assessments is set against individual rights for privacy and community needs for the integrity of the individual.

[xvi] Thanks to Emilie Lasseron for this observation. She is currently developing these ideas further in her work on user-centered design in a digital age.

[xvii] In the bookseller market, the *Borders* and *Barnes and Noble* chain stores in their brick and mortar form are more of a threat to the local vendor than Amazon. Indeed, venture capitalists behind Amazon report that the original investment was an "experiment" in the consequences of internet-based retail marketing by new entrants, disintermediation. The conclusion they drew early on from Amazon was that there were sharp limits to the retail possibilities the tools provided. Similarly, the telecom collapse hinged on faulty notions of how data networks would be used. A most evident false notion was the asserted belief in the staggering and continuing expansion in the use of bandwidth to carry entertainment content. The image was often that the consumer net would become a sophisticated

vehicle for centrally distributed content. However, the error is evident in the history of the American post office. The post office in the United States was established to distribute newspapers, but the killer application that supported the system was letters, peer-to-peer communication to use today's vocabulary (Zysman 1998). Communication, not just voice but messaging and video meetings, and peer-to-peer exchanges are likely to be the killer applications.

[xviii] Alternatively, consider pharmaceuticals. If NextGenPharma sells a drug to be dispensed by a doctor or hospital, or sold in a pharmacy, it is producing a product. With gene mapping and molecular analysis, we are moving toward the possibility of a service model of therapies adapted to particular physiologies. If NextGenPharma really is a database company with a store of detailed molecular-level drug information and genome functionality, it could sell an online service to customize drugs or therapy.

[xix] Certainly the dotcom era bubble reflected greedy projections of assumption rarely reassessed of greed and hope. In fear that the "moment" would pass by, images that were projections of possibilities were taken as solid facts.

[xx] Op. cit. Eliasson. Note that this argument is consistent with and now draws on the framing argument of Gunnar Eliasson (1991).

[xxi] However, state action is not the solution; indeed, it never was. It is an important part of a regional development strategy that needs to span both the public and private sectors. The history of most crucial developments in the digital era – the development of the internet being among them – is one of the interplay of both public purposeful action and user-driven innovation enabled by deregulation. Private actors will (have to) continue to be the source of much of the needed entrepreneurialism.

[xxii] See Cohen et al (1984); This argument is also being developed in work on regional growth by Stowsky, Nielsen, and Zysman. A current take can be found in Zysman and Newman (2006).

[xxiii] Framing the debate about increasing labor market flexibility as one of maintaining-versus-retrenching the welfare state is unfortunate, because it masks the real issues. Labor as a commodity has such special properties that the existence of regulating institutions can actually increase the efficiency of labor allocation, especially in the widespread presence of information asymmetries (Spence 1972). For example, it is a highly differentiated commodity, because human beings differ greatly in both their accumulated skill sets and willingness to employ them (Iversen 2005). Furthermore, Polanyi (1944) argues that labor is merely "fictitious commodity", because it that is not produced for sale. Neither from a theoretical vantage (Marsden 2003), nor from an empirical perspective (Freeman 2005), do deregulation and reductions in social benefits seem to increase labor market performance. The debate, as it often structured, fails to recognize the positive incentives provided by many welfare state programs. Indeed, they are incentives that will prove important for companies' success in the digital era.

[xxiv] The academic literature on the different regimes of welfare capitalism provides a good starting point for an inquiry into the different incentives for social mobility provided by countries' systems of social protection (see especially Esping-Andersen 1990). Importantly, in the process of studying this literature, we do not need to buy into the literature's frequent normative biases that prompted Philip Manow (2002) to invoke the title of one of Sergio Leone's famous Spaghetti Westerns for his characterization of the comparisons between the universalist Social Democratic regimes of Scandinavia, the low-spending Liberal Anglo-Saxon countries and the high-spending but stratifying conservative systems of Continental European countries as a competition between "The Good, The Bad, and The Ugly." Protecting current employment turns out to be harmful with respect to both efficiency targets and the legitimacy of a flexible labor market regime, while protections against the negative effects associated with unemployment can jointly enhance mobility and efficiency (Hall 2006).

[xxv] For a good overview piece on the Danish "flexicurity" regime, see Madsen (2006); for a more theoretical and comparative perspective, see Wilthagen and Tros (2004).

[xxvi] The Danish Confederation of Trade Unions stresses that "Danish companies are more willing to hire new employees in times of economic revival than their European competitors, who have trouble letting off workers when the economy goes downhill again (Fuller 2004)."

[xxvii] The economic success of Denmark in the current market environment has come as a surprise to many analysts. As recently as in 1990, influential business analyst Michael Porter predicted Denmark's certain decline on account of its outdated political economy. Now, with employment and growth numbers envied by many other European countries, politicians and academics have started to speak of the Danish 'miracle' (Nielsen and Kesting 2003, Schwartz 2001). Such talk is partially due to the relative inability of established frameworks to account for the Danish success story. Denmark could not build on a legacy of high-technology industries or homegrown multi-national corporations such as neighboring Sweden. Rather, Denmark's performance largely rests on small and medium-sized enterprises in sectors that were originally seen as being mature, generating slow growth and exhibiting low technological intensity. With the analytic framework developed in this essay, we can get a handle on understanding why the country was able to weather the storms of the digital era.

[xxviii] Among the legacies being invoked by various analysts are the social cohesion stemming from the particulars of the Danish history of nation-building (Campbell and Hall 2006) and the high degree of concertation flowing from Denmark's small-country size (Katzenstein 2006, Nielsen 2003). Kristensen (2006) stresses the role played by Denmark's worker training systems and the peculiar organization of the systems of social protection in creating the high degree of fluidity that has characterized the Danish labor market for almost 75 years.

[xxix] In the process, the degree of strategic rationality displayed by Danish elites in their reflection on the Danish performance in the digital era is most remarkable (see Innovation Council 2004, FORA 2005). On the basis of the country's small size and a strong corporatist tradition, Denmark's policy networks display strong public-private links and a high degree of coherence. In such a context, formulating a "national strategy" seems an entirely realistic vision, an assessment shared by many Danish decision makers. This outcome has been achieved in an environment, in which 76 percent of Danish workers were union-members in the mid-1990s, and collective wage-bargaining has a very strong tradition. Indeed, while recently yielding more scope for decentralized decision-making, collective agreements have played an important role for delivering flexibility in another dimension of labor deployment. Since 1965, these agreements have included provisions for flexible working hours, which – after further expansion in 1995 – also place the Danish labor market among the most flexible in Europe with respect to work scheduling (Campbell and Pedersen 2005, 16-20).

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[xxxi] Importantly, three changes in the 1990s have further increased the efficacy of these programs. First, the vocational training system was opened to the unemployed with the goal of using the economic downturns to upgrade their skills, making it in turn more attractive for companies to hire them during the next upswing. Second, union-employer negotiations over the organization of the blue-collar training curriculum were decentralized, so as to target skill acquisition more effectively to local needs. Third, new skill upgrading programs were introduced to allow workers to spend more time away from work. This measure increased the level of competition among technical schools and raised the quality of the training provided (Campbell and Pedersen 2005, 21-26).

[xxxii] The analysis was conducted using data from the third European Survey on Working Conditions (Paoli and Merllié 2001). To arrive at this conclusion, the authors distinguish between the 'lean' production model, originally theorized by Womack et al (1991), and the newly conceptualized 'learning' model as corporate organizational templates geared towards the competitive marketplace of the digital era. While both models display stronger learning dynamics and higher problem-solving activity on the part of employees than either taylorist or pre-Fordist traditional organizations, the learning model constitutes a distinct way of delivering flexibility and cooperation within the company. Companies organized along the lines of the lean model display such attributes as the strong use of teamwork, job rotation, quality management and multiple work pace constraints. In contrast, the uniquely socially embedded learning model is more decentralized and grants employees a high degree of autonomy. According to Lorenz and Valeyre, the learning model builds on local traditions in work organization, for example, the Swedish socio-technical principles of the 1970s. For a review of Lorenz and Valeyre's findings and a discussion of their implication for research in Comparative Political Economy, see Schulze-Cleven (2006).

[xxxiii] For example, Sabel (1994, 136) reports that shop stewards in the metalworking industry invented new payment, training, and job classification systems to increase the flexibility of production and the general skill level among workers.