How Revolutionary is the Revolution: Will there be a "Political Economy" of the Digital Era?

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The purpose of this paper is to consider whether there is a political economy of a digital era. Our concern is how the digital revolution influences the role of the State in society and the economy and the politics that surround it? In the spring of 2000 in the midst of the stock boom we would have asked: "Is the extraordinary expansion of computing intelligence, the pervasive spread of digital networks, and the recent arrival of the commercial Internet, the edge of an historical revolution, a transformation?" Data networks had existed for decades and Business to Business commerce (B2B) had been conducted over these networks for years. But the sudden interconnection of disparate networks into a single "cyber world", and broad consumer participation in those networks through vehicles such as AOL seemed to augur a new era.[i] The pace at which individuals, not just firms, were being connected to the Internet in the United States was explosive. Businesses were reorganizing and extending internal activities to capture the possibilities of the network of networks. Together the Internet's rapid build out encouraged the fantasy that the new information network technologies could, in themselves, transform the terms of competition and restructure a broad range of the economy. By the summer of 2003, the conventional question had become different: "Was this the revolution that never happened, the dreams evaporating with stock values, first during the dot com collapse and then in the telecoms debacle?" Did the digital revolution have more in common with tulip speculation, a pure ephemera, than the railroad expansion and transportation revolution that created and destroyed individual fortunes.[ii] Of course, the industrial revolution did not end with the first textile company failures, nor does the digital revolution end with the dot com collapse.[iii]

We ask as we begin, what is the digital, or the information technology revolution? The Internet, as significant as it is, is simply one phase in that story. The digital revolution as a technological transformation rests really on three pieces:

- **There is a conception that underlies the whole thing**: the information revolution begins with the notion of information as something that can be expressed in binary form.iv Within that overarching conception, we speak of the "software" that manipulates digitally represented information.[v]
- **The equipment: the hardware and the software:** The hardware, the equipment, that executes the processing instructions, has evolved from the era of vacuum tubes through individual silicon transistors through integrated circuits

implemented on silicon wafers and may evolve into other physical manifestation. The software consists of written programs including procedures and rules that guide how the hardware equipment processes information. As the capacity to process digital information grows, the software that structures that processing and makes the calculating capacity useful evolves as well.

- **The data networks that interlink the processing nodes, and the network of networks** that together create a digital community and society.

The dot com boom, and the crash associated with it, are not a self contained story, rather they are one episode in this longer digital revolution.

We use two starting points for our effort to situate the digital revolution and the role of the State in the digital revolution, one economic, leading sector, and one political, the "great transformation". *First*, the digital revolution is *a "leading sector"* that drives the economy and transforms society. What we ask is required from the State to sustain growth in this era of digital development? We ask, to turn that question, how does the digital revolution alter the policy requirements for development, the character of economic competition, and the place of the State in economic competition amongst countries.

Second, do the political rules of state and polity shift in significant ways with the digital revolution? To drive the discussion, perhaps in heuristic exaggeration, we ask whether the digital era marks *a second Great Transformation*.[vi] The industrial revolution was not a technological story, but an outcome of a basic "transformation" in the organization of economy and society that took place. By the "Great Transformation", we mean a fundamental and basic shift in the rules of society that alters the way economy and polity operate. There is one classic example, the great transformation that begins in England. In this case, the creation of the commodities of land, labor, and money defined the establishment of a market society. Before that transformation there were markets, but they were adjunct to the society. Those markets, the traders and the burghers that defined them, were in a secondary position to the landowners. Peasants were tied to the land; and land was encumbered by its social position in a political order. For landlord, peasant, and burgher, position in a politically defined social community defined access to opportunities and to earn income**.** The market system stood these relations on their head. Land and labor became commodities to be bought and sold in the market. Social position could move in relation to what was captured in the market. The

argument here must be that digital tools open the possibility for such a profound reformulation of the rules of society and polity. The political fights are about providing the inputs necessary for the construction of a market in the digital era; responding to negative externalities generated by the new market; and constructing systems of international governance that permit global marketplaces. Does the changing character of information and its expansion as a core commodity do the same for a digital era, opening at least the possibility of a second Great Transformation?

Two social/economic aspects of the digital technological revolution are distinctive and deserve mention at the outset of our story. First, knowledge, particularly theoretical knowledge, has been recognized as an essential element of the contemporary economy.[vii] 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. Digital technology represents a set of tools for thought that manipulate, organize, transmit, and store information in digital form.[viii] In so doing they extend the range of what can be constituted as formal data. Expressed in digital form, information becomes a commodity that ever more readily and extensively can be transmitted, manipulated, stored and sold as an object. 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.

Second, polities can be represented in part as systems of decisions based on information, albeit selectively available; markets have often been presented as systems of exchange based on information, and communities can be conceived, and indeed expressed, as flows of communications including how information is transmitted and to whom. Whether information moves by phone, by letter, or face to face shapes the very character of communities and markets. If information that was once available only by participation in community groups is suddenly available in the isolation of the home over the network, the patterns of community interaction are changed. It is not just that communities are altered as digital technology emerges and shifts the flows of information, but rather that the rules about digital technology are directly and simultaneously rules about the community. Decisions about the rules of information – be

they intellectual property or privacy or market transactions -- are, whether intended or not, at once decisions about broader social values. The counterargument would be that infrastructures often have the consequence of structuring markets and community. Decisions about where to put freeways or public transport systems influence how a city's labor markets work, who will have jobs and who can live where. Is digital technology simply another instance, or different in kind? Is digital technology all this and more? Who has access to broadband technology, for example, influences who has access to pools of information. But as powerfully the rules for information technology touches directly and immediately into our notions of self, indeed whether we can protect our very identity from use by others; shapes our social autonomy and privacy, determining the relation of the individual to the government and to private economic power; and indeed will determine affects the foundations of property on which the economy rests. Thus decisions made about narrow business problems in information technology are decisions about information in the community and polity as well. The choices are not sequential or derivative; they are coterminous.

Part I: The State in the Digital Economy

What is the economic role of the state in a digital era? The answer will turn around the role of information and how it can be used; how it can be used to segment markets, control machines, influence decisions. We take three steps to locate the place of information and hence the distinctive economic role of the state at home and abroad in a digital era. Each step also informs us about the character of the digital revolution itself. The Digital Revolution is a leading sector, plus, a renewable revolution. The State has an ambiguous role in the creation of this disjuncture, at once interventionist and deregulatory. Next, we situate the digital transformation in historical perspective to seek a distinctive role for the state. An elaborate discussion of the evolution of a digital era of value and production helps us identify which inputs are needed for construction of the marketplace and the externalities that are generated to which groups respond. Finally, economic development does not occur in national isolation, so we consider the role the State in creating markets and standards in a so called global and liberalizing economy.

A. The Renewable Revolution

The Digital Revolution as Leading Sector. A leading sector has two evident features that make it a driver that reshapes the economy; demand and transformation. First, *demand;* new products and services in the leading sector drive demand in the economy as a whole; demand for the goods in a leading sector grows faster than the economy, as a whole, and indeed demand for the products and services made possible by the new digital technology has been part of growth and transformation in the advanced economies in the latter part of the 20th century.[ix] Producing those new innovative goods creates chains of linked, and inter-linked, activities. The surge initiated by the leading sector involves not only new technologies embedded in leading sector products but new infrastructures for making and using the technologies. The production chains are evident; for example, steel for cars and trains, roads and rails for those cars and trains to move on, petroleum and coal to drive the trains, and coal to make the steel.[x]

Just as the industrial revolution rested on a revolution in tools and power, the core of the information technology sector is the creation and production of a new tool set, tools for thought, and the chains of activities that are then generated. Information technology, tools for thought, as Steve Cohen, Brad deLong and I have argued, are the most all-purpose tools ever.[xi] These tools manipulate, organize, transmit, and store information in digital form. They are used to calculate, sort, search, and organize. That calculating, sorting, searching, organizing creates a set of information services and information products, and powerfully, sets of tools for the application of information to industrial as well as machine processes.[xii] The "tools" for digital manipulation of information, the tools for thought, apply this capacity to an ever wider array of tasks. There are at least three separate lines of tool development: 1) The growing processing capacity of the hardware, the individual tools, 2) the evolution of the instructions, the software, that applies those capacities, and 3) the networks that link the tools and the information. That interlinkage among these information processing tools is not just communication among people, or of human being control of machines, but interlinkage of machines as well. Processing tools, the software that shapes them, and the network inter-linkage of these individual tools certainly represents an array of capital goods, capital equipment, in what we label the information and telecommunications sector of the

economy. The production of those tools, information technology, becomes itself a sector in the economy.

Second, *transformation;* those same leading sector products and services alter production, organization, and location in the rest of the economy. Information technology tools manipulating thought and information can be applied to almost everything, almost everywhere.[xiii] Those "tools for thought" in turn permit new information products, change the production and distribution of more traditional goods, and alter the markets for both information goods and traditional goods. Those tools create the capabilities to process and distribute digital data, multiply the scale and speed with which thought and information can be applied. IT tools can affect every economic activity in which information sensing, organizing, processing, or communication is important--in short, every single economic activity.

The widespread expression of information in digital form, a critical aspect of this transformation, has at least several implications. Precisely 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 become integrated, or at least more intimately influence each other. 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. Is there a parallel here? *Next*, the knowledge component of much of industrial activity can now be formalized, codified, and made actionable. Industrial processes once defined loosely as know-how can more readily be expressed in digital code, and made actionable. Examples would include auto braking that could be understood abstractly, but acted on only imprecisely by human intervention or through analog control solutions.[xiv] Information technology has then both moved inside of machines, controlling their functionality, and moved out into the communications networks, altering not only how and at what price we talk, but how we share, store and use information. *Finally*, the new tools change the price for applying information in different economic setting. Most obviously the decreased communication costs should reduce the costs of conducting transactions, of gathering and applying information; as these costs drop, organization changes. This is not simply a matter of how more easily to

manage geographically distributed organizations with sales and production strung out across countries with information moving smoothly across corporate networks. Networks facilitating large scale file transfers and the expression of production orders in digital form, for example, permit not only the geographic separation of semiconductor design from production, but the separation of these two functions into separate companies. Production management more generally is altered.

But we must ask, does the build out of the IT sector look different from leading sectors in other historical periods? We need to cut through the hyperbole that accompanied the dotcom boom. Sofia Peretz has argued that each technological revolution, an era in which an interconnected package of technologies emerged, followed a common format. Simplified, a phase of technology revolutionary eruption leads to a phase of diffusion of a new "paradigm" compelling changes in organization, infrastructure, and policy followed by a new normalcy. Periods of financial speculation and burst are followed by the reintroduction of traditional investment.

What would be different here? Does the ICT sector pull harder, represent a larger chunk of new demand than in previous instances? Is it a greater portion of the economy influenced as these new tools are taken up? Are those tools more pervasive? De long argues that in its sheer scale relative to an existing economy, the IT revolution is greater than the textile boom of the original industrial revolution.[xv] He argues in fact that the present digital revolution is an order of magnitude greater in its economic impact than the original industrial revolution. But that is delicate to measure and its political consequence is at best ambiguous. Or, second, is the pace of productivity increases changed as a result of the IT sector, the gains achieved from a given investment. The debate is wide open, there is no firm conclusion on which we as social scientists could build broader arguments about an unfolding digital era. Thirdly, and more certainly, there have been enduring changes to the way competition in the marketplace takes place, who is competing with whom about what.

What seems most significant is that information technology represents not one, but a sequence of revolutions. It is a continued and enduring unfolding of digital innovation, sustaining a long process of industrial adaptation and transition, The original innovation, the transistor, really represents an initial step in a sequence of innovations;

the functionality of original transistor being not even a hint of the functionality that would follow.

> In the 1960s Intel Corporation co-founder Gordon Moore projected that the density of transistors on a silicon chip--and thus the power of a chip--would double every eighteen months. Moore's law, as it came to be called, has held. Today's chips have 256 times the density of those manufactured in 1987--and 65,000 times the density of those of 1975. This continued and continuing every-eighteen-month doubling of semiconductor capability and productivity underpins the revolution in information technology. The increase in semiconductor density means that today's computers have 66,000 times the processing power, at the same cost, as the computers of 1975. In ten years computers will be more than 10 million times more powerful than those of 1975--at the same cost. We now expect--routinely--that today's $1,000 personal computer ordered over the Internet will have the power of a $20,000 scientific workstation of five years ago. And what was once supercomputing is now run-of-the-mill. The past forty years have seen perhaps a billion-fold increase in the installed base of computing power. [xvi]

The conventional economic explanation of a leading sector is that the original innovation creates a set of opportunities, somewhat like distributing money on the ground. Some radically valuable possibilities, the larger bills, are picked up first; the smaller opportunities captured later. But the original technological revolution loses force as the most valuable opportunities are picked up and implemented. The notion argued in this paper here of course is that the revolution is renewed, if not with each cycle of Moore's law, certainly with the radical increases in computing power generated in a very few years. An original transistor, a single bit, bears little relationship to a 16 kilobit integrated memory chip bears, and indeed the integrated circuit was by some accounts the radical first step. That 16k chip bears some relationship to a 256 kilobit chip that is two Moore cycles further along. Somewhere, along some scale, we could work in a comparison of a Model T to a contemporary car. But that would understate the scale of change. A gigabyte chip with a billion transistors is another thing altogether, and it is 5 Moore cycles, less than a decade along the road from the 256k. And Moore's law has at least several more cycles to run. The technological revolution is renewed every decade or so, would be the argument. The currency is redistributed on the ground. The

implication here is a sustained role for the State in the creation and continued elaboration of the digital era.

What role for the State? The State's role has been powerful in the unfolding of the digital era, but extremely varied. From the *American* story of the emergence of the Internet itself, just note two examples about the relation of state and economy in the digital era with starkly conflicting messages. First, the creation of the Internet was simultaneously the product of *purposive intervention,* government action by the Defense Department's Advanced Research Projects Agency's, and *aggressive deregulation/re-regulation.* DARPA (the original acronym was ARPA, Advanced Research Projects Agency) seeking to protect defense communications from nuclear interruption funded the creation of the underlying conception and protocols of the Internet.[xvii] Government managed that network through the National Science Foundation and then prepared it for transfer to commercial use. It was, though, the aggressive introduction of competition into a private utility playing a public role, ATT, under the label of *deregulation* of the telephone system, which unleashed user-led, and consumer based, innovation in data networks. That opened the way to user-generated networks and facilitated the radical and rapid spread of Internet technology.[xviii] The *European* Story would likewise highlight these twin roles. Simplified, one part of the story is deregulation of the telecommunications system led by the Europe Commission. The Commission created national coalitions for European wide rules that would compel the transformation of State administrations responsible for post and telegraph into regulated companies in at least partly competitive market.[xix] The other side of the story is an array of directed state actions intended to develop and diffuse digital technology. Dramatic was the development of the foundations of the World Wide Web at CERN, the Center for Nuclear Research.

Government intervention has continued but taken on a different flavor with the state sponsored transition to high-speed broadband connectivity. The original consumer use of the Internet could expand so suddenly because it could be deployed over the existing telephone infrastructure. Put a modem in your computer and just dial into an Internet Service Provider (ISP). Dial-up modem's provided adequate access for enough applications from home or small office to the higher speed digital backbone to induce the

rapid adoption of the technology. In the original Internet policy days, it was possible to accelerate use just by deregulating and allowing the new networks to "interconnect". However, downloading music or playing videos over the Internet require a different infrastructure, unless you want to join what came facetiously to be called the World Wide Wait. That infrastructure is loosely called broadband, with broadband typically referring to anything faster than what you currently have, and in any case what is required for music and video. In any case broadband rests either on a network of fiber or DSL technology into the home. The fact that the next generation consumer network requires an infrastructure other than the traditional copper system posed new policy problems. Now new networks using new technologies needed to be built. What role would the State play?

While there is broad international policy agreement on the need for rapid deployment of broadband data networks for consumer use, the policies to accomplish that rapid deployment vary by country radically. And there are rival strategies within each country reflecting different political or market positions. The one option not really on the table in the advanced countries is for government itself to build these networks. The question remains, should this build-out be a purely private decision of local providers; should government encourage competition to accomplish that; should government subsidize the competitors or parts of the network? The answers around the world are quite varied. To capture the flavor, consider Korea and the United States. Korea, is a story of stunning penetration of broadband services into the society. The broadband build-out was consciously subsidized by redirecting funds from the wireless spectrum auctions[xx]. In the United States, we have left the effort to a competition amongst the cable tv companies generating a cable TV infrastructure; phone companies offering DSL services, cable for TV, and potentially power companies offering access.

As with all leading sectors new possibilities call for new rules of marketplace and economy, a central issue for us. As digital information becomes ever more core to the operation of markets and machines, the fundamental issues are about who can use that information and for what. We turn to this more extensively in Part II.

B. Evolving Models of Production and Competition: The Digital Era in Historical Perspective[xxi]

Our second cut at the economic role of the State in the digital era is to consider the evolution in how we make and distribute goods and services. We briefly summarize the evolving model of production and competition that follows an historical sequence that goes from American dominance with mass manufacture, through challenges to mass manufacture in the form of Japanese lean production and European flexible specialization or diversified quality production.[xxii] Then we focus on the transition to the digital era from a mechanical or electro-mechanical age that comes with Wintelism[xxiii], before examining in more detail the dynamics of the digital era itself. Each phase places a different emphasis on the State's role 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. Mass manufacture is broadly understood to mean the high-volume output of standard products made with interchangeable parts connected using machines dedicated to particular tasks and manned by semi-skilled labor.[xxiv] Traditionally noted features of this basic definition include: the separation of conception from execution—managers design systems, operated by workers in rigidly defined roles that match them to machine function; the "push" of product through these systems and into the market; large-scale integrated corporations, whose size and market dominance reflect mass manufacture's economies of scale. In this system large scale manufacture implied rigidity. Fixed costs in the production line and design was high; consequently changes in products or reductions in volume were difficult in expensive. Scale economies at the level of production and distribution seemed to push toward large firms, markets dominated by a big few.

Alongside the technical policy issues were political ones, of which power and stability were central. Certainly how could the few big firms be kept from abusing power in markets seemingly naturally dominated by a handful. The national economy was rigid as well as the production lines since drops in demand would be difficult for mass production companies to absorb. An initial downturn in final consumer demand could cumulate into sharper economic downturns. Booms and busts implied worker

dislocations, and the social/political management counterpart of business cycle management became the political debate about how to use a public policy to cushion not only the economic dislocations but also the political dislocations that would come from mass unemployment.

The Keynsian state, demand management policies, associated with the label of Keynes, were born. The debate was both whether the State was responsible for managing business cycles and what the techniques for doing so should be.[xxv] *Fordism,* an American innovation, came to mean mass production with Keynesian demand management. In any case, Fordist mass manufacture was associated with American industrial development, military success, and post-war hegemony. With its emphasis on internal demand and domestic demand management, it might have been called "capitalism in one country".

Producers abroad, often with the support of their governments, tried to imitate the American mass manufacture model. The state acted to promote demand domestically and finance large scale facilities and encourage company mergers to reach critical volume. While most efforts failed against American competition, some of these efforts generated new rounds of production innovation, spawning a second phase in twentieth century manufacturing. American mass production as the model of manufacturing leadership gave way in the 1970s and 1980s to innovations from Europe and Japan.

Challenges from Lean Production and Flexible Specialization:

Challenges to American manufacturing came from two different directions, each challenge embodying a distinct role for the state. The more important challenge was the interconnected set of Japanese production innovations loosely called *flexible volume production* or *lean production*.[xxvi] Japanese producers created an entirely new approach to volume production that culminated in flexible volume production or as a model, lean production.[xxvii] The Japanese production machine in mechanical and electro-mechanical goods set American, and secondarily European, industrial establishment on its heels. It attracted intense attention because of the stunning world market success of the Japanese companies in consumer durable industries requiring complex assembly of a large number of component parts. The Japanese lean production system seemed to provide flexibility of output in existing lines as well as rapid introduction of new products, which permits rapid market response. High quality has come hand-in-hand with lower cost.

The Japanese state's developmental strategies were essential to corporate production innovation. 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.[xxviii] Indeed, protected domestic markets and exports were decisive in Japanese success in export markets. Moreover, those closed markets were critical to the emergence of the innovative and distinctive system of lean flexible volume production. [xxix] Stable and expanding levels of production created the conditions in which the factory floor and supply lines could be reorganized. Limited foreign competition, trade policy assured that, and easy access to export markets accomplished that.[xxx] Lean production was the focus of policy and corporate attention because it represented a direct challenge to both mass manufacturing and assumptions of American global economic policy.

While the Fordist story highlights national strategies for demand management, this Japanese story of lean production and developmentalism highlights the interaction among the markets and producers of the advanced countries in international competition.

The second challenge to the classical American mass production model had little to do with the volume production strategies emerging in Japan. Different accounts of its development variously labeled this collection of innovations as *diversified quality production* and *flexible specialization*.[xxxi] The "Third Italy" and the Germany of Baden-Wurttemberg 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. [xxxii] Firms in these countries often competed in global markets on the basis of quality not price; they used production methods involving short runs of products that had higher value in the marketplace because of distinctive performance or quality features. Competitive position rested on skills and flexibility, not low wages. These challenges -- often in high value-added niche markets -- came from small- and middle-sized firms rooted in particular industrial districts. "Craft production or flexible specialization," argue Hirst and Zeitlin, "can be defined as the manufacture of a wide and changing array of customized products using flexible, general purpose machinery and skilled, adaptable workers."[xxxiii] [xxxiv] 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 locality and community was the focus rather than the national state.

These two challenges to American production dominance each embedded a role for the state. The Japanese developmental state actively promoted internal development while free riding on the international system using exports as a domestic balance. The Flexible specialization model hinges on local institutions that permit the continuous combination and recombination of local activities, likewise in a global marketplace.

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

"*Wintelism*" is the transition period out of an electro-mechanical era into a digital age. The real break with Fordism, it turned, politically, on domestic deregulations and international deals that created an ever more open international trade system. In some sense the production structure and trade structure that emerge contributed to, if not drove, the expansion of something loosely called Globalism. The firm innovations that constitute this interlude rest on the American state's role in allowing the American market to be open to Asian production in particular and the pressure for an open trade system in general, on the anti trust policies that permitted and forced a component based competition in electronic product markets, and the development strategies of the third tier Asian states that inserted their economies into MNC production networks as a means of achieving new positions in the international division of labor.

The story is important to our analysis of the State in a digital era. Wintellism emerged as a response by American producers to the Japanese production challenge. Twenty years ago, it seemed that American firms were being dominated in international markets, when a flood of innovative entertainment products like the Sony Walkman and the VCR joined traditional electronic products such as televisions. 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 coming unraveled. That is, the array of equipment suppliers to the semiconductor industry were eroding making it more difficult for American semiconductor producers to

hold market position. With weakening position of the semiconductor makers it seemed less likely that final product producers would have access to the most innovative chip designs needed in their final products.

Then suddenly, it seemed that American producers rebounded. They had not reversed the decline of production in electro-mechanical products, but rather, a new sort of consumer electronics product had emerged, defining a new segment of the industry. What was a "new" consumer electronics product? [xxxvi] The "new" consumer electronics, as Michael Borrus has argued, are networked, digital, and chip-based.[xxxvii] They involve products from personal computers to mobile devices. The nature of manufacturing and the sources of functionality change dramatically. The core engineering skills moved to chip-based systems given functionality by software. Technologies began to spin on from the civilian to the military spin-on technologies.[xxxviii]

The process of creating value and the role of production were beginning to change as well. Consider the PC, the personal computer. What part of the value chain confers the most advantage? 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. It is the producer of the constituent elements, the components of the system such as the chip, the screen, and the operating system? The added value is in the components or subsystems. Those components and subsystems are built to generally agreed standards that emerge in the marketplace, and thus part of their value lies in the standards. Much of the value is in the intellectual property (IP), formally in the components, often in partially open but owned standards that create de facto IP-based monopolies or dominant positions. Modularization, as it came to be called, facilitated a vertical disintegration of production. Outsourcing, a tactical response usually aimed at cost savings with a decision to procure a particular component or service outside the organization, evolved into cross-national production networks (CNPNs) that could produce the entire system or final product. Then that discussion of CNPNs transformed into a broader business debate of how to manage the supply chain.

Let us state it formally: This first chapter of the digital era can be best characterized by two elements: Wintelism and Cross National Production Networks (CNPNs). *Wintelism* is the word Michael Borrus and I coined to reflect the shift in

competition away from final assembly and vertical control of markets by final assemblers.[xxxix] Competition in the Wintelist era is a struggle over setting and evolving de facto product market standards, with market power lodged anywhere in the value chain, including product architectures, components, and software. Each point in the value chain can involve significant competition among independent producers of the constituent elements of the system (e.g., components, subsystems)—not just among assemblers—for control over the evolution of technology and final markets. As these fundamentals of Wintelism have evolved, the constituent elements of the product became modules. Even if distinctive intellectual property remains in the modules, production becomes modularized as the knowledge about the elements and components they interconnect becomes codifiable, that is formally stated and expressed in code, and then diffused.

CNPN is a label we applied to the consequent dis-integration 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. This strategic and organizational innovation, what we might now call supply chain management, means that even production of complex products can become a commodity service that can be purchased in the market. The nature of those chains, now often labeled *global value chains*, varies with the complexity of the transactions, the codifiability of the knowledge involved, and the competence of the suppliers.[xl] The strategic weapon for companies such as Dell moves from the factory to the management of the supply chain. And the supply chain itself is extended both forwards into the marketplace and backwards into development.

The central role of cross-national production networks is a defining feature of the role of the state in third tier Asian Development. Tier One, "Early Late-Industrialization", is the case of Japan and its 19th century industrialization. Modern Japanese politics is a story of the political creation, in relative international isolation, of a market system intended to assure continued political autonomy. Tier Two,"Cold War Late-Industrialization", consists of Taiwan, Singapore, Hong Kong and Korea—the original newly industrializing "Tigers" who jumped to the advanced industrial frontier using strategies of technology catch-up and export-led growth. Tier Three could be

labeled "Late Late Industrializaton via CPNs", while Tier Four will be the forthcoming placement of the giants such as India and China in the Asia system.

Tier Three is the one of interest here. Tier Three: "Late Late-Industrialization via CPNs" includes the major Southeast Asian countries of Indonesia, Malaysia, Thailand, the Philippines, and the coastal provinces of mainland China, along with potential newcomers like Vietnam and Myanmar. These countries do not have the local domestic manufacturing that developed indigenously in Japan and was created through successful learning in the second tier countries. The lack of indigenous manufacturing experience rendered Southeast Asian countries more dependent on MNCs for their industrial development.[1] Increasingly, their development strategies revolve around insertion into the cross-national division of labor defined by partially overlapping or competing cross-border networks under the control of Japanese, US, Korean, European, Taiwanese, and other overseas Chinese multinational corporations.[2] This story of development by insertion is new and distinct from that of indigenous development or traditional export of final production. The implication suddenly is that FDI can be a friend, if it is associated with local learning and development. The question is not principally one of the mobilization of finance, but rather the consolidation of industrial learning in local forms that can sustain ongoing competitive innovation.

Wintelism was the beginning of the transition from an electro-mechanical era into a digital age, into a digital era in which tools for thought--broadly, communications and computing--are central. The State had a new role at home and abroad in this transition. These two elements, Wintelism and Cross National production networks, hinged ultimately on domestic deregulation leading to component makers having leverage to influence the course of digital development and the emergence of global market rules that permitted cross national production networks.

Competing in a Digital Age

In the digital era the role of the State hinges on how the emerging digital tool set and networks alter firm strategies to capture value and market position. The digital era is

[1] See Mitchell Bernard and John Ravenhill, "Beyond Product Cycles and Flying Geese: Regionalization, Hierarchy, and the Industrialization of East Asia," *World Politics* 47, no.2 (January 1995), especially pp. 195-200.

defined by a set of tools for thought--data communication and data processing technologies that, we keep repeating, manipulate, organize, transmit, and store information in digital form, with information defined as a data set from which conclusions can be drawn or control exercised. As the mechanisms that create value in the market change, there is a constant pressure to formulate new rules about markets, intellectual property, and trade.

A brief explication is necessary. To understand the issues raised for governance, for the state and for the fights over rules in the internet era, we begin by considering several dimensions of how digital tools affect a firm's core process of creating and sustaining value.

First, market segmentation and product versioning is a distinctive strategy of the digital era. Digital tools permit markets to be segmented, and then permit the segments to be attacked with functionally-varied product. 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. [xli] Thus, collecting consumer information in a variety of forms--credit cards or grocery store purchases are obvious examples--is a critical matter. One result, of course, is a policy struggle about what information can be gathered, shared, and combined. Or put more boldly, is privacy gone?

Digital tools then can create a range of product versions, not only for purely digital products that are themselves principally information, but for traditional products as well. Digital tools permit ever-greater functional variety in products, which permits firms to address these now defined or created market segments. The coffee maker that automatically turns on at a particular time in the morning depends on simple digital functionality. Versioning is not new; functional variations defined by digital means are new. Henry Ford, we are all told, created Mass Production. General Motors transformed

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[2] For a description of the potential for developmental insertion, see Dieter Ernst, *Carriers of Regionalization*, supra.

the automobile market into a series of segments by using several brands each aimed at different sets of customers. The variance in underlying technology and cost was often much less than the brand differentiation suggested or the price commanded. Japanese production innovation in the 1970s and 80s created competitive advantage by facilitating flexibility in the existing range of product and rapid introduction of new models over time. But the models did require different assembly lines, parts, paints, and interiors. What differentiates a fast printer from a slow printer? Often the electro-mechanical operations are identical, even the fundamental microprocessor controller. The variation is in the instructions built into the controller. The difference between many higher speed, higher priced printers and their slower, lower priced counterparts is in the software that tells the printer how to operate.[xlii] The instructions in the slower, lower cost printer, simply tell it to go slower; in other words, it is the same printer forbidden by its makers to go fast.[xliii] This is "commercially crippled software," or a sophisticated kind of price discrimination. Let us overstate the conclusion. Electro-mechanical functionality of the Sony Walkman or a Bang & Olufsen high-end CD stereo system rests on proprietary manufacturing skills. The digital functionality of the coffee maker or an MP 3 player rests largely on commodity micro-chips in products that can be assembled by commodity production services. Management of "supply chains" to assure that the flexibility of digitally based functionality can be used to address the variety of markets segmented by ever more detailed consumer information.

Managing supply chains is about more than just cost, quality, or sustained innovation. When market advantage rests on proprietary product and market knowledge, protecting that knowledge as intellectual property becomes a central issue. Digital information makes product and process knowledge explicit, and permits it to be stored in easily replicated forms. It is easier to transfer, or lose control of, formalized knowledge than intuitively-held know-how. Often, what might have previously been embedded in organizational know-how, as the accumulation of individual understandings shrouded from view in the final product, is now potentially transferable as a data file. Suddenly, intellectual property, a creation of law and social agreement if there ever was one, becomes central to company strategy and the politics of the internet. Not surprisingly, who owns, or can construct the right to own, which intellectual property, becomes a

central business problem and policy question. This is the case whether the firm is a media company, a company building routers, or Microsoft. When surgical technique can be formally expressed, the surgeon can be replaced by a robot. The surgical program becomes essential as hip surgery becomes a form of high-end machining. Consider that if you redefine copyright law, one thereby changes who controls the use and distribution of media products such as melancholy music. By redefining the control of use and distribution one alters the value of many existing media products. In so doing redefining copyright law redefines the valuation of an entire swath of media companies. The well known fight over napster is simply one instance.

Second, tools for thought, the digital manipulation of information, reorder profoundly blur the lines between service and product. This highlights the changing logic of value creation and market competition. It also affects how markets in services will be governed and organized. Most evidently, and in the public view, is the case of IBM. Traditionally IBM sold product, mainframe computers for example, and in the price embedded services that differentiated them from the competition. At their height, their costs of development were spread across such a large product base, they controlled such a large percentage of the market, that no other producer could match the package at the price. Now IBM often sells a service; the television ads we see are a branding recognition of this internal shift in strategy. IBM sells as a service a system solution to company problems, solutions that embed and are often facilitated by distinctive IBM equipment. Or 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. Slowly the distinction between product and service empties of meaning; we are left instead with the question with which we began. Next 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.[xliv] If you put the program on the Web for access with support for use on a fee basis, then you likely offer a service, as an ASP, or Application Service Provider. For the firm this poses a strategic question. If what is being sold is a service of defining a customized drug, then does it matter who produces the drug, the product. Does it matter to the enduring competitive position of the custom drug service company, if it sources the product, the drug, as a commodity in the marketplace? In each case what changes is which companies are able to capture value, and where the activities take place. For the community, if legal services or accounting are sold as a product or web service rather than by an accounting firm or law firm, who governs legal and accounting standards?

Third, who in a digital age makes what and where? For a government, the immediate development question is where are the jobs and the profits. Evidently this is a corporate strategic problem of what to make itself and what to outsource. For both governments and companies, what activities must be retained within the community or within the corporate boundaries to sustain the capacity to generate productivity and innovation in the country or region, or a company? Products continue to be made; production does not disappear in a digital era. [xlv] Let us consider for a moment products that remain physical, that are often best evaluated in person (textiles and cars), and must be delivered in our physical world. In the case of a car or refrigerator the IT instrumentality creates distinct controls and adds value to the product. Although the underlying purpose and the source of functionality, transportation or refrigeration is something physical and not digital, digital tools permit new answers to the fundamental question of how much people are willing to pay for which products and how functionality is created. The strategic problem for a firm in a digital era is deciding when actual production is a strategic asset, which may often be kept at home or under direct control, and when it is a commodity that can be purchased in the marketplace, wherever that marketplace leads. [xlvi] At the other extreme some products can be entirely digital and exchanged in entirely online marketplaces. These are digital goods in digital markets.[xlvii] Media and finance are examples where the product can be represented digitally and the marketplace, even delivery of the product, can be online. What does it mean to make or produce an entertainment or financial product for delivery? There is the creation of the

underlying entertainment content or financial instrument, and then the digital construction, the programming or development of the digital product. Even pure software products, be it a Windows operating system or the web structure for delivering an accounting service, are "built". The difficulty is that they can increasingly be built anywhere. That has led to a flow off shore of software development and telephone support services. The basic corporate question of commodity or strategic asset is rarely directly asked in making those decisions, what must be done in house or at common locations to sustain advantage. As we continue our search for the role of the State in a digital era, we note: first, production matters, if differently in a digital era, and hence where production is located matters as well; second production is increasingly distributed around the globe in supply chains; and new models of production reflect new possibilities of social organization.

The question is how that "building process" is organized. In looking at production we discover also the precursors of new forms of social organization that rest in fact on new notions of property. Data networks permit and facilitate these varied distributed networked production systems, and digital products are more susceptible to distributed production. [xlviii] Cross-national production networks that emerged in the Wintelist transition era were precursors of global value chains, and supply chain management emerged alongside factory management. Evidently, software activities in which the underlying components or subsystems can be transmitted fluidly over the net are even more open to distributed production than physical production. The most dramatic evolution comes with newly orchestrated systems of distributed innovation. Its most dramatic manifestation is the Open Source movement. It is not simply collaboration across distances by traditional software developers, but rather, the emergence of entirely new production systems in the open source community.[xlix] For some time product development activities have been distributed across locations with digital tools assuring the flow of information and coordination of efforts. But the open source software may be the archetype of the digital era, a system of distributed innovation where tasks are self-assigned and where even the management of the innovation is voluntary.[l] It is quite a contrast to the archetype of the industrial era, division of labor, as exemplified in Adam Smith's pin factory, where the production of the classic good, the pin that had been made

by a craftsman is now made by an industrial process. This approach sets the process and the divisions of labor, assigning tasks that subdivide the process. These two systems of political economy--division of labor and open source--rest, moreover, on quite different notions of property, each defined by aspects of its era. In the industrial era, property gave the right to exclude others from using what you possessed, such as the creation of the private use of land from what had been a commons. By contrast, in the digital age, property in the form of open source software is the antithesis of exclusion. Steve Weber writes:

> Property in open source is configured fundamentally around the right to distribute, not the right to exclude. If that sentence feels awkward on first reading, it is a testimony to just how deeply embedded in our intuitions and institutions the exclusion view of property really is.[li]

Two eras, each characterized by distinctive production systems, distinctive notions of property, and perhaps by evolutions in the notions of property as well.

C. The Digital State in the International System

Does the emergence of this new digital technology shift the relations among the nation states and with it the nature of the state itself. Where does the national Digital State sit in the international system? At one early moment there was a dream of an unregulated "cyber-space" existing outside of national boundaries and outside national control. We learned quickly though that the character of the cyber world depended on how "code" was written, and how the code was written was a political choice.[lii] Reversed , political choices are expressed in the structure of code that shapes the network channels and rules of communication. Code can be written to create a virtual wild west. Or, alternately, code can be written so the networks maintained and supported political control, put in place the Big Brother of 1984.[liii] Regulate the code writers and control the network system. But who will regulate the code writers if the networks of code become global? Who will control the flow of information and of commerce over ever more integrated data and communication networks.

The Digital Chapter in the Globalization Story

The digital story and the story of globalism have been entangled in the popular mind.[liv] We have been asking for decades, "Is national sovereignty at bay?"[lv] The press of international market forces seems to sweep past the capacity of nations to respond, channel, or control them, Policy at home is, increasingly, not only influenced abroad but made as part of international deals and treaties, and, indeed, often important policies at home are influenced by supra-national institutions such as the World Trade Organization. Some contend that with governments constrained by common requirements and with few levers of individual influence, national differences will soon be more stylistic than substantive.[lvi] [lvii]

Is there a distinct digital chapter in this story? At the micro economic level globalization has been presented as a story about reduced communication and transaction costs that allow firms to operate across the globe, and the digital revolution accelerates those processes. It is conventional to argue that as markets grow in geographic scope, new equilibriums and new rules, new policy, to facilitate those equilibriums are required, that the evolving technology drives new politics and rules. Evidently, as communication and transport technologies have advanced, economic and social distance has diminished. Certainly "Tools for thought" continue to expand communications capacities and to reduce the costs of transaction over distance. These digital tools, and the networks that interconnect them, facilitate the communication and data exchange required for integrating geographically widely dispersed operations and markets into a single global marketplace and business community. We ask then, do the political resolutions of digital issues take a common *form,* influencing the international system in a common way that would give it a distinct or new structure? The answer, a quick review of policy debates shows, is no.

Let us for just a moment consider several cases pointing different directions. Does the integrated network character of the digital era push toward institutions that embed some form of shared sovereignty, such as the WTO, and at least partial transfer of final authority over how rules are applied and enforced? For example, in the arena of Intellectual policy national arrangements were made in response to a treaty, a bargain amongst governments, made through the World Intellectual Property Organization

(WIPO), but enforced not only at a national level but through the judicial powers of a trade constitution agreed in the World Trade Organization (WTO). The international institutions, by changing the process, served to alter domestic bargains not just to express the will of strong states or strong private actors. The decisions about intellectual property that resulted in the DCMA changed the balances between consumers and providers in media. They are not, we have discovered, are not simply rules about trade, but powerful rules about politics, about the pubic domain and discourse. Or, alternatively, will arrangements tend toward either bargains amongst governments in which national differences are reconciled, thus maintaining but not suppressed, then the multiple world remains a possibility. For example, privacy rules, which set many of the technical features of the network architecture, are nationally rooted. (Treat the European Union as a single entity, as is appropriate in this case.) The telephone system was governed through the ITU, a set of deals amongst governments or their representatives that linked watertight sovereign compartments. In the Internet era there are a series of international, really seemingly supra national, arrangements for technical management that include ICANN that sets the rules for domain name management that take on an institutional life somewhat independent of their governments. Yet ICANN is an American creation and has been American dominated. In fact, the Internet itself involves a hodgepodge of arrangements, of solutions that are bargains among countries and institutions that have a supranational feel.

Globalization with Borders: The Enduring Place of National Systems in a Global Economy

Globalization has not led to the ineluctable elimination of national systems. The digital revolution will not lead to the elimination or diminution of the importance of national political systems either. Rather than smoothly generating an ever more interconnected economy through mechanisms such as lower "transaction" costs; the digital evolution may shifting the balance in trade debate from a focus on trade gains to an emphasis on winner take all games. Ironically it may bring a renewed awareness of the State's importance in those outcomes.

Micro economic facts do not dictate the character of the macro political economic outcomes. Consider an earlier epoch of globalization. As is now well known,

by many measures of globalization, the industrial economies were as inter-linked by the start of World War I as they were at the end of the century.[lviii] The depression, two World Wars, and the Cold War that followed shattered the economic linkages that had existed by 1914.lix Contemporary globalization involves more than just a quantitative expansion of trade and investment. As a macro political economy story, globalization really reflects four phenomena: Asian expansion as a player and trade partner; cross national supply chains resulting from both outsourcing and offshoring; Europe's expansion as an economic entity; and American / European cross investment.[lx]

The digital era is one in which an increasingly global market coexists with enduring national foundations of distinctive national economic growth trajectories and corporate strategies. Distinctive national tales of development are an integral part of the global story. Instead of global forces sweeping away national structures, a variety and sequence of national stories drive the character of globalization. In this version of the story, "global" forces are channeled through enduring national, and local, institutions and political structures to produce distinct responses to common problems. The possibilities of government policy have not been eliminated, just shifted.[lxi] The presumption is that multiple possible futures exist, that the variations matter, and that the choices will be made by political decisions, principally at the national level. Rather than emphasizing, and perhaps thus seeing only the common constraints of markets or technology, this vantage emphasizes that markets and technology establish an array of possibilities, a choice frontier of significant alternatives, that still leaves open political choice.[lxii] National models of growth in the advanced countries are, in this vantage, not collapsing, but are rather undergoing a common transition along distinct trajectories. [lxiii] For example, Robert Boyer argues that differences in how knowledge is generated and diffused and in the operation of labor markets create significant national differences, alternate paths to successful development in a digital era.[lxiv] The position here is that differences in national outcomes, and the processes of state action, are more than mere curiosities, but have market and social significance.

National Innovation in a Global Theatre

National tales of development, seen from this vantage, create the global story. Indeed we viewed in Part I industrial and trade competition in the last half of the century

as a sequence of national innovations. Without global markets the Japanese production innovations would not have been possible or had the same significance. The Japanese challenge of the 1980s rested on the specific national production innovation that then changed the character of global markets that Japanese producers accessed. Japanese production innovation carried Japanese producers to a dominant competitive position in a phase of mechanical and electro-mechanical industry development. The now often forgotten power of the Japanese production innovation in turn triggered American responses in the form of contract manufacturing and cross national production networks. Distinctive American policy strategies of deregulation led to distinctive corporate competitive advantages in network based industries. As American firms, unable to rapidly match Japanese production advantage created a cross-national production system through outsourcing, Asian third tier manufacturers in Thailand, Taiwan, and Korea were brought into the game the global game. The third tier producers ability to position themselves in the then emerging global production and provisioning network hinged on their national strategies and policies. Now they are followed by entrants such as China and in some sectors, India, whose sheer scale may again change the "global" game. Without global markets Nokia's corporate reorientation from the low end Soviet markets for standard goods to world class high tech communications company would not have been possible. Finnish adaptations to the post-cold war environment in the context of Scandinavian mobile communications collaboration generated an unexpected powerhouse in mobile telephony. The Japanese implosion over the past few years likewise turns on national stories, on the national policy choices that were driven by internal dynamics not global markets.[lxv] The Japanese implosion was not even centrally about global markets, but the inability to adapt an administered credit based financial system appropriate in a catch-up and capital short era to a period of capital abundance and cutting edge manufacturers. Again and again the waves of innovation that disturb global markets are rooted in the enduring national structures. The national stories, the national innovations, reverberate across global markets. The significance of the national stories is amplified and the impact of the consequences accelerated by global markets.

But aren't there multinational companies, operating free from national control? With a few exceptions, and at least for the moment, companies are rooted in a national

home base. (The meaning of cross continental investment the past decade is yet to be really understood.) Certainly companies, not countries, compete in specific product markets. But the companies compete, even when they are multinationals, from a national home base. Those national bases matter in different ways. Each national base is characterized by distinct market dynamics that generates particular corporate approaches and innovations. Japanese lean production required its structure of vertical keiretsu with semi-market contracting arrangements and would not have emerged in the United States or France. The Internet required user driven communications innovation and probably could only have emerged in the US.[lxvi] Governments play the international economic game differently. Some governments, such as Japan in the developmental years, have acted as gatekeepers between the national and international economy, acting to break apart the package of the MNC. National policies are reflected in corporate strategies.

The market game in similar sectors can look different when played by companies from different countries; and as a consequence each national industrial system produces a mix of products that reflect its institutional arrangements and policy choices. The trade data supports the notion that countries develop distinctive patterns of comparative advantage, the Germans clearly have created a position in Capital goods, American firms in science based technology, the Japanese in volume production of consumer durables.[lxvii] Many technology partnerships are fundamentally trades between distinct national pools of technology; trades between national systems that in fact reinforce rather than erode their distinctiveness.

Globalization is not simply the wiping away of national boundaries but rather a nationally generated series of often unexpected challenges played out on the global stage. It is not the end of national place that characterizes the global world. It is the pace and multi-directionality of the changes that gives the feel of a new era. National innovations and developments are played out more quickly on larger stages: regional and "global" theatres. When we look at the global world, it is not simply that there is competition in such technical matters as speed-to-market which has grown, but rather it is the rapidity with which diverse nationally generated market challenges follow one on another. The number of innovators increases, that in turn increases the array of significant innovation, innovations which spread more quickly across more integrated markets. The enduring

national sources of innovation in globally integrated markets create endless and seemingly unpredictable disruption. Only a few of those national innovations, such as the Japanese lean production system of volume production with quality, shock markets and force extensive changes across the global system. Does globalization with borders mean an intensification of competition amongst national systems?

Corporate Competitions or National Competitions

Corporations, not countries, compete, the conventional view argues. But if there are significant national differences that shape several different trajectories of product and strategy, are there then indeed national competitions? Or phrased differently, do the outcomes of corporate competitions in global markets influence the national trajectories of development of their home countries?

Let us begin with the conventional view. Productivity growth is at the core of national well-being. So a conventional strategy of saving and investing in productive resources, both publicly and privately, can sustain growth in each country. In this view, countries are engaged in a friendly track and field training exercise. The faster they each run, the better off they are. Learning from each other, prodded on by each other, they all are better off. A conventional view would be that although there are transition costs as companies and communities adjust to market conditions, but countries and their growth potential is not damaged by the defeat of one national company or a sector. Resources can, in the traditional notion, move smoothly from one use to another, even from one sector to another. Indeed the argument might be that even if a government abroad subsidizes a national company to the disadvantage of companies elsewhere, there is little harm.

But let us not move so quickly. National mechanisms of technological learning, related industries clustered together, and infrastructure required for operations underpin the position and strategies of swaths of firms. If that complex erodes then the competitive fate and position of national firms affect the broader course of national growth and productivity. Much knowledge is not embedded in either formal training or in individual know-how. Rather it is embedded in organizations, that is the particular collection of individual know-how applied to categories of tasks expressed in rules and routines of the firms. Dissolved the same combinations of individual knowledge may not

be easily recreated. That know-how, for example textile machine applications or machine tools, may dissipate in a country with corporate failure even if the fundamental level of training and skills could support such applications. If that know-how influences the capacity for innovation in particular technology areas, the significance of particular corporate failures maybe broader than traditional theory would suggest. Resources, this suggests should not be conceived as organizationally disembodied inputs that can move seamlessly or without friction to alternative uses. Different estimates of the national consequences of the corporate market competitions turn on judgments about how the basic inputs to production, including skills and know-how, are created…and destroyed. Successful companies generate pools of know-how and skill, and their failure in that can dissolve those skill pools in communities. If general education creates those resources and they move smoothly to other uses in the case of specific company failure, then the results of market competition will not matter to the basic pattern of a particular nation's development. If those resources are *created* by corporate competition or don't move easily to new applications, then the very resources on which growth rest are created by and destroyed in market competition. The very resource base on which comparative advantage of a nation may be assessed is, then, generated – at least in part, perhaps significant part -- by the outcomes of market competitions. Jigger the market outcomes today, even if the logic of comparative advantage is against you, and you may alter the resource base tomorrow on which comparative advantage is assessed. Hence if production in one sector using highly trained science based engineering drops, those workers and the training they embody cannot be used in other sectors.

Is there a tension in our logic? In the previous section tracing the emergence of Wintelism, cross national production networks, we seemed to be arguing that distance matters less, observing that the Corporation is the core organization orchestrating productive activity across borders into varied markets. And here we are arguing that national structures and policies have powerfully influenced the strategies of Corporations in a manner that gives advantages to some nationalities and localities. Both positions can be true; we don't have to choose. Place matters differently. What if a few countries play a game that tilts the choices of Corporations to place jobs or to drive the accumulation of knowledge in those activist countries?

Will the Digital era be a Return to A Winner Take All World?

How does the emergence of digital tool set and digital products affect these arguments about firm competitiveness, national policy, and international competition? The 1980s opened with intense trade conflicts between the United States and Japan in core digital technologies, the semiconductors, computers and in telecommunications. That case arguably fit the circumstances in which concern about the fate of a particular national industrial sector would be justified. The application, as well as the development, of the innovative digital technology could arguably be slowed if integrated competitor firms, or if firms in a country that perceives competition in national terms, denied easy access for firms in other countries to the underlying components of a digital era or tools with which to build them to firms abroad. The concern in the semi-conductor case was that integrated Japanese firms would develop both the applications of advanced chips and the tooling to assure sustained innovation in chip production and design? In some ways the competition was quite traditional, scale production costs; in some ways the role of market established standards in information technology became central. Could the Japanese firms leverage their domestic market to establish global standards in IT products; could speed to market with next generation products, speed affected by the control of the tooling, influence the standards that emerged with next generation products. And importantly, competitive markets were re-established not by opening the Japanese market but by the entry of new chip players. The success of the Koreans and Taiwanese amongst others to enter the commodity memory semiconductor market assured multiple sources of critical technologies and multiple customers for critical equipment. With an internationally diverse set of suppliers together assuring a competitive marketplace, the fear that Japanese firms would control the course of the industry dwindled. Here were all the elements of the twenty first century trade dynamic, an interplay between state policies and global marketplaces, with neither winning, but both affecting the tone of the competition.

The significance for our story is that competition in the IT sectors has a winner take all flavor. While there are offsetting forces, the concerns are always there. The core point, noted in Part I, is that competition in the IT sector is distant from the classic world of atomistic markets. *First*, it is influenced by network/standards effects that mean that

the value of a product depends on how many other people are using the network or product. Since marginal production costs for goods like software programs tend toward zero, while fixed development costs are high, the benefits to scale are enormous. Since product demand often grows rapidly from early use to mass consumption, learning curve effects are powerful as well. Consequently, an early lead can be consolidated as a dominant position. *Second*, since these are often new industry segments growing from innovative products, the initial competitive ground can often be quite empty. Early advantage as the sector expands can be consolidated and defended by leading firms. *Third*, some places, countries or sub-national regions, may generate location advantage. It may be develop institutions to develop, accumulate, and apply knowledge and knowledge works. That may be in the form of public institutions, private market arranged, or an infra-structure in the form of innovative networks or clusters of supporting firms grows up with and around leading edge companies create enduring advantage. *Fourth*, established products from consumer durables through textiles are designed, made, and distributed differently as a result of the IT revolution. And that evolution of product, production, and supply chain is continuous. Consequently, competition in these sectors will look more like competition that has part characteristics of classical inputs, labor cost for example, and partly rest on regional and corporate learning and knowledge management. Thus, the application of IT to an array of new products and new production/distribution processes mean that many traditional sectors will have competitive characteristics of high tech sectors. Rapid changes in product generations, either because of production equipment or product design, will give advantage to those who are adept at new technology adoption. Consider the Japanese auto industry. Rapid expansion and managed competition while borrowing technology in protected markets created powerful learning curve effects that culminated in lean production. [lxviii] The fact that this strategy did not work so effectively in semi conductors or PCs does not mean it cannot be effective in other IT segments.

Given the clear possibility of affecting outcomes across industrial segment, States will – whatever the arguments and rules --- intervene to help create location advantage and corporate advantage. Those policies will run a gamut. Policies aimed at assuring an educated and skilled workforce are essential preconditions and not controversial; outright

overt protection of markets with formal trade barriers by any of the advanced countries is not viable now. Everything in between that is at issue. Consider infrastructure development. Policy for telecommunications infrastructure can quickly become a policy of industrial and technological development. American telecommunications deregulation created a new customer base, a customer base experimenting with new networks and strategies. New dominant firms producing the equipment for these new digital data networks were the result. Traditional equipment supplier stumbled in efforts to apply their switched network mentality to an internet router era. Cisco is the clearest example. Of course, the end of the bubble saw a fall in capital spending for networks and brought the collapse of many of the innovative firms. Cisco's former competitor Ascend Communications purchased by lucent for 25 billion dollars, then closed with the bubble downturn, is a clear instance. By contrast in a purposive policy by government, the Europeans established a single second generation mobile, cellular, standard for the continent. Mobile usage took off creating a vast consumer market. The GSM standard created the setting for Nokia's success but did not assure success for Ericcson, or Alcatel for that matter.

A critical public policy question, then, is which infrastructure development strategies induce or permit success amongst national equipment makers. Many countries acted to sell off spectrum to third generation would – be cellular providers. Most European governments funneled the money into their Treasuries. As noted, the Koreans acted to use the sale revenues to support the build-out and competition in the provision of high speed broad band wired networks, and in so doing created both a market, not entirely open and privileged for domestic Korean firms, and a broad base for development of innovative uses.

Since World War II we have been busy building the institutions to support an open, now global, international economy. And the economic theories have been used to support those objectives as maximizing both individual and global welfare, even if the adjustment costs would be real. Alternative views have been marginalized, usually scorned as ignorance. Now, in the digital sectors, arguably purposive directed domestic policy for infra structure and standards, for example influence broadly the outcomes of competition in IT sectors, create not only winners, but winners with defensible,

retainable, position. In my view, the mercantilist tonality will not be denied. The question is the ideological/theoretical tone and institutional form it will take. The final answer, quite evidently, will hinge not on the digital technology sectors themselves, but on the broader politics of trade. The breakdown of the recent WTO round hinges on agricultural not digital issues. But we must ask: Will the state actions, and there will be state actions, be hidden on the side underneath the garb of continued commitment to open trade? Or will the real winner take one element of digital competition been an element that tilts the trade world to a more state centered, more mercantilist structure? In any case, what an ironic outcome it would be if competition in digital industry, which began in the belief that government hindered development and that information yearned to free, became a trigger for increased roles for the state at home and abroad.

D. A role for the state in capturing the gains from the Transformation?

What can a government do to capture the gains from the digital transformation? How does a government help its constituents capture, or help capture for its constituents, gains from the underlying innovations, from their diffusion into products and services, from the resulting reorganization of firms and factories, and generally by making itself an attractive location to house these activities. Much of the appropriate policy menu has become almost a mantra, albeit a mantra with considerable merit. With direct subsidies and overt protection increasingly outlawed under international trade rules, the mantra tends to focus on: supporting the research infrastructure; assuring the educated and skilled workforce the new technologies require; assuring the financial market instruments required for investment in new products, whether those investments are made by startups or established firms; providing the essential communications infrastructure on which all firms now increasingly depend. There are of course significant policy arguments

Beyond the mantra there are real policy arguments about how best to accomplish these objectives. And there are two significant debates. First, what interventions by the State into the market can be effective? There are an array of instances in digital development that taken in part can support virtually any argument. For every instance of successful Korean intervention to push broad band, there are counterarguments whether

of the state provided Minitel system that though early was bypassed by the internet. The old, and overly simple argument about whether the State can define lines of development or must entirely withdraw leaving matters to the market just won't do. That old debate will have to be restructured. What can the State do through the market by direct action, regulation, or extension of market competition. Even to accomplish social purposes, the ideological will have to give way to the tediously technical.

Second, what can the state accomplish in an ever more extended global environment. A globally available skilled work force has been created both by efforts at education in places such as India and by the entry of countries such as Russia with large supplies of low cost into the Western market system. Supply management of cross national production systems emerged in the 80s and 90s allowing diverse locations with distinct advantages to produce particular components or perform specific activities as part of corporate supply chains. Twenty years ago we were reassured that the service sector was a safe haven for workers as manufacturing was declining, that the digital work force, those who manipulated the symbolic to create value would be our economic future. But will that be the case. Now nearly instantaneous communication and data sharing makes tasks from service call centers to sophisticated software development transferable. And open source models of coordination say the era of regional development nodes may be over, the development node maybe virtual.

Part Two: The State in the Digital Society

Governing a digital economy is fundamentally about information and how it can be used. It is about who can communicate what information to whom, about speech. It is about who can know what information about whom, about privacy. It is about the forms in which information can be owned and exchanged, what constitutes intellectual property and what are its rights. It is about market power, who controls the markets for the digital tools and their applications. It is about what the government can do and know, about the State and Society. A grand flourish with which to begin, but at the end we will find that the meaning of the digital era will be set by political choice not technology.

The digital revolution has radically altered the types and amount of information in the economy as well as the ability of actors to transmit and use that information. With

data cheaply passing over digital networks, long nourished business dreams become reality. The questions arise: who will capture the benefits of these innovations and what threats do they pose for society? The initial basic debates then are about market rules – which market rules, what kind of rules, and whom do they benefit. Arguably, digital issues become entangled with the governance of the economy; they reopen fights, and when fights are reopened the possibility for fundamental change exists.

Government, then, stands at the crossroads of the digital era, constructing the rules that underpin these emerging markets and mitigating the negative social externalities posed by the digital revolution. But digital issues do not dictate a new "role" for government, that is either its exclusion from or its weighty governance of new markets. Instead, the state has a number of policy tools at its disposal to resolve emerging policy dilemmas ranging from direct adoption of new technologies to the catalyzation of private sector initiatives. What then is "new" about the digital state is less some technologically augmented or vitiated state authority but rather the ability of the state to influence the resolution of fundamental societal bargains about property, privacy, and free speech that have been reopened by changes in information technology.

The goal then is to search for the role of the State in the political transformation that follows from the technological revolution. In order to accomplish this task, the relationship between the technology and basic societal values must be examined. Digital technologies, while offering tremendous opportunity, may threaten many caught unprepared for the information revolution. It is then important to ask how the State may mitigate or channel such pressures. Can governments ignore the power shifts that accompany such innovations or should they intervene to shape the politics of the digital world? Regardless of the strategies chosen, however, interest group preferences influence and mold State efforts, resulting in distinct national solutions to the political dilemmas raised by the digital era.

The fundamental governance issue is whether the digital debates will force a basic reconsideration of values concerning how we organize our societies? Information and how it is used is the very substance of communities, polities, and markets. Communities can be conceived and indeed expressed as the character and flow of communications amongst members, polities as systems of decisions based on information, and markets as

architectures for exchange based on information. Consequently even the technical rules about digital technology and about the digital market are directly and simultaneously decisions about the very nature of the community and the polity.

Adapting or translating, laws, rules, and regulation to the digital era requires a basic reflection on what our values are and which we hope to pursue. It is not only a matter of how to accomplish some seemingly clear and agreed purpose, whether that is how to provide a system of addresses for email or involve broader values such as privacy or freedom of speech. Rather a debate is opened or reopened about the construction of identity – should society permit personal behavior to be commodified so that individual information may be redeemed for a thirty-cent coupon from the regional supermarket chain. When the rules must be reconstituted and their purposes reconsidered, existing coalitions for free speech, privacy, and "fair use" in the public domain must be recreated.[lxix]

The digital debate has a peculiar form in that the rules of digital information, and hence of a digital polity, are embedded not only in convention or in the law, but in the computer code itself. [lxx] Just as highway architecture dictates where you can get on and off the freeway, the computer architecture and the code implementing applications dictate what is and isn't possible in a digital era. In the early years of the Internet the open and user controlled architecture led to the sense of Cyber space as a domain outside the control of governments or physical communities. Hence Stewart Brand's infamous remark: "Information wants to be free", reflected the particular architecture of the early Internet. But that early Internet was only one potential architecture; other more controlled or restricted networks were also possible. Digital information wants nothing at all; it flows where the network architecture permits.[lxxi] And the network architecture is a product of the code writers. To say that we must regulate the code, and hence the code writers, is not to say that there is a single technologically dictated outcome. While politics is always about values and outcomes, about who gets what, for such choices to have meaning in a digital world they must inevitably be embedded in code and respect the technological logic of the "tools for thought". Law and code then interact to establish the rules of the digital era.

As the technological revolution unfurls, two political debates take center stage. While these have equal importance to social scientists, they do not necessarily proceed in tandem. First, what are the rules that should underpin these new markets? As digital technologies diffuse businesses in industries ranging from financial services to telecommunications search for market advantage. At the same time, however, these innovations have the potential to disrupt the current distribution of power within a sector and across a polity. Incumbents simultaneously see lucrative market potential and economic disruption in digital advances and the market rules that emerge or are imposed will fundamentally shape political outcome. The dramatic spasms in the music industry, including weekly new business models and industry suits against high school students, demonstrate the market instability that exists in the information age. Market rules, drafted and enforced by the State, will fundamentally shape the distribution of economic gains from changes in information flows and modulate the extent of the revolution.

Consider the varied government roles in the operation of the Internet. At the creation of the Internet, the government effectively enabled self-regulating groups who established and sustained markets in cyber space. For those earlier "net" pioneers who were establishing the system rules, setting the architecture of the early internet, it seemed liked government was an interloper in a system that was run by technologists for technologists. Of course, the early notions that the Internet should be free of government, like a mythical wild west community, ignored the fact that the western settlements required political and legal organization; they required governments. When the Internet was transferred to the commercial world, those requirements for legal structure in the operation of the network became more evident, more urgent, and the rule making for the Internet became, at least in part, rule making for the economy. The issues were no longer simply technical ones of how to operate the network or communicate across this network of networks. Suddenly all the questions of an operating marketplace had to be addressed; appropriate rules had to be defined for domains from privacy through taxation. Take taxation as an example. Promote the Internet by making Internet commerce a tax free environment? Sounds wonderful, but that gives Amazon an advantage over your local bookstore. It becomes a pubic subsidy to e-commerce based start ups. And every economist with a union card would argue, and we agree, that the

question of whether traditional commerce or electronic facilitated commerce should win in the market should not be answered by subsidy. Like all markets, cyber markets, require definitions of property, transaction, competitive market structure. And all that requires rules.[lxxii]

Second, new market rules have consequences for society more generally. As the digital economy is constructed, decisions concerning market rules inherently structure information flows and thus influence the character of the political community. The manner in which information flows are shaped not only affect economic competition but also basic political values about participation, transparency, and representation. The State is confronted with the challenge of dealing with the social externalities that arise in parallel to the digital economy. Even without an intentional shift in our views on privacy, for example, information technology changes the balance of who can know what about whom. Suddenly information technology tools for collecting personal information become so powerful that credit cards companies can predict divorce from expenditure patterns; insurance companies can access medical records to assess health risks. The dangers of unrestrained data processing will be all the more powerful as existing genetic profiling becomes conventional and the capacity to create statistical profiles of individual medical futures becomes possible at birth. Legislation that spells out how personal information may be collected and deployed in the economy, simultaneously influences the way an individual may present them self in society. Rules then establish the architecture for the market and often unknowingly shape the very nature of society. The complexity of the situation is confounded as increasing amounts of information are processed in foreign countries where similar basic debates have been resolved differently.

While quick adjustments to rules or laws may sometimes be sufficient to resolve both market dynamics and social externalities, significant debates will not be settled by adding an extra line that asserts that traditional notions embedded in existing rules apply to a digital era. Old questions will be posed in quite fundamentally new ways. Take for example the domain of digital content. The easy replicability of content, video and music, on computers makes untenable the traditional legal balance between producers and users. It was this that made Napster and its brethren possible. In this case, establishing a new rule, the Digital Millennium Copyright Act (DMCA), in the name of

an old notion, intellectual property, is not a neutral extension of the original principle. The extension re-sets the balance between users and providers in favor of the providers. Digital innovations have opened the possibility that the prior battles could be refought and prior, seemingly settled, outcomes could be altered. Rather than a simple addendum to an old deal, the new formulations will often require conceptual innovation and political entrepreneurship.

B. Have Basic Rules in Society Changed?

We return to our initial question, will the resolutions of the specific issues about information cumulate into basic shifts in the role of the state and rules on which our market economies and democratic polities rest. There is still a sense that something dramatic has changed; that there is a fundamental transformation. Will the policy outcomes of the array of digital fights represent fundamental breaks in existing patterns of economic and political governance? Or is it an illusion, like the dot com revolution, that this is a moment of inflection, a disjuncture, when new directions are set?

In an effort to demonstrate the potential scope of the digital revolution we identify three critical debates: property – that which can be owned and disposed of as an economic good; privacy – that which permits us to remain in our personal domains secluded from the view of others; speech – that which we can say and debate in the public arena. These debates begin in the *marketplace*, how to use information to economic advantage, and spill over in to *society,* how our communities and political processes will be organized. After taking each issue in turn, we will return to discuss the role that the State plays in mediating the extent and direction of the digital transformation.

Property is *the core of "cyber law".* Cyber law has for the most part focused on creating a market world in cyber space[lxxiii], on the particulars of transaction and property, in the new digital network society. "The notion is to establish the foundation of individual action, or corporate action, by establishing in addition to property rights the basic operation of a civil society (the ability to contract and freedom from tort)". In any case, many of these issues really constitute an evolution not a revolution of existing practice.[lxxiv] Intellectual property (IP), however, is pervasive in a digital era, a central

feature of an information society. We know that property is always a legal creation involving the specification of enforceable rules about what a person can have, hold, and dispose of. Hence in a fundamental way, property and its rules of use, is always a political creation.

We also know that physical property and intellectual property have different characteristics. In the case of tangible goods with a physical existence, the rules of property set terms of use and disposition. Since the physical property can't be simultaneously shared, some rules of use and disposal are necessary, whether those rules constitute private property or not. Hence with our great transformation case in England, the enclosure movement closed off common public lands converting them into private holdings. By contrast, intellectual property is not something that I hold, carry about with me, physically deny to you, or something that if you use, like a car, is unavailable to me. Hence, intellectual property as economic property in ideas and information, that is something you are willing to buy because you cannot have its use without payment, is entirely a political creation. The very "good" is a product of rule. The terms of that creation in an information society are then absolutely central.

In an information economy the character of property is a very critical, but tricky, business. Pervasive digital expression of information complicates that already tricky business of intellectual property in several critical ways. The mantra is often chanted but must be chanted again, digital technology radically changes the logic of control and distribution of intellectual property. Whatever the cost of developing intellectual property be it a movie or a software product, the marginal cost of precise reproduction and distribution is almost zero. In a digital world, if I watch a movie, you can almost without cost watch the same movie; if I listen to a song, you can listen to the song, and send it to a friend in digital form, without diminishing my ability to listen to my exact copy. Since media products are so immediately affected, it is evident why media companies have driven reformulation of intellectual property law to permit them to recreate control of the distribution of their products.

Additionally, new forms of intellectual property are created. For example many types of data can now be easily packaged and sold. Expressed in digital form, information becomes a commodity that can be transmitted, manipulated, stored, and sold

as an object. Argued most generally, in a digital era commodified explicit knowledge becomes pervasive. Here we must distinguish between formal knowledge or explicit information, which might include the operations of an electronically controlled fuel system in an automobile engine, from theoretical knowledge which defines why that engine works the way it does, and from implicit knowledge. As knowledge, including digital instructions for physical control, becomes explicit and explicitly expressible in useful ways, the possibility and importance of protecting that knowledge as property increases. Hence, it is not just the media industry which turns to copyright for protection, but also semiconductor designers who would protect the design and the production processes. The fight in law over what can and can't be protected is critical in daily business; for our purposes the seemingly inexorable expansion of the protectable is the issue.

Finally, the digital environment makes possible experiments with shifts in the underlying notions of property, and with it the organizational notions of political economy. The market for computer software has traditionally been built on a traditional understanding of property, definable IP that can be sold by the innovator for use and denied to others. The protections are both legal, and the very character of computer code that means your computer operates from machine language that is not, usually, understandable to even expert programmers. The "source" code that underlies the machine instructions is proprietary. The company, Microsoft for example, then hires programmers in traditional hierarchical fashion to develop that sources code, and retains the intellectual property. Things work differently in the open source world.[lxxv] "Groups of computer programmers…made up of individuals separated by geography, corporate boundaries, culture, language… and connected mainly via telecommunications bandwidth, manage to work together over time and build complex sophisticated software systems outside the boundaries of a corporate structure and for no direct monetary compensation." The system, the rules of community and property works on three principles: [lxxvi] 1) the source code must be distributed or made available with the software for no more than the cost of distributrion; 2) anyone may redistribute the software, but they may not charge royalties or licensing fees; and 3) anyone may modify the software or derive other software from it, and the distribute the modified software under the same

terms. This is not a challenge to property or capitalism, but rather a challenge to particular business models. In essence, the rules of property have been shifted from rules of exclusion to rules of distribution. Consequently, the response of the traditional producers such as Microsoft who are challenged comes both in the marketplace and in the courtroom.

Intellectual property rules inevitably affect more than just the media industries or the business possibilities of sectors that use digitized information and programs. There are consequences in multiple domains. Knowledge is likely to cumulate differently. Intellectual property has always been about balancing the community need to reward those who generate knowledge and to assure its distribution and use. Digital technology makes more information more easily accessible; offsetting that, technology and law create new boxes to control that information. The possibility of diffused and distributed information really emerges. Furthermore, as work can be fragmented into different tasks, labor organization and company organization will both be more distributed geographically and organizationally. Finally, the texture of social and political debate is powerfully influenced by who owns and can use content generated by others. Arguably, what we call the "public domain" of civil and political discourse rests as much on the rules of property as on conceptions of "free speech". The politics of discourse consequently change. The political community is thus shaped by the rules of intellectual property. What if a theatre critic could not quote from a play in a review? What if a political critic could not quote from a rival's speech in a political tract? Well, both restrictions are legally possibilities under recent legislation.

Equally vital to a digital world are the rules and norms associated with the collection, processing, and exchange of personal information, which fall under the banner of privacy.[lxxvii] With the rise of digital technologies both the quantity and quality of personally identifiable information has shifted. As each credit card purchase, web visit, mobile phone log create a new bit of data, behavior becomes easily tracked. New moments of personal life become monitorable. From the webcam in the taxi to emerging genetic tests, these technologies erode the barriers between knowable and unknowable and simultaneously permit the networking of previously discrete data. Information intensive sectors such as telecommunications, banking, and health care are the first to

rely on this wealth of personal information to customize products, rationalize costs, and minimize fraud. The supermarket clubcard typifies this line of innovation. With each swipe the company is better able to target customers and lock-in loyalty. The shift in a range of service industries from marketing products to marketing customers further demonstrates this trend. Where once a branch of an insurance firm marketed home policies, they now attempt to understand individual customer needs across a wide array of company products**.**

Improved consumer differentiation, however, goes beyond mere efficiency gains, creating whole new potential markets. The emergence of sub-prime credit in the US, which allows financial service firms to offer high interest rate credit to high-risk customers, is just one example. It is only in the early 1990s that personal credit information combined with complex computational programs permitted banks to differentiate interest rates among consumers. Similar information products are emerging in the insurance sector with the rise of customized health care products. Reversing the logic of traditional credit cooperatives or risk pooling efforts, complex individuation offers firms the ability to profit from extreme differentiation.

The opportunities inherent in personal information processing, however, threaten to erode personal privacy. As digital technology expand the quantity and quality of personal information available, individuals loose the capacity to control information flows. The boundary between public knowledge and private secrets shifts, leaving less and less room for the private. In contrast, however, to previous challenges to privacy such as mass-produced newspaper gossip columns, information privacy is not about defamation. Privacy advocates are not worried about the publication of embarrassing personal details, but the networking of formally discrete personal information for third-party economic gain. Information privacy deals fundamentally with an individual's ability to control what is know about them not what is published about them. And therefore, it addresses at root how individuals construct their identity. If credit data banks cement early risky consumer behavior into a widely distributed consumer report, it is difficult for individuals to be free of the negative data profile. In short, a major concern of the digital age is the inability to forget, a fundament of most health societies.

Not only does digital technology shape an individual's ability to construct their personal identity but it, in turn, risks creating new breads of economic discrimination. The fear arises that say credit card firms amassing hundreds of interactions sub-sorted by purchase types could link their databanks with travel patters available from electronic toll systems. This might be done innocently to offer a valuable customer an appropriate discount but could easily be used to manage clients showing spending and movement patterns denoting extramarital activity. Similarly, one could easily imagine car insurance firms using mobile phone logs to track commuting patterns and potentially changing rates of individuals traveling through high-risk areas. The flipside to customization and risk reduction is the potential discrimination of those most vulnerable. The question then arises concerning the role of the state in a highly differentiated personal information market. Are governments better positioned to prevent the expansion of personal information production or to ameliorate the consequences through a new round of social policies geared to a digital economy?

Which brings us to a more fundamental issue concerning the state and the explosion in personal information production. In a very real sense, digital privacy issues threaten to redefine relationships between state and society. As the amount of information held by the private sector rises, the possibility exists that governments will look to private sector data warehouses to enhance public sector surveillance needs. The recent JetBlue scandal vividly illustrates the potential harm that exists in the linkage between private sector firms collecting information and government bureaucracies hoping to advance security interests. In this case, the airline transferred millions of personal customer files to a defense department contractor who linked the airline data to commercial databanks in order to construct risk profiles. Far from an isolated incident, governments across the globe are looking to private sector data files like telephone or ISP records to monitor citizen behavior. As the line between public and private enforcement breaks down, traditional checks against government abuse are neutralized. The traditional fear of a government dominated Orwellian world is replaced by the specter of public/private partnerships of control.[lxxviii]

Just as notions of property and privacy have been challenged by the emergence of digital technology, questions concerning free speech have been reopened. While often

receiving fewer headlines than the economically more potent cases of property or privacy, speech issues lay at the cornerstone of modern political communities. By defining what can be said to whom, free speech rules shape an individual's ability to express themselves, maintain social networks, and organize politically. While often blindly repeated in the catalogue of basic democratic rights, as the most critical arrow held by opponents of established power, free speech is far from uncontroversial.

Digital technology, then, in altering patterns of communication and the capacity to transmit content has transformed global debates about free speech. With the rise of international Internet connectivity, a resident in the US can as easily transmit information to a local neighbor as a fellow netizen in Europe. As a result communication patterns have emerged that undermine traditional power centers. Take for example the thousands of human rights sites based in European countries that report on daily abuses in African and Middle Eastern dictatorships. Receiving reports from kinship networks in home countries, exiled activist have a new platform to publish and disseminate their perspectives. Given the relatively low cost of managing a basic website, the Internet has the potential to transform previously marginalized voices by democratizing publishing capacity.

Similarly, peer-to-peer networks cropping up across the globe have the potential to reorganized communication patterns offering the possibility for radical new forms of communication. For example, the Vote Swap program that arose in the 2000 election demonstrates the disruptive nature of the technology. Given the three candidate race, many voters wanted to support the Green party candidate but did not want to risk electing the Republican candidate through their efforts. As a result a group of activists organized a clearinghouse website where citizens could meet each other digitally and swap Green votes in competitive districts for Democratic votes in uncompetitive districts. As a result the Green party would receive the same overall vote count but not at the expense of the Democratic candidate. Similarly, activists have leveraged the decentralized networking power of the Internet to organize large anti-globalization rallies. None of these examples should suggest that governments have lost control of communication flows, as examples from China and the Middle East demonstrate. Government censorship is as alive as ever. But activists have new means to communicate both with each other and the world.

Not only has technology changed patterns of communication but also the capacity to transmit content. One only needs to think about streaming video, audio, and even instant messaging to realize that the types of information that maybe instantaneously shared has been fundamentally transformed in the last decade. In terms of free speech this is no where more apparent than in the "piracy" debates that plague the entertainment industry. As previously described in the intellectual property discussion, digital goods are non-rival and replicable at no marginal cost. Why then shouldn't individuals be allowed to share such content with friends? Potentially equally explosive have been policy action concerned with harmful content. Varying considerably by country, these include issues such as obscenity, political speech, and security. From French courts banning the sale of Nazi paraphernalia to the US government limiting the distribution of encryption technology, there is no consensus about what may be distributed. But in both cases, it is clear that digital technologies have challenged basic societal deals concerning speech.

C. Mediating the Transformation

What is certain, is that the digital revolution has reopened fundamental societal debates and in turn brought a reexamination of the role of the state in the emerging political economy. Political fights are underway and the state is an active participant in these discussions. If we look for a general conclusion concerning the role of the state, the "evidence" is so conflicting that any answer would have to be ambiguous. The array of government activities in the creation, management, and expansion of the digital technology, the digital economy, or the information society -- however we pose the question --- has been varied, nuanced, and complicated. To return to the question how digital technologies have altered the character of the state in the political economy, the answer certainly lies not in a quantifiable expansion or reduction. Instead, preliminary findings demonstrate that governments across the globe meditate the transformation. The manner in which states have influenced these processes, however, has differed considerably ranging from policy efforts to guarantee competition within new digital markets to substantive interventions that influence the winners and losers of digital politics.

Despite the complexity of political fights, governments clearly modulate the character of the digital revolution. It is useful to examine three policy strategies that highlight the manner in which states guide the transformation. First, governments may intervene to promote competition in the new market place as technological change disrupts existing business strategies. States intervene to secure fair ground rules for the fights between dominant players and new entrants. These rules may emphasize equal market access, level regulatory playing fields, and transparency. The European Union convergence effort in the communications regime typifies this policy strategy. As medium including telecommunications, radio, cable, and satellite compete head to head with one another for core digital products, market disruptions result from regulatory legacies. Telecommunications companies, for example, face very different regulatory burdens when entering new markets than cable companies. Universal service requirements mandate that telephone companies guarantee access to underserved communities, a cost not faced by cable companies looking to compete in broad band markets. The convergence process attempts to smooth over these regulatory differences and create a comprehensive regime for the digital communications industry. This strategy of getting the market rules right, preferences procedural neutrality and long-term market competition over attempts to shield specific electoral prizes.

In the second policy strategy, governments intervene to reassert incumbent market power. Digital innovations have the potential to upset existing business dynamics in a sector, threatening powerful industry groups. Policies in this strain attempt to shore up the pre-digital distribution of resources and prevent political coalitions from shifting. The Digital Millennium Copyright Act (DMCA) offers the prototypical example of this form of state intervention. The DMCA criminalized the development and use of devices that may be used to break encryption systems. Technological solutions to intellectual property rights questions received legal support, consolidating the entertainment industry's effort to reassert property rules in the digital environment. Despite intense lobbying efforts by new entrants from the information technology sector to curb the legislation, the government attempted to reassure the entertainment industry as a critical interest group. Potentially viewed as a reactionary strategy, the second approach directly steers the political character of the digital transformation biasing existing power centers.

Similar to the previous approach, governments considering the third strategy attempt to shape the substantive character of emerging digital markets. Instead, however, of retrenching existing interest constellations, the state recasts the balance of power in society favoring public interests. The citizen consumer is empowered in the new digital environment, receiving increased control over information resources. Most easily identified with the mission of consumer advocates, this third strategy attempts to promote the public interest more broadly and to prevent digital innovations from further concentrating power in economic and government elite. Often motivated by political fears that individuals will rejection new technologies and thereby stall economic development, this approach emphasizes State safeguards that protect and assure citizens. The European Union data privacy directive provides a clear example. With the explosion of personal information in the digital age, the directive provides individuals with a clear level of control over industry and government data processing. While not eliminating the commodificaiton of personal information, European regulations reset the default benefiting consumers. Governments, promoting the third potentially populist or progressive option, channel the transformation so as to rebalance societal relationships prioritizing citizen concerns.

Digital technology forces choices, forces us to remake bargains, about the place of government in society. But it does not dictate the answers. That seems a disappointing conclusion for all this fuss. Neither vitiating state power nor emboldening the state, the digital revolution creates a policy environment of change. Three strategies present them self as the State attempts to construct the character of the digital transformation. While the first establishes basic rules of market competition, the later two approaches more clearly translate technological change into political advantage. The character of the transformation under each strategy differs considerably, shaping both basic political values and the distribution of power within the digital society. Given unique regulatory structures, nations are differentially suited at adopting these possible strategies. At the same time, governments face policy legacies that influence decision-making as the US telecommunications regime did for initial rules concerning data networking. The diversity of policy responses, therefore, has varied cross-nationally and by issue area given the institutional capacity available to different states. The outcomes,

however, depend on the context of the political fights as well as the strategies available to policy makers.

C. The Dynamics of the Debates

As firms use digital technologies to create advantage or position in their markets, old political economy bargains are undermined. Often, new entrants see opportunity in the technological disruption, incumbents struggle to hold onto old business models, and public interest groups fight to maintain or expand consumer rights. Amidst the commotion, governments begin to formulate policy strategies which inevitably implicate the distribution of business opportunity. Consequently, the digital policy debates are rarely fought over broad principles as abstract as constitutional claims about the nature of a digital society. Rather, the policy fights pose themselves often as struggles about property or about the rights of sellers in the market to gather and use information. The choices may be technically narrow but they are socially significant. The legal foundations of the music file sharing case that begins with Napster influences not just the nature of property and media business models, but issues concerning free speech, private surveillance of Internet use, and creates the basis for private enforcement of property violations.[lxxix]

The dynamics of these political debates may be complex but are far from random. In addition to the state whose policy options are often bounded by its regulatory capacity, business lobbies and public interest groups struggle within a given political institutional environment to construct the emerging rules of the digital economy. In order to understand the variation in policy results across countries, it is vital to identify the roots of business sector and public interest preferences. In short, we contend that the organization of economic and public interest sectors influences their preference formation and their relative stake in digital debates.

Several caveats about business and public interests are important to keep in mind as we examine the preferences of various political actors. Business interests may be driving the process of reformulating rules for a digital age, but there is no unified business position. There is certainly no "digital sectoral" interest, let alone a class interest. To start firms have different preferences and positions on the same issues;

competitors in networks seek to turn the rules to their advantages; companies building and using different technologies, or at different positions in the market, have quite distinct needs.

But there is more to the story. As Abe Newman has shown in his work on privacy, the business interests of financial institutions depends not on the market problems alone, but on the corporate organization of the firms themselves. That organization is partly a business choice and partly a result of regulation. Highly integrated financial institutions, as in France, do not depend on information commodity markets to gather the information they need to market to their customers. Firms rely on their internal warehouse of information to target customer needs. By contrast, the highly fragmented character of financial services in the US reinforces demands for a market in commodity information. So, interests may be definable, but they cannot be read off a market map in any simple way.

Similarly, public interest groups have been at the forefront of many digital policy debates across the globe. But their level of engagement, their policy goals, and their lobbying strategies differ dramatically across countries. Take for example the work of the most active public interest groups in the US, such as the Electronic Privacy and Information Center and the Electronic Freedom Foundation, and compare it to their counterparts in Europe, like data protection or consumer protection bureaus. While the goals appear identical, guaranteeing a social agenda for an information society, the logic of their tactics (e.g. class action suits and media scandals versus negotiated technocratic bargains) vary and are in a very real sense shaped by their institutional settings.
Not only do their tactics differ, but the position of the various players to influence legislative debates changes across policy landscapes. In the US, for example, broader public interests are represented in only a limited way in these struggles over digital rules. Certainly the narrow business story of the emergence of electronic commerce and the tools to conduct commerce using networks, becomes entangled with the broader political struggle over fundamental values, goals, and processes and jurisdiction. But at least in the United States, oversimplified, it is a story of business seeking new rules to implement the digital technologies, with public interest groups seeking to influence the character of those rules.[lxxx] More often than not groups defending general principles, such as privacy

or consumer protection on the network, enter the fights in response to business initiated or proposed rule changes. None have mobilized effectively on a mass basis and as a result there is no digital equivalent of the environment movement.[lxxxi]

The US debate is driven by markets and market actors and therefore has the flare of business dominating the political debate. Elsewhere public interest voices are fitted differently into the political system, either through a formal institutional position or through political parties. This privileged position turns the tables on industry, forcing trade associations to respond to legislative agendas pushed by consumer interests. Two examples prove illustrative. The role of the Green party in Germany has radically altered the place of consumer groups. Held as a core party policy area, the small party has successfully raised the issue to a cabinet position. At the European Union level, consumer interests have been institutionalized in the consumer protection directorate, elevating public interest demands within European policy debates. As a result, industry is stuck in the position of responding to positions placed on the table by consumer advocates, who at the same time often have an ear of the European Commission or national governments.[lxxxii]

This forces us to at least open the basic question, how do political groups form and how are their interests defined. Because business now operates globally, because markets and products cross borders, these domestic battles for values and principles, from privacy through the right to expression, will have to be fought again; and the terrain of political battlefield will be much more varied, more complex. Political strategies will now involve cross-national coalitions and deals in international institutions to settle what were once exclusively domestic decisions. Indeed, the creation of interests in the whole array of digital cases emphasizes that interest groups are never mechanical functions of markets or political structures, but politically created.

E. Conclusions for Political Economy and Polity

It is clear that new deals are being struck, but the content of these deals are not compelled in any consistent way by the digital tools and networks themselves. Rather the state finds itself struggling to manage digitally inspired conflicts fueled by business and public interest groups. As technology reopens debates, governments have varying policy tools at their disposal and confront distinct policy legacies. One therefore, should expect to see different government approaches to basic digital fights. Not only will proposed government solutions take on a unique character, but the struggles shrouding their adoption will take on a fundamentally different texture. The cross-national varying dynamic of policy debates will reflect market conditions and problems but more fundamentally the distinct organization of the public and private sector lobbies involved.

Do the resulting choices though have the capacity to alter fundamental parameters of economy and polity? Remember that the drama of the Great Transformation itself was the shift from a Traditional society in which markets fitted within social order, in which economic activity bowed to the confines of social rules, to a Market society in which land labor and capital became commodities and moved in response to price signals from the market. That transition was marked by a series of battles that redefined England. They included the enclosures, the poor laws, and the Corn laws. The enclosures transformed community public lands into private farming lands, beginning the creation of a market in land. The series of poor laws culminating in the Speenhamland law in 1795 created a labor market. It broke the link for survival between individual and local community, making the individual worker's well being dependent on wages obtained in the labor market. The Corn Laws in 1815 opened British agricultural markets, limiting trade protection, so that lower cost grain could feed the emerging industrial work force. That political decision marked a shift in power from the landed classes to the emerging industrial bourgeoisie.

The focus has to date been too narrowly on questions of how "tools for thought" alter the administration of government and narrow matters of how voting take place. The issue is not whether we have online voting, but who votes. And in California where the convenience of voter registration with driver's license registration, motor voter laws, would extend the Franchise, they are opposed by those who precisely would not extend

the Franchise. The question is which new fights are opened or forced by e-tools, and whether the outcomes would radically alter the rules of politics and the governing coalitions – the political regime. Similarly, are *the institutions of governance*, the operations of the state, altered? E-government operations being sold, by SAP for example, a skeptic would correctly observe, is likely to alter the service operations of government, but not its critical processes of decision and the central place in society and economy. The critical development in France will not be electronic communications but decisions about where tax authority lies in the regions and how the French relate to decision making from Brussels.

Yet, the counter argument would be, that the *dynamics of politics*, the underlying coalitions on which governments rest and on which policy operates may be reconfigured. The notion here is that the structure of interests will so change, the nature of political groups be so altered, the stakes and rules of political competition will be affected. In that case e-voting is a diversion; the real issue is how interests line up around market structuring policy choices concerning privacy, finance, intellectual property, and competition. Many of the narrow issues may become the basis of mobilization. Ecology has become the basis of political mobilization, but not "fair" use of information on which fundamentals of free speech and public discourse rest. The strongest claim would be that structuring the economic and social use of information may in the next years set the features of political regimes.

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[i] Niko Waesche, *Internet Entrepreneurship in Europe: Venture Failure and the Timing of Telecommunications Reform* (Northampton: Edward Elgar, 2003).

[ii] J. Bradford Delong, "Technology and Opportunity," Keynote Talk at the Francisco Partners Investors Conference, Fall 2002.

[iii] Some argue that in its sheer scale relative to an existing economy, the IT revolution, some argue, is greater than the textile boom of the first industrial revolution.[iii] And the telecom collapse that followed dot.com collapse opened real possibilities. Brad de Long urges us to recall, that it was the collapse of the railroad bubble that set the stage for the transportation revolution, facilitating the applications and uses that depended on lower price shipping. When excess rail capacity drove down transport prices in the late 19th century the result was innovative and transformative businesses. Telecom network providers have overbuilt, creating excess network capacity that is, at this writing, available at pennies on the dollar, generating new innovations in delivery.

iv The work of Claude Shannon and Norbert Wiener in a real sense define the information age. Those notions precede and underpin the computer itself. Norbert Weiner, The Human Use of Human *Beings: Cybernetics and Society* (Boston: Da Capo Press, 1954) and Norbert Weiner, *Cybernetics: or Control and Communication in the Animal and the Machine* (Cambridge: MIT Press, 1965). Weiner defines cybernetics, or the theory of messages, as the "entire field of control and communication theory, whether in

the machine or in the animal." The development of messages and communication facilities, both man to machine and machine to machine, will play an ever-increasing role in our society. Cybernetics argues the "structure of the machine or of the organism is an index of the performance that may be expected from it." Analogous to humans, communication machines use feedback mechanisms to reduce entropy and maintain effective communication.

Claude Elmwood Shannon, "A Mathematical Theory of Communication" in N.J.A. Sloane and Aaron D. Wyner (Eds.), *Claude Elmwood Shannon: collected papers* (New York: IEEE Press, 1993). Shannon argues predictable symbols can be omitted from communication. Information, or "those symbols that are uncertain to the receiver," measures an information source's entropy. Entropy, in turn, "determines the smallest number of bits per symbol that is required to represent the total output." See Lucent Technologies, "The Meaning of Information" at http://www.lucent.com/minds.infotheory/what.html and "An Overview of Information Theory" at http://www.lucent.com/minds/infotheory/docs/history.pdf.

[v] Again, it was a conception, the underlying protocols of the internet and the addressing system of the World Wide Web, and the software and coding to implement them, that moves us truly into a useful global network of networks that now defines the new information era.

[vi] All due deference, let alone citations, to Karl Polanyi. See Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (Boston: Beacon Press, 1944).

[vii] Castells and Bell before him.

[viii] Cohen Delong Zysman

[ix] Lawrence H. Summers and J. Bradford Delong in "Is the 'New Economy' a Fad?" Project Syndicate, April 2002 offer the following statistics: in 1950 there were 2,000 computers in the US. By 2002, there were 300 million computers. That is a 4 billion fold increase in raw automated computation power, an average annual rate of growth of 56%.

[x] There are traditional lists of leading sectors, or clusters of technological innovations, over the past two centuries. They include in some format: 1) the industrial revolution and the Arkwright mill, 2) the age of steam and railways, 3) the era of steel/electricity/ heavy engineering, 4) the automobile era of mass production, and now 5) information and telecommunications.

[xi] Cohen, Delong and Zysman, "Tools for Thought: What is New and Important about the 'E-conomy'" (Berkeley: BRIE, 2000), pp. 7-8.

[xii] Norbert Weiner, *The Human Use of Human Beings: Cybernetics and Society* (Boston: Da Capo Press, 1954), pp. 136-162.

[xiii] The use and application of transformative technologies alters the array of activities in the economy as a whole. The diffusion of those transformative technologies is undoubtedly the critical step. It is not just the fortunes made as the leading sector expands, but the industrial development transformative technologies engender. Notably, as Brad de Long points out, in the 19th century the several railroad bubbles brought down the price of transport and in the process, by extending the geographic size of markets, generated such innovations mail order retailing. Thus, ironically, the .com and telecommunications collapse in last years may, in historical perspective, prove to have accelerated use and diffusion. The collapse of major telecom carriers as a result of overbuild of telecom networks has brought a precipitant drop in the price of network use.

[xiv] Other examples would be hip surgery, or semi conductor ovens that requires temperature controls within one degree C at roughly 2000 degrees.

[xv] According to the Department of Commerce Bureau of Economic Analysis, in 1998 US trade in IT was $314 billion. The total volume of American trade--imports and exports--in information technology is now doubling in less than seven years.

[xvi] Cohen, Delong and Zysman, "Tools for Thought: What is New and Important about the 'E-conomy" (Berkeley: BRIE, 2000), pp. 13-14.

[xvii] Katie Hafner and Matthew Lyon, *Where Wizards Stay Up Late: The Origins of the Internet* (New York: Touchstone, 1998).

[xviii] Ibid.

[xix] Research with Cowhey

[xx] interviews

[xxi] This section is based on John Zysman, "Production in a Digital Era: Commodity or Strategic Weapon?" BRIE Working Paper 147 (Berkeley: BRIE, September 2002). John Zysman, "Strategic Asset or Vulnerable Commodity?: Manufacturing in a Digital Era," BRIE Working Paper 147A, sponsored by the

National Academy of Science (Berkeley BRIE, 2003). John Zysman, "Transforming Production in a Digital Era," in William Dutton, Brian Kahin, Ramon O'Callaghan, and Andrew Wyckoff (Eds.), *Transforming Enterprise* (Cambridge: MIT Press, 2004, in press).

[xxii] Japanese lean production is a term associated with the work of Jim Womack, *The Machine that Changed the World* (New York: HarperPerennial, 1991). Flexible specialization is a term widely used by Charles Sabel and Michael Piore generating a veritable industry of studies. See *The Second Industrial Divide* (New York: Basic Books, October 1990). Diversified Quality Production, Wolfgang Streeck's term for similar phenomena is developed in "On the Institutional Conditions of Diversified Quality Production," in Egon Matzner and Wolfgang Streeck *Beyond Keynesianism* (Aldershot: Elgar, 1991) pp 21-61.

[xxiii] John Zysman and Michael Borrus, "Globalization with Borders: The Rise of Wintelism as the Future of Industrial Competition," *Industry and Innovation*, Vol. 4, Number 2, Winter 1997. John Zysman, "Production in a Digital Era: Commodity or Strategic Weapon?" BRIE Working Paper 147 (Berkeley: BRIE, September 2002).

[xxiv] James P. Womack, Daniel T. Jones and Daniel Roos, *The Machine that Changed the World* (New York: HarperPerennial, 1991). See also Paul Hirst and Jonathan Zeitlin "Flexible Specialization: Theory and Evidence in the Analysis of Industrial Change," in J. Rogers Hollingsworth and Boyer (Eds), *Contemporary Capitalism: The Embeddedness of Institutions* (Cambridge: Cambridge University Press, 1997).

[xxv] Peter Hall

[xxvi] Stephen Cohen and John Zysman, *Manufacturing Matters: The Myth of the Post Industrial Economy* (New York: Basic Books, 1987). Benjamin Coriat, "The Revitalization of Mass Production in the Computer Age," paper presented at the UCLA Lake Arrowhead Conference Center, Los Angeles, CA, March 14-18 1990. Ramchandran Jaikumar, "From Filing and Fitting to Flexible Manufacturing: A Study in the Evolution of Process Control," Working Paper 88-045 (Boston: Division of Research, Graduate School of Business Administration, Harvard University, c1988). James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine that Changed the World* (New York: HarperPerennial, 1991).

[xxvii] Chalmers Johnson, Laura Tyson, and John Zysman (Eds.), *Politics and Productivity: The Real Story of How Japan Works* (New York: Ballinger, 1989). 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 re-organization 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, but they have been at the center of vertical Keiretsu, loosely speaking, a Japanese conglomerate conventionally understood to be headed by a major bank or one consisting of companies with a common supply chain linking wholesalers and retailers, that have tightly linked the supplier companies to their clients.

[xxviii] John Zysman and Laura Tyson, "The Politics of Productivity: Developmental Strategy and Production Innovation in Japan," in Chalmers Johnson, Laura Tyson, and John Zysman (Eds.), *Politics and Productivity: The Real Story of How Japan Works* (New York: Ballinger, 1989).

[xxix] John Jay Tate, "Driving Production Innovation Home: Guardian State Capitalism and the Competitiveness of the Japanese Automotive Industry" (Berkeley: BRIE, 1995).

The argument is simple. The relationships of production and development in these production systems are, at best, delicate. Just-in-time delivery, subcontractor cost/quality responsibility, and joint component development push on to the subcontractor considerable risk in the case of demand fluctuations. True, there were techniques to continuously reappraise demand levels and indicate to 'client' firms their allocations so that the client firms could in turn plan. This reduced unpredictability throughout the system. But if demand moved up and down abruptly, those techniques would not have mattered. True, government and corporate programs to reduce the capacity break-even point in small firms helped. Nonetheless, imagine that Japan's emerging auto sector had to absorb continuously 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? Simply a smooth and steady expansion of demand typified the Japanese market in sectors such as autos and facilitated these arrangements and developments. The high growth rates--combined with the

need to re-equip Japan in the post war years--created the basis of the continuous expansion. But domestic growth did fluctuate and the rivalries for market share led consistently to over-investment, or excess capacity, in the Japanese market. The story about Japan told by Yammamura and Murakami, Tsuru, Zysman, and Tyson, and by Tate in the case of the auto industry shows that the excess capacity was "dumped" off onto export markets. Seen differently, these exports permitted a steady and smooth expansion without which the production innovations outlined here would not have emerged. The developmental strategies of Japan were essential to its production innovation.

[xxx] Tyson zysman , Tate

[xxxi] Wolfgang Streeck, "On the Institutional Conditions of Diversified Quality Production" in Egon Matzner and Wolfgang Streeck *Beyond Keynesianism*, pp.21-61 (Aldershot: Elgar, 1991). Michael Piore and Charles F. Sabel, *The Second Industrial Divide: Possibilities for Prosperity* (New York: Basic Books, 1990). Robert Boyer and J. Rogers Hollingsworth, *Contemporary Capitalism: The Embeddedness of Institutions* (New York: Cambridge University Press, 1997). Robert Boyer and Yves Saillard, *Regulation Theory: The State of the Art* (New York: Routledge Press, 2002).

[xxxii] Charles F. Sabel, Horst Kern, and Gary Herrigel, *Collaborative Manufacturing: New Supplier Relations in the Automobile Industry and the Redefinition of the Industrial Corporation* (Cambridge, MA: International Motor Vehicle Program, Massachusetts Institute of Technology, 1989). Charles Sabel, *Work and Politics* (Cambridge: Cambridge University Press, 1982). Suzanne Berger and Michael J. Piore, *Dualism and Discontinuity in Industrial Societies* (New York: Cambridge University Press, 1980). Paul Hirst and Jonathan Zeitlin, "Flexible Specialization: Theory and Evidence in the Analysis of Industrial Change," in J. Rogers Hollingsworth and Boyer (Eds.) *Contemporary Capitalism: The Embeddedness of Institutions* (Cambridge: Cambridge University Press, 1997).

[xxxiii] Paul Hirst and Jonathan Zeitlin, "Flexible Specialization: Theory and Evidence in the Analysis of Industrial Change," in J. Rogers Hollingsworth and Boyer (Eds.) *Contemporary Capitalism: The Embeddedness of Institutions* (Cambridge: Cambridge University Press, 1997).

[xxxiv] Charles Sabel, "Flexible Specialization and the Re-Emergence of Regional Economiesn" in Ash Amin (Ed.), *Post-Fordism: A Reader* (Oxford: Blackwell Publishers, 1994). **Communities of groups of small companies arose, organized in what are perceived as twentieth century versions of industrial districts. These communities are able, in at least some markets and circumstances, to adapt, invest, and prosper in the radical uncertainties and discontinuities of global market competition more effectively than larger, more rigidly organized companies. "These districts escape ruinous price competition with low-wage mass producers," Sabel explains, "by using flexible machinery and skilled workers to make semi-custom goods that command an affordable premium in the market."**

[xxxv] Michael Borrus and John Zysman, "Wintelism' and the Changing Terms of Global Competition: Prototype of the Future?" BRIE Working Paper 96B (Berkeley: BRIE, 1997).

[xxxvi] Michael **Borrus**, "Left for Dead: Asian Production Networks and the Revival of US Electronics," BRIE Working Paper 100 (Berkeley: BRIE, April 1997).

[xxxvii] Ibid.

[xxxviii] Steve Vogel et al. (Eds.), *The Highest Stakes: The Economic Foundations of the Next Security System* (New York: Oxford University Press, 1992). Jay Stowsky, "Secrets to Shield or Share? New Dilemmas for Dual Use Technology Development and the Quest for Military and Commercial Advantage in the Digital Age," BRIE Working Paper 151 (Berkeley: BRIE, April 2003). More or less at that same moment, products that were thought to spin off from technology investment in military good into civilian products seemed less significant. Leading edge civilian technologies contained more advanced technologies and components than their military counterparts.

[xxxix] By vertical control we mean both vertical integration from inputs through assembly to distribution, as in the case of American auto producers, and the "virtual" integration of Asian enterprise groups, as when Japanese producers of consumer durables effectively dominate market relations with semi-independent suppliers through the Keiretsu group structure. See Masahiko Aoki, *The Japanese Firm as a System of*

Attributes: A Survey and Research Agenda (Stanford, CA: Center for Economic Policy Research, Stanford University, 1993). Mashaiko Aoki and Ronald Dore (Eds.), *The Japanese Firm: The Sources of Competitive Strength* (New York: Oxford University Press, 1994). Masahiko Aoki, *Information, Incentives, and Bargaining in the Japanese Economy* (New York: Cambridge University Press, 1988). Michael L. Gerlach, *Alliance Capitalism: The Social Organization of Japanese Business* (Berkeley: University of California Press, 1992).

[xl] Global Value Chain Initiative http://www.globalvaluechains.org/

[xli] Barbara Baran, "The Technological Transformation of White Collar Work: A Case Study of the Insurance Industry," dissertation (Berkeley:University of California, 1986).

[xlii] Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston: Harvard Business School Press, 1999). (p. 59 refers to the versioning of IBM printers).

[xliii] Ibid.

[xliv] Certainly downloading the program would also be sale of a product, but it confuses the presentation.

[xlv] Gary Fields, "From Communications and Innovation, To Business Organization and Territory, The Production Networks of Swift Meat Packing and Dell Computer," BRIE Working Paper 149 (Berkeley: BRIE, March 2003). Martin Kenney and David Mayer, "Economic Action Does Not Take Place in a Vacuum: Understanding Cisco's Acquisition and Development Strategy," BRIE Working Paper 148 (Berkeley: BRIE, September 2002).

[xlvi] Francois Bar, "The Construction of Marketplace Architecture," in BRIE-IGCC E-conomy Task Force (Ed.), *Tracking a Transformation: E-commerce and the Terms of Competition in Industries* (Washington, DC: Brookings Institution Press, 2001).

[xlvii] This categorization follows Bar's, previously cited.

[xlviii] Niko Waesche, *Internet Entrepreneurship in Europe: Venture Failure and the Timing of Telecommunications Reform* (Northampton: Edward Elgar, 2003).

[xlix] Steven Weber, *The Success of Open Source* (Boston: Harvard University Press, 2004, in press).

[l] Ibid.

[li] Ibid.

[lii] Lawrence Lessig, *Code and other Laws of Cyberspace* (New York: Basic Books, 1999).

[liii] Shanthi Kalathil and Taylor C. Boas, *Open Networks, Closed Regimes: The Impact of the Internet on Authoritarian Rule* (Washington, DC: Carnegie Endowment for International Peace, 2003).

[liv] Globalism as a term began with the arrival of the Asian challenge—Japan's success followed by the extraordinary rates of Asian growth in the second development tier (especially Korea and Taiwan), the third development tier (Thailand and Malaysia among others), and now parts of China. Asia's growth has been premised on a distinctive asymmetry in trade and investment, a seemingly permanent trade surplus with the West. This era is, thus, one in which an increasingly global market coexists with enduring national foundations of distinctive economic growth trajectories and corporate strategies. Globalization has not led, we will argue here to the elimination of national systems.

[lv] Raymond Vernon, *Sovereignty at Bay* (New York: Basic Books, 1971). The outcome considered remains the same remains; what control can national government exert over the economic social and political process within borders. The independent variables, the proposed triggers of change, vary; each a chapter in the story. Is the trigger that puts sovereignty at bay the evolution, variously, of transportation, of communication, management practice, financial market integration or evolution, and now the internet. The intermediary processes, by which these triggers translate into variations in outcomes, are at dispute also. Is the mechanism of change the result of market forces compelling policy decisions or political choice about matters such as security.

[lvi] We are continuously told that markets become larger; companies operate effectively over diverse geographies creating complex cross - national production network and unified product offerings. One classic "chapter" is that the interconnected financial markets make independent fiscal and monetary policy impossible, since international currency and investment markets will constrain choices and punish deviations. Communities become more diverse and more integrated; for example, demand for labor drives significant waves of migration. Those who move often remain tied to and integrated in communities of their origin. Consequently, not only must the host country integrate diverse communities that retain ethnic identities and attachments, but also the home country of origin must accommodate a citizenry that is informed from abroad and with attachments abroad.

[lvii] Journal cite WHAT JOURNAL? Let us call the first tale, The Amex Story, which highlights the constraints of markets and technology on corporate strategies and government policy. This is called the Amex story because it is most often represented by global financial markets in which American Express participates and popularized by the American Express Journal.

[lviii] Paul Hirst and Grahame Thompson, *The Future of Globalization* (Cambridge: Polity Press, 1999). "The 50 years between 1950-2000 are not remarkable when compared with the period 1850-1914-in that period flows of merchandise trade, capital investment, and labour migration were all comparable to or greater than those of today…Financial integration was far greater, and levels of capital export from the major lender countries unprecedented."

[lix] Economic historians debate whether the world today is more "globalized" than it was back on the eve of World War I. See Michael Bordo, Barry Eichengreen, and Jongwoo Kim, "Was There Really an Earlier Period of International financial Integration Comparable to Today?" in *The Implications of Globalization of World Financial Markets* (Seoul: Bank of Korea, 1998). Robert Wade, "Globalization and Its Limits," in Suzanne Berger and Ronald Dore (Eds.), *National Diversity and Global Capitalism* (Ithaca: Cornell University Press, 1996), pp. 60-88. However, there is no doubt that business organizations are more able to reach across national borders to finely organize their internal divisions of labor than ever before. See Michael Borrus and John Zysman, "Globalization with Borders: The Rise of Wintelism as the Future of Industrial Competition," BRIE Working Paper 96B (Berkeley: BRIE, 1997).

[lx] In fact, globalization originated as a label not a concept. It was an emblem pointing to dramatic intertwined changes in the interconnections among economies, in the processes of national adjustment, and in the relations among the several national systems. What distinguishes the present "Global" era from earlier eras that were code-named "International" and "Multinational"? When international firms first sold abroad, their era, the period of British industrial pre-eminence, was one of trade. Multinational firms produced abroad in a variety of locations, defining an American era led by Foreign Direct Investment (FDI). In each case, the British international era and the American multinational era, a single dominant style of production organization spread out from a single dominant core country. Firms in other countries imitated, adapted, or struggled to cope with the advances of their competitors in the lead country. The present "global" era, to use that often deceptive label, has a distinct logic and feel. This is a world economy of multiple centers with a deeply rooted and distinct capacity for innovation and development.

[lxi] Cite list ..Hall Berger etc. Zysman

[lxii] Let us choose a rather mundane example from the politics of France in the mid 20th century. Is there a single best technocratic solution to the question of how a city should collect garbage? This view would argue that there is not a single best way of collecting garbage. Rather, given a financial constraint on a city, there is more than one best way of collecting garbage. The answer depends not on efficiency but on political values, on a decision as to whether all parts of the city should be equally clean for example, or whether particularly difficult waste is the responsibility of the homeowner or the community. Similarly given different values or objectives, there will be, at a given technological frontier, not one solution, but a series of most efficient solutions. The choice amongst them is one of political values.

[lxiii] The character of these national trajectories, what changes them and sustains them, is an established debate, but there is a common view across different flavors of this argument. Colin Crouch and Wolfgang Streeck, Political Economy of Modern Capitalism (London: Sage, 1997). (see also Cohen and Pisani and their references)

[lxiv] Robert Boyer, "The Diversity of Institutions Governing the New Economy," paper prepared for the session "Labour Market and Human Resources" (University of Amsterdam: SASE 2001 Meeting Knowledge: The New Wealth of Nations, June 28 –July 1, 2001). The Nordic countries with strong corporatist and social welfare traditions present one clear alternative to the American pattern of aggressive deregulation and labor market disorganization. Finland managed a shift from supplier to the Soviet Empire to high tech innovator in Western markets through already established instruments of political and social concertation. These small countries rather than trying to invest across the board in advanced science and technology have developed national and corporate systems of knowledge management to track, harvest, and apply technology. Korea's highly successful build out of high speed broad band demonstrates the enduring power of the State in purposively shaping the course of development. The state has used policies such as introducing competition into land line provision and auctions of wireless spectrum, policies that elsewhere were intended to remove government influence, as means of directing the contours of development. The result has been a broader penetration and more extensive use of landline broadband

networks than elsewhere in the world. This diffusion of networks creates powerful domestic markets for advanced IT equipment for local companies such as Samsung. It encourages leading edge users and user led innovation. The government objective was diffusion of network use and resources were taken from government auctions of wireless networks to subsidize that objectives.

[lxv] The American industrial come back was led by an electronics sector that had been left for dead, to use Borrus's phrase, and hinged on the possibilities of a new round of consumer electronics. This new round was very different than the old electronics that had been dominated by the Japanese. The old consumer electronics had hinged on open standards, such as televisions, which highlighted commodity manufacturing and innovation in presentation and some components such as screens and innovated in electro-mechanical products such as walkmen and VCR turning professional goods into mass consumer products. The new round turned on open but owned architectures such as the intel processor or the Windows operating system and on network connectivity. The new consumer electronics rode computing and communications, both the internet and the mobile phone. It turned on deregulation of communications in the US and Europe and European innovations in regional standards setting in mobile telephony. And critically the merchant semi-conductor industry that drove innovation in American electronics emerged from the competition policy decisions to prevent AT&T and later IBM to dominate the component sectors, to permit the market space for innovations in micro electronics. The corporate strategies that permitted that American comeback in global markets were deeply rooted in American policy.

[lxvi] For the more detailed argument, see John Zysman and Michael Borrus, "Globalization with Borders: The Rise of Wintelism as the Future of Industrial Competition," *Industry and Innovation*, Vol. 4, Number 2, Winter 1997.

[lxvii] Paolo Guerrieri, "Trade Patterns, Foreign Direct Investment, and Industrial Restructuring of Central and Eastern Europe," BRIE Working Paper 124 (Berkeley: BRIE, July 1998).

[lxviii] John Zysman and Laura Tyson, "The Politics of Productivity: Developmental Strategy and Production Innovation in Japan," in Chalmers Johnson, Laura Tyson, and John Zysman (Eds.), *Politics and Productivity: The Real Story of How Japan Works* (New York: Ballinger Press, 1989).

[lxix] Steve Weber and John Zysman, "Governance and Politics of the Internet Economy—Historical Transformation or Ordinary Politics with a New Vocabulary?" BRIE Working Paper 141, (Berkeley: BRIE, June 2000). See materials from The E-conomy Project conference, "The E-business Transformation: Sector Developments and Policy Implications," September 26-27, 2000, available at http://e-conomy.berkeley.edu/conferences/9-2000/conferences.html.

[lxx]Lessig, Lawrence, *Code and other Laws of Cyberspace* (New York: Basic Books, 1999).

[lxxi] Thanks to Steve Weber for the reference to Stewart Brand.

[lxxii] Steve Vogel titled his excellent comparative study of deregulation that focused on Japanese telecom and financial: *Freer Markets, More Rules*.

[lxxiii] Thanks to Jonathan Sallet.

[lxxiv] The transaction issues are significant but mostly secondary to our broader political concerns. Transaction issues are about how buyers and sellers discover each other, negotiate or agree to terms, and complete a binding deal. Negotiation in the marketplace is visibly and fundamentally altered by online auction, changing the dynamics of pricing. Ebay is the most convenient instance of online auctions. There are difficult dimensions, but for the most part these are straightforward issues, and there are often technical solutions that require certification and enforcement by government. It is not simply who assures consumer protection in on-line deals. Even the most straightforward solutions carry other implications. Identification or authentication of who is engaged in a transaction is evidently required. But how is that done? Who can observe the deal? And who has access to the information? The transaction rules directly influence our questions of privacy. But the transaction issues are likely to be an evolution of existing practice.

[lxxv] Steven Weber, *The Success of Open Source* (Boston: Harvard University Press, 2004, in press).

[lxxvi] Ibid.

[lxxvii] The section on privacy is derived from Abe Newman's dissertation, *Creating privacy: the politics of personal information in the US and Europe.*

[lxxviii] For a review of privacy concerns in a digital age see Abraham Newman and David Bach. 2003. Privacy and Regulation in a Digital Age. In Harry Bouwman, Brigitte Preissl and Charles Steinfield, eds., *E-Life after the Dot.Com Bust*. Berlin: Springer Verlag.

[lxxix] As a single example, consider that to attack music downloading, the RIIA (acronym) entered a series of law suits. To obtain the information on which the suits were based, the trade associate required access to the records of the Internet Service providers, the ISPs. The law as now written, the Digital Millenium Copyright Act, compels the ISP to provide them access to that information on the basis of suspicion of IP violations without court authorization or review. This constitutes the creation of a private posse enforcing its will in civil courts.

[lxxx] There are exceptions of course. One is the present debate about the effort to restrict telemarketing calls in the United States, which has mobilized a broad constituency. But even this issue, which receives almost universal popular support, has faced a harrowing road to implementation, including multiple court injunctions that threaten to derail a consumer friendly outcome.

[lxxxi] Thanks to James Boyle, Professor of Law at Duke University.

[lxxxii] For the differences in the role of public interests groups in the US and Europe see Alisdair R. Young and Helen Wallace, *Regulatory politics in the enlarging European Union : weighing civic and producer interests* (Manchester : Manchester University Press, 2000)