The State in A Double Bind:
Staying Wealthy in a Changing Global Economy

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Can Wealthy Nations Stay Rich In A Rapidly Changing Global Economy? This was the question with which we began our inquiry several years ago. The policy objective for governments is classic and enduring: sustain the growth of employment and productivity to assure expanding real incomes of the citizens. Success requires that "under free and fair market conditions, the community (firms and populace) can produce goods and services that meet the test of international markets while simultaneously expanding the real income of its citizens."[i] But the strategies required to achieve the goals and the debates about those strategies have evolved in two different directions, seemingly proposing alternate and contradictory priorities on governments.

I. Overview: The Double Bind: Before the financial crisis, two dramatic long term shifts in the ways companies create value and generate productivity were underway. The first shift is the decomposition of the production of goods and services. More and more production is conducted in discrete stages, such as research, design, manufacturing, and assembly, in specific locales around the globe. Even without fully understanding the need, nations started de facto to specialize around specific stages of production. It is no longer enough to know which countries excel in what industry; we now have to specify the particular stages of production at which these countries compete. Information and Communication

Technology (ICT) tools facilitated this decomposition, and with it a geographic recasting of production tasks across borders, and its re-composition in what have become known as supply networks.

The application of ICT tools to services is driving a second basic shift. Service activities are transformed when they are converted into formalizable, codifiable, computable information based processes – processes often with clearly defined rules, algorithms, for their execution. The application of these rule based information technology tools radically alters how these activities are conducted and value is created, changing the way firms compete and what they do to capture market position. Information based goods – whether finance or libraries – became highly automated. Physical goods – cars or refrigerators – can be integrated into service networks. Some purely personal services, such as nursing or home care, become integrated into sensor based monitoring systems. And other personal services from corporate consulting through medical diagnostics and even the hair salon are augmented by these information tools. The data suggest that this transformation has resulted in a surge in productivity in many of the recast and newly created services and may have created a permanent improvement in service growth prospects.[ii] Importantly, from the point of view of the State, there is *a real need to reframe rules of markets and service activities*.[iii]

The policy debates accompanying these changes in the logic of value creation often focused around the supposed constraints on national policy making – the supposedly diminishing ability of national governments to shape their own markets and economies – and on the need to get government out of the market place. By late 2007, the time we first conceived this book, many believed there was an inexorable movement toward an ever more integrated "global" economy in which governments influence was drastically restricted by the market forces. The argument was that market forces in a global economy limit governments so much that, beyond basic macro-economic policy and deregulation, their policy strategies are simply rhetoric and hapless floundering.[iv] The debates on "globalization" and "deregulation" had many sources, but they were consistent with the policy concerns of firms that were spreading production across diverse borders, of the rise of strong new competitors in Japan and China, of the ICT facilitated globalization and reorganization of finance and telecommunications.

Our own view of those processes is quite different. We have been arguing that globalization has been in fact a sequence of national stories played out on a larger stage.[v] In reality it was a globalization with borders, in which new emerging national players from Japan through Finland could pursue their development in larger markets.[vi] National strategies for rapid growth in a variety of countries and regions including Finland, Israel, Ireland, Taiwan, South Korea, and Japan showed

the argument that governments were helpless to be overdrawn, if not simply wrong. The empirical reality has been that amidst the increasing complexity of global production, novel national strategies for growth took advantage of new possibilities, at the same time that more traditional approaches found limits. Many have been celebrating, or mourning, the demise of the Japanese and French 'old model' of State-led national-champions-based industrial development, and of the 'traditional' Scandinavian social-democrat welfare state; touting these examples as a proof that state power is on the decline. At the same time other countries, such as Denmark, successfully employed a revitalized Neo-Corporatism model to become a critical node in the upper level design and manufacturing of many global networks.[vii] Others, such as South Korea, have rejuvenated the national-champions-based industrial development model after the 1997 to achieve further growth. Furthermore, other states, from Taiwan and Israel to India, have seen rapid growth of their high technology industries by focusing on a specific stage of production be it novel-product R&D in the case of Israel, to ODM and upper level development in the case of Taiwan and India.

The diverse national successes demonstrate that a variety of viable strategic growth options are possible.[viii] Phrased differently, the already wealthy countries in Europe and the United States – particularly in the liberal economies of Britain and the US – focused on the *constraints* globalization put on government, trying to

make themselves into "competition states." Meanwhile, the emerging challengers focused on the role of the state in *promoting* growth, devising new models of state-led economic growth.[ix]

At the same time, and consistent with the arguments about globalization, there was a decades long push, both ideological and practical, toward supposed "deregulation." The purported intent was to restrict the role of government in actively shaping markets, to pull back governments from direct intervention in outcomes. As an instance, important aspects of financial markets were considered self-regulating, new risk management techniques facilitated by and built with information technologies were thought to diminishing the need for government to assure proper market functioning. Self regulation by private actors in markets, we were told, would not only be sufficient to assure the proper and appropriate functioning of the markets, but would also be superior in its outcomes in terms of the efficient allocation of resources throughout the economy. Many, we amongst them, believed that the debate about deregulation was mis-framed. Demands for deregulation really hid the arguments about how to "re-regulate" segments of the economy.[x] It is not a matter of whether governments can act, but rather how they do, and to whose benefit. The reregulation of markets, which is a more accurate depiction of what occurred under the guise of deregulation, shifts the rules to influence who was advantaged and who was discomfited, and who controlled and

who lost control. This was clear, to anyone really watching, for a range of sectors from finance through media.

Then the financial crisis erupted. The debates changed focus and emphasis. With the financial debacle, we were tiptoeing along the precipice of depression. Suddenly there were insistent demands that governments fix things, that the market rules, particularly financial market rules, be reset. For many this was the painful rediscovery of the simple truth: all markets need, and are built on, rules that allow them to function. The choice of rules powerfully influences not only the stability of the market, but also who benefits and who is dislocated.

The real question, it became clear as the financial crisis unfolded, was not whether there are market rules, but what the rules are, and who devised them and for what purpose. All those rules are contested, influencing as they do who wins and who loses, who benefits and who is damaged. As their basis markets always require rules defining property. Hidden within the enthusiasm for digital start-ups, entrepreneurs, and free market driven innovation is an intense debate about digital property rights and piracy.[xi] The notions and definitions of property had to be recreated. One could not just declare: "the traditional rules of property apply in a digital age;" the issue of digital property is difficult because the information property is different from physical property. Indeed, information property, it is

increasingly accepted, is fundamentally a creation of the law. The classic example is the car and the digital song. If I use my car, you can't. To use it you have to take it away from me. Property is concrete. A digital song can be shared widely without your use of the song diminishing the quality of the digital file I have. Hence, we have to create rules to specify what "digital" property that should not be shared is. Accordingly, with changing technologies the notions and definitions of "property" need to be constantly refashioned and recreated.

Likewise, to function markets require rules about legitimate transactions defining the roles and responsibilities of intermediaries and traders, as several notorious cases from Enron to Madoff showed at great cost to many. Hence, politics is an inherent component of the market, any market.

Government interventions in industrial crises, such as the decline of the American car industry, highlighted again the central relevance of government to what is produced by whom and where. It is unfortunate that it took such a massive toll on human welfare for all of us to be reminded that not all government choices are foolish and not all private sector decisions strategically incisive, operationally sound, and superiorly implemented.

Globalization itself has now come into question, in two very different ways. First, and most simply, there have been significantly different national approaches

to the crisis: how to restart growth, how to reregulate markets, and what the structure of the international currency system should be, particularly proper role of the dollar. They have been different enough to prompt the question: "Is the era of financial globalization at end?"[xii] If Globalization is not dead, then at least the simple neo-liberal American promoted version has been badly wounded by the financial market collapse.

There is a second, and perhaps more fundamental reason the notion of globalization is under pressure. The global economy has had a tendency to divide into those who produced too much and those who consumed too much. In the end all that production decomposition, the modularization, unbundling, and redistribution of work really meant was that some countries, such as China and Germany, were doing a disproportionate part of the producing and other countries such as the United States were doing a disproportionate amount of consuming.[xiii] As a consequence our current globalization was built on very fundamental imbalances, and hence, in its existing form, is not sustainable.

Significantly for the developing nations, resolving those imbalances would suggest that export-led development, the one successful development formula in the last six decades, may not be sustainable. Resolving the dilemma, financial and consumption balances on the one hand and growth for the emerging countries on

the other, will undoubtedly involve a more active role for governments in both the emerging market countries and the advanced countries. For example, some economists such as Dani Rodrik argue that national governments in the emerging economies will need to promote domestic consumption of exportables, goods that might be exported but can be consumed at home. In his view that will require cleverly constructed industrial policies. In this case, as in so many others, the conversation is turning back to the role of the State in economic growth.

One symptom of this change is the emergence of Sovereign Wealth Funds. Often, now, the emerging, and not the advanced, economies, are the "one with money." Some contend that sovereign wealth funds are so constrained by the market that they do not give leverage to governments; others argue that these funds can shift or distort the markets themselves. What is indeed not yet clear is when sovereign wealth funds can actually serve strategic national purposes with long term impact in terms of the balance of power and knowledge. Nonetheless, there is no doubt that new massive state actions, such as stimulus programs enacted by governments around the world and the new energy development projects, will influence future patterns of trade and technology development. [xiv]

More or less at the same time as the financial crash, the concern with climate change "heated up." Global warming focused the debate on the task of moving to a low carbon energy efficient system to control emissions. While the overall

problem, Climate change, and its consequences, are global, the choices and changes are very national, indeed often local. Policy concerns in all major countries are now focused not only on how to prevent climate change, but also, and more and more so, on how to capture the gains from the transformation of the energy system in form of jobs deploying and building the new technologies and in the intellectual properties that come from generating those new technologies.

Together the financial crash and the climate debate turned the focus back to the question of what the State can do, of how to use national development strategies to gain position in global markets and address crucial national problems. Nonetheless, even with the central importance of government in the aftermath of the financial crisis and in the move toward a new energy system, properly functioning markets remain critical. Banks may need to be recapitalized and regulations changed so there are sensible rules for managing the system risks involved in lending and derivatives. But financing will still take place through markets. Banks, and financial institutions more generally, will continue to be the financial agents for companies and consumers. Similarly, government policy may support innovation, invest in the development of, and subsidize the deployment of, new technologies, as well as force the price of carbon to rise to induce the transition toward new energy system. But the energy system shift and the rise and success (or failure) of new innovation will all still take place in response to market

signals. In the case of energy, the transition to new modes of energy will only happen if firms respond to market signals to develop and deploy the new systems and consumers buy and adopt the new products and adjust their energy usage. And of course, the twin drivers changing the logic of value creation, decomposition of production and the ICT transformation of services, will continue to proceed apace.

There is, then, a tension between the issues, policies, and debates that began before the meltdown of the financial markets, and those that emerged afterwards. There is a conundrum the policy makers must resolve as they seek to shift the appropriate blend of policy, regulation and government action, with market operation and private initiative. Before the crisis, advocates of a strong role for government in the advanced countries were often on the intellectual and political defensive. In its extreme version the paradigmatic debate was concerned mostly with how to make the state "get out of the way." Economics posited itself a hard science, uncovering the 'natural' laws of social and market behavior. Many of its proponents deemed economics to be closer to physics than the 'other' social sciences with which it was often grouped. Theories emphasizing that coolly rational utility-maximizing calculating actors would produce self-equilibrating market outcomes and that sophisticated mathematical techniques could manage risk without regulatory intervention were dominant. With the crash of the financial system, the debates changed direction. It was not just that the work of John

Maynard Keynes was taken off the shelves, and the macro dynamics of the economy had to be rethought, but that the basic premises of modern economics came under scrutiny. A significant cause of the financial market debacle, for example, has been the failure to distinguish between the notion of risk that assumes the precise probability of specific eventualities with a known set of eventualities, and the notion of uncertainty, in which limited knowledge makes it impossible to exactly describe an existing state, let alone a future outcome.[xv] Furthermore, if the recalibration of states' role in the economy was not strong enough with the financial meltdown, the urgent need to shift to a new energy system also calls for active role for the state to ensure economic transition.[xvi]

Nevertheless, nothing has, of yet, appeared to challenge neo-liberal economics from its paradigmatic domination as the benchmark of policies in the advanced countries. The temptation of falling into the belief that perfect competitive markets utopia actually exist on this earth is still too strong an intellectual drug for most economists to resist.

What then is a poor state to do, caught between pressures that seem to pull in different directions? There is one pull for the State to facilitate market adaptation to production decomposition and ICT transformed services; there is a competing pull for the State to intervene to limit the consequences of market disruptions and press toward define goals such as reducing emissions. The State is in a double

bind. Certainly, one might argue that different problems call for different policies, and the strategies should be adapted to the problem at hand. But it is difficult to go in two seemingly difference directions at once. Most likely, governments will do what they have done in the past, and at first try to make the problem they confront fit the solutions they have available.[xvii] They will do so because it is hard to shift the institutional constraints on choices. Similarly, most politicians will seek solutions within the theoretical frameworks with which they are most comfortable. Those frameworks not only define the problem and suggest the solutions, but also "inform" politicians and the public at large what are legitimate state actions within each polity.[xviii] However, when the substantive problems call for distinctly different policies, policies most easily justified in competing theoretical frameworks, then the State is in a bit of a double bind.[xix]

Both policy makers and academics, albeit for different purposes, will need to ask how sharply will existing structures of governance and power, and the existing theoretical frameworks, constrain the ability to envision, configure, and implement needed policy innovations?

We argue that increasingly the politicians and bureaucrats who must manage the competing pressures, establish priorities amongst the problems, and develop innovative solutions will find it hard to define the political terrain for policy and

identify the interests of their constituencies, interests will be continuously reconfigured. No longer will political interests be easily read off from the production profile of the existing economy, or even the production profile of an imagined economy. When two generations ago production began to move overseas, the interests of management and work force divided over issues such as trade policy. Factories could be built overseas to attack new markets or benefit from lower wages; capital could move but not labor. Now, with modularization of manufacturing and unbundling of services, the interests of different sets of workers, even those with seemingly similar roles, become sharply differentiated. And the same is true for industries. With the emergence of the merchant semiconductor firms such as Intel and AMD, the interests of the electronics industry fragmented. And indeed, a new trade association, the Semiconductor Industry Association (SIA), emerged as a result. We are watching very fundamental economic changes, and those changes have very uneven influences on traditional constituencies. As a consequence, the politics of political economy will become ever more central.

We will dig into these issues throughout the book. We sketch some of them a little more deeply here. To set the policy and analytic issues, this chapter starts at the beginning, sketching the pressures that the fragmentation of production and the algorithmic revolution of the services industries exert on the advanced economies

before the financial crash and the character of the changing policy problem with climate, and setting the policy and analytic issues.

II. Before The Meltdown: Let us look more closely at the two core stories changing the logic of value creation even before the crash: the decomposition of production and the transformation of services.

The Decomposition of Production: Production is no longer organized in vertically integrated companies focused on home locations. This process of production decomposition takes the form of modularization, or fragmentation, in manufacturing, and the unbundling activities of services. [xx] Modularization in manufacturing has allowed companies to break apart the production of their input components, from research down to final assembly, and source them either internally or externally (also known as out-sourcing) throughout the world (either on- or offshore). A similar transformation is well underway in services, where it is often referred to as unbundling. Businesses are more than ever able to break apart their activities and then outsource and, often, controversially, offshore the constituent elements of the products or services, and reassemble them, here or abroad, for final delivery and after service.[xxi] The notion of a value networks or webs of production modules and service bundles, as opposed to a simple chain,

suggests the constant re-orchestration and relocation of the components of value creation.[xxii] This process does not mean that every major corporation now looks the same. Boeing , Cisco, Dell, and Apple create such grids quite differently; but they all extensively use global production networks in the delivery of their services and products.

Amongst the many consequences or implications of decomposition, let us highlight four. First, each subsystem, module, task, or component suddenly becomes a potential product, a point of competition, and a possible new competitor in inter-firm and international trade. [xxiii] The risk for some firms, and the opportunity for others, is that a product, a decisive component, or a competency on which competitive position in the market rests will become a commodity in the marketplace. For some firms that means a loss of competitive advantage or diminished price premiums, for other firms it represents an array of new opportunities, opportunities to enter new businesses or tweak or reformulate older offerings Indeed, modularization , unbundling, and outsourcing increasingly recast internal manufacturing functions as a capacity that companies can buy on the marketplace, as with semi-conductor fabrication. Companies in disparate industries such as General Motors (GM) in automotive and IBM in computers spun-off much of their manufacturing, into Delphi in the case of GM and Celestica

(now one of the world's largest electronic contract manufacturers) in the case of IBM.[xxiv] The same logic, as we noted, applies to countries, and indeed regions, which specialize in particular stages of production. Often, as in the cases of India, Taiwan, and China, they do so with great success, although as chapter XXX shows over-specialization is not without risk.

Second, the resulting commodification has driven a constant search by firms for the "sweet spot" in competition, that is – the (at least momentarily) defensible point to capture distinctive advantage and profits – drives a constant reshuffling of what is produced within the corporation, what is outsourced, and what is located where. The commodification of particular goods and service activities accelerates the increasing pressure to innovate in products, processes, and firm-level organization. The semiconductor industry is a perfect example. Firms once had to both design and fabricate their chips. Now production is often decomposed into companies focusing on fabrication and those that focus on design. New competitive pressure appeared in all stages of production.[xxv] Consequently, the competitive struggle is increasingly for distinctive advantages in the shifting "sweet spot" in value chains as well as for the capabilities needed to sustain innovation. Taiwan created a sweet spot through the business organizational model of the "pureplay" foundry.[xxvi] For Apple, the iPod is extremely well

designed, but the iTunes service is what anchors its position in the market by solving in part the problem of intellectual property rights.[xxvii]

These examples suggest that for both firms and places two things are required to win in the new competition. Certainly, firms and places must have the critical skills to produce and deliver specific modules, or segments of production, are required. At the same time, firms must have the ability to judge which modules, or components, will be decisive in creating advantage and value and must be developed in house, and which can be safely sourced from outside. Places must have the judgment to invest in the appropriate skills and infrastructure. That judgment must include an estimation of which elements will evolve radically and what in-house skills are needed in order to compete. Therefore, it is not just the critical skills needed to produce particular artifacts or subroutines, nor just the ability to create a system, reintegrate the decomposed, outsourced components and constituent elements, but the combination of both and the ability to understand both technology and industry-wide development trajectories. What began with the label of "wintelism" and now is loosely called "open innovation" is a complex game of judgments and guesses about the pace and direction of technology evolution.[xxviii] HP's efforts in printing technologies show the careful strategic management of internal development projects and outside sourcing technology.

HP licensed laser printing technology, from the then dominant product Canon. Certainly that permitted HP to focus on developing ink jet printing, and ink jet printing did prove to be a market changing technology. However, licensing a critical technology from a competitor was a real vulnerability. HP managed that resulting vulnerability by maintaining an internal development project on laser technology. That internal project strengthened its hand in negotiations with Canon because there was a price at which it was better to step away from the license and complete the internal project. HP carefully balanced internal development and external sourcing. A second story would point to the shift in Apple's development and production strategies from the MacIntosh to the Iphone. The company moved from a MacIntosh with principally internally developing products up to the level of sub-components such as batteries, to the Iphone with aspects of the product development as well as manufacturing is mostly outsourced.

Third, and quite evidently, if Charlie Wilson, then CEO of General Motors, was ever right in proposing that what was good for GM was good for the US, that the interests of giant integrated companies and their home communities were closely aligned, he certainly would find it hard to make the argument now. Nonetheless, in a perfect example of the double bind states find themselves in, when Detroit came calling, the Obama Administration answered. It is an ironic

twist of fate that the once proud GM, whose managers truly believed that the interest of the US are best served by advancing the interest of their company, is now partly-owned by the American tax payers, and desperately need not only to succeed, but to explain to itself and the world what does it mean to be a US conglomerate in a decomposed world.

The traditional strategy of supporting the "home, national flag" players in the market may not sustain the "home" communities. State support of national or regional companies often generates jobs as well as product and process innovation in other places and countries. The core location of innovation, not just employment, is at issue. Often governments invest in the stimulation of R&D projects by "their" national companies in the hope these will translate to new jobs and industries created within the national borders. However, those same supposedly national firms often then locate the downstream activities, where job creation and economic growth benefits might be maximized, in other national places, places that offers unique advantages that have very little to do with novel product innovation.[xxix]

Indeed, places, not just products, risk commodification. Each decomposed element in product or service creates a point of market entry, an opportunity, for a producer in a new location. Thus each new point of market entry created by

outsourcing, also creates an opportunity for new locales to enter the race, not just for new firms. [xxx] Each act of offshoring of production transfers skills and know how to new locations. Places as well as firms must develop competencies and assets that allow them to retain high value added activities and good jobs. But that objective means different things for firms and places, and different things for different places. While the objectives of firms and governments can, quite evidently, be contradictory, they are also intertwined. Firms must operate somewhere, and regions want to be the location. A firm may reorganize and relocate its activities in pursuit of its own advantage. It will draw on capabilities and resources from wherever it can find them. The threat for a place is the cumulative loss of mobile activities. Consequently, a "place" must strategically combine its immobile assets (e.g. infrastructure, training, "brand," and tacit knowledge) with their valuable mobile resources (e.g. capital and highly skilled labor) in order to attract other valuable mobile activities and firms in a global economy. Since the mix will likely be constantly shifting, places must pursue employment and productivity, but defending particular jobs may be counterproductive.

National strategies in a world of decomposed production are further complicated by the fourth feature of fragmented production system, its inherent

tendency to start self-reinforcing-sequences. As a consequence, places might quickly find themselves going down a particular path with increasing difficulties to tune their offering to the changing needs of the global industry. The two main mechanisms by which production decomposition is self-reinforcing are: "production/service stage economies of scope and scale" and "production/service stage specialization and capability building"[xxxi] "Production stage economies of scale and scope" is the process by which, once a specific production chain decomposes into discrete stages, suppliers in each stage create economies of scope and scale that in-house divisions cannot.[xxxii] These enable suppliers to become more efficient and to profitably operate on margins that are significantly lower than those achieved by in-house divisions. This cost advantage allows them to lower their prices further while offering the same or even higher quality. "Production stage specialization" is the process by which decomposition leads companies to develop superior capabilities in particular stages or components of the product/service network. Accordingly, on the positive side once a locale successfully enter production networks around particular stages, with time its skills offering will make it more and more attractive on these specific stages. On the negative side, if global and technological changes means that these offering have become commoditized then it will be increasingly difficult to retune their offering in a flexible adaptive way.

It is important to note that there have, recently, been a series of efforts to reintegrate production. Those efforts seemed sparked by three things. One, consistent with traditional economic argument, is cost driven: exchange rate shifts and wage increases in some production locations make it more attractive to move production to the advanced countries.[xxxiii] A second, and crucial aspect is the way modularization influences the innovation process. Ericsson, for example, has over the years changed the mix of make/buy decisions. Recently, to facilitate its own internal innovation processes in the final product, it has reintegrate semiconductor design.[xxxiv] The important point is that the choice of make or buy, build or design in-house or source outside, will be constantly shifting. The crucial element, for final purveyors of goods and services, is how to integrate the elements into competitive offerings.

The Algorithmic Revolution and the transformation of services:

Services, once thought to be a sinkhole of the economy, have with the algorithmic revolution been transformed into a significant driver of productivity.[xxxv] We examine this more carefully in chapter (x). A quick analysis of national accounting reveals that the services industries have grown in quantitative size, becoming a significant part of the economy. [xxxvi] But the category is really an afterthought, a

residual miscellany in the national accounts; a jumble of activities that are not manufacturing, extraction, or agriculture. [xxxvii] What we call the services transformation is not about the growth in quantity or value of activities we label services. Rather, it is the transformation of service activities, resulting from the application of rule-based Information Technology, which alters how these activities are conducted and value is created. Service activities are changed when they can be converted into formalizable, codifiable, computable processes – processes often with clearly defined rules, algorithms, for their execution. The application of Information and Communications Technologies to service activities radically alters the nature, organization, and delivery of services. As importantly this transformation changes the way firms compete and how they create value. [xxxviii] Services have become central to value creation and critical to the effort of firms, including manufacturing companies, to escape the quagmire of commodity status.

IBM, for example, has gone from producing computer hardware that embedded services to selling services that embedded hardware. Services such as home nursing, once considered to be intensively personal, are changed into sensor-based monitoring systems. [xxxix] Nonetheless, not all firms follow the same strategies, at the same time IBM is shelling more and more of its hardware-production legacy, Oracle, one of the quintessential software giants, has opted to

buy Sun Microsystems, specifically in order to add specialized and dedicated hardware capabilities to its service offering.[xl]

The consequences are pervasive. First, business processes, from finance and accounting through customer support and CRM, are altered when they can be treated as matters of information and data management. The algorithmic transformation of services permits routine and manual functions to be automated, enabling in itself a fundamental reorganization of activities. It also permits the unbundling of the multitude of activities and tasks that constitute a service, the parallel to modularization in manufacturing, facilitating outsourcing and the easy relocation of activities. Likewise, sensors and sensor-based networks change many personal services. Consider two examples. Some aspects of security already substitute sensors for muscle, transforming a service based on the presence of people into an activity monitored from a distance. Likewise, a similar process is at work in home care nursing when sensors at a distance substitute in some ways for nurses and attendants. There is a corresponding shift in skills, for the most part from semi-skilled to more abstract judgments and computer system skills. This is not, or *at least need not*, be a story of down-skilling. This reorganization of service provision represents a new division of labor within the firm; old tasks

become automated, usually requiring workers to take on new tasks and develop new skills.

Second, the dilemma long faced in the production of goods – can you control what you cannot produce – is now as sharp in the production of services. [xli] Answering the question whether the unbundling of a service permits the advantages of corporate focus, or whether it fragments the knowledge that underpins innovation within the firm, is increasingly important. This algorithmic services transformation is not just a matter of reorganizing, automating, outsourcing and offshoring existing service activities. Services become central to strategy as a response to commodified production, whether those products are manufactured goods or software. Product companies, such as IBM, that used to embed services in their product offerings begin offering services with hardware embedded. Apple's music business is not just selling the iPods, but also, and probably much more importantly, selling a music service. Even in very traditional industries this transformation revolutionizes the ways firms think about what is that they do and are, for example Kone, a ninety eight years old Finish industrial company and one of the world's leading producers of elevator and cranes, is repositioning itself as providing "elevation" services rather than merely producing elevators and cranes.

Three ideal types can help express the way ICT is influencing firms, competition, and productivity. Imagine a spectrum of services from the purely automated, through the hybrid, to those that irreducibly delivered by people. [xlii] A first ideal type of service firms offer services that are entirely automated, such as search services from Gooble, Yahoo, and Microsoft. They include data networking services that manage communications. These activities, we note, do not in themselves escape commodification. Their providers fight against commodificaiton through continuous innovation in the service and its process, through intellectual property, and through network effects.

A second ideal type, are companies offering hybrid services. These come in various types. Some are created when *products are woven into a system* that is partly or entirely digitized. An example of such companies are OnStar and its plethora of competitors such as Lexus Link and BMW Assist, which offer a service that embeds the car and its on-board technologies (radio, video screen) in a network of ICT services for the benefit of the driver and passengers. Other hybrid services arise when *personal services are digitized* through the use of electronic tools (such as sensors) for monitoring, measuring, and recording information. Home health care and other fields of medicine are rapidly becoming hybridized through the development of digital monitoring tools that can sense a patient's vital

signs (heart rate, blood pressure, temperature, and so on) and alert a professional when human intervention is necessary. Other hybrid services are created when digital systems for communicating and manipulating information are deployed to *let customers serve themselves* when, where, and how they prefer. We see this type of hybridization, for example, in the bank-at-home systems now provided by most financial services companies, which allow customers to conduct basic transactions on their own, without the mediation of a bank employee.

Third, at the other end of the spectrum are personal services, which fundamentally rely on human talent. As we've noted, even at this end of the spectrum, ICT tools can serve to make workers more productive. The work of a trial lawyer, for example, is irreducible—there is no move afoot to develop robot attorneys that would use voice synthesis to plead cases in court. But there's no doubt that trial lawyers and their supporting teams of professionals have greatly boosted their productivity by using online databases to research legal precedents, word processing software to write and rewrite briefs, videotape to record depositions, and so on. Still, the number of billable hours that a law partner must devote to a thorny case has not dramatically changed as a result of digital ICT, which is why most legal services fall into the irreducible category.

Importantly, as we will see in chapter x, when services are transformed by ICT there have been massive gains in productivity, with the greatest gains in the automated sectors, substantial gains in the hybrid sectors, and some gains in those primarily personal services that advantage themselves of these tools.

There are three important caveats in the story of services. First, services are increasingly produced and stored. The old notion that a defining feature of services is that they are consumed as they are produced, for example cutting hair or grass, is not appropriate to a digital age. Rather ICT based services are delivered as part of ICT systems, and the capacity to deliver is stored in those constructed systems of information processing, storage, and distribution. Consequently, the notion of production, which has traditionally centered on manufacturing, has expanded to include the "production" of services, software, and web-based activity.[xliii] We may talk about manufacturing goods, but we also must talk about producing ICT based services. There is then a services equivalent of the older question asked about manufacturing: Can you control what you can't produce?[xliv] If a company or country loses the capacity to produce a product, can it compete effectively? To answer this question we need also to know whether unbundling and outsourcing a service, or modularizing and outsourcing a manufacturing process, grants the advantages of corporate focus and arms length market pricing, or instead

fragments the underlying knowledge in a way that makes ongoing innovation difficult, and transfer control over critical information and competencies to suppliers.

A second caveat is that this algorithmic transformation is not a mechanical or purely technological process. Services are socially embedded; therefore national rules about services, and the politics of those rules, powerfully influence how the services transformation unfolds across the globe.[xlv] Application of ICT tools to health or finance is about privacy as much as efficiency. Capturing the productivity gains means resolving the reconstitution of services. That reregulation of services is not about adding an addendum that the old principles apply in the new information age. Rather in issues from privacy through financial markets, the old debates will be refought.[xlvi]

Central to the policy story is that services – whether finance, health, accounting or media – are embedded in social rules and regulations.[xlvii] Capturing the value added and productivity will require not just new corporate engineering and business models, but also substantial social reorganizations. This inevitably means that economic policy becomes directly enmeshed in the complex politics of social rules and regulations, institutions, status and position. Thus, policy debates will go beyond the terms of market competition narrowly defined. There will be

political fights about social rules and regulations, institutions, status and position, about – for example – who can read X-rays and whose private information is available to whom, and thus about how to distribute the gains from these new sources of productivity. [xlviii]

The third caveat is that while for policy makers the problem might seem straightforward: how to support that services transformation. In fact it is very difficult. For example, the education and training appropriate for an industrial society may be quite inappropriate for the new age of information service. It is not just that new infrastructure policies are required, or that the education and training programs must adapt to the necessity for high level conceptual skills throughout the community, but that reorganization of services involves reorganizing rules and relationships in the society very broadly.

Our focus in this book is on national government responses to the recasting of value creation in market, the reorganization and global distribution of production, and the entrance of new players from emerging markets. For governments, this unbundling and relocation of activities poses serious problem. The old strategy of chasing smokestacks is clearly obsolete, but simply investing in R&D or education is not sufficient, and doing nothing is a formula for decline.

Hence, the growth strategy for a place must extend well beyond supporting the competitiveness of particular national flag companies.

III. After the Meltdown: as we note before, the economic meltdown of 2007-8 brought into this debate a reconsideration of the role of government, of the appropriate regulation of markets, and of the proper instruments of macro policy to restart growth. As a practical matter, governments' role had to be reconsidered. That reconsideration began to drive both an ideological and intellectual reconfiguration. For example, debates began on reregulating the financial markets to force a proper distinction of risk and inherent uncertainty in investment, appropriate regulation to assure more effective management of risk and consideration of the systemic consequences of particular failures of private risk management. The enduring reality of the importance of national choices in global markets was underlined. Different governments began pushing in varied directions. Some European proposals for bank regulation and accounting would fragment radically global financial markets; Chinese demands for consideration of a schema that would displace the dollar as the core global currency could generate a "global financial" currency, or simply provide China leverage in the financial markets. Or consider stimulus programs. Many European countries have been reluctant to have

the government be the buyer/spender of last resort, while the US and China have launched massive programs. In any case, efforts to restart employment lead to new claims about the importance of national production and the benefits of at least partial autarchy

In the meantime, accumulating scientific evidence amplified concerns about the climate change generated growing calls for government action. Climate concerns open important questions about the role of the State. While the worry is that global warming will wreak havoc on our communities and our lives, the operational questions are really about energy – its production, distribution and use. The Climate issue is then the urgent need to move from a carbon intensive fossil fuel based energy system to a low carbon energy system with reduced carbon and renewable assets; central themes of national policy. Most directly, the undertaking is shifting from one energy system to another, from one technology infrastructure to another. What that means, of course, is a profound reorganization of companies and communities as the prices of energy rise, of how firms use energy and the types of energy they use. This represents a radical shift in priorities around energy and raises important questions about the place of government in the economy.

Significant changes in energy systems have always been driven by, facilitated by, or impeded by government. In1615 the English crown compelled

glass to be manufactured with coal because use of wood as an energy base was destroying the timber needed to build ships.[xlix] Oil and electricity, to choose two other examples, brought advantages in the distribution and application of energy, reflected in the market, but state actions were always required to facilitate that shift. Indeed government policy mattered in a whole variety of ways. For example, the triumph of oil as the preferred fossil fuel for transportation (and not just heating and lightning), was deeply tied with the decision of the world navies to move from coal to oil.[l]

The present problem is that CO2 emissions cumulate, and consequently the speed of the shift to a low carbon energy system matters. It is not just a matter of whether we make that transition, but rather of how rapidly. Market prices will not capture, internalize, the consequences of a slow or faltering shift. The consequences of a delayed transition are the radical impacts of climate change running from rising water levels through desertification and massive migrations. The traditional concerns of debates about energy have been economic, low cost and reliability of supply, and national security, making certain that energy producers are not able to exploit the dependency of energy users. Those traditional concerns of security of supply and low cost reliability to sustain growth and placate

communities have to give way to rapid reinventions of the energy system. As important, the market processes must be accelerated and supported.

One dimension of this shift in energy systems is crucial to our analysis. The shift in energy system means new technologies for the production of energy – wind and solar, new technologies for containing carbon – clean coal, new technologies for distributing and using technology – intelligent energy grid and energy intelligent buildings, and new services to deploy these energy systems.

In all the advanced countries the taken-for-granted assumption is that investments in the new technology systems will generate jobs. Consequently, climate change has now become the herald of novel industrial policies, in a similar way to what national security was to the great powers in the 20th century. Certainly the pure construction of the new energy systems will produce jobs, whether that involves deploying a "smart" grid (whatever precisely that would mean), retrofitting homes with solar power, building windfarms and nuclear plants, or constructing the national system for electric-powered private transportation. The crucial questions, on which is explicitly part of the concerns of the developing world with regards to advanced country proposals about controlling emissions, are who will produce these devices? Who will own and benefit from the formal Intellectual Property embedded in them and expressed by the devices? and who

will have the know-how to deliver energy services whether in the form of designing grid systems or heating systems or managing energy efficient buildings?

It is not just manufacturing that matters, it is the mastery of the energy efficient objects, and the software and knowhow to effectively deploy them. But who will benefit from this transformation in energy systems? Will some national political economies have an advantage in this profound transformation that amounts to a concerted sequence of innovation? Even the question itself is difficult to pose. The answers are not obvious. Some might propose that the leadership would come from Silicon Valley innovation, and hence the United States would "rule the green waves." Certainly an array of Green Venture Capitalists have emerged, some have shifted from a focus in electronics such as Kleiner Perkins, some have specific green divisions such as Vantage Point Partners, and some have been set up explicitly for the purpose, such as Khosla Ventures. For the most part, the Venture investments done in Silicon Valley are in particular technologies or products that will become part of the new low carbon energy world. That would include innovations in lighting, intelligent thermostats and the like.

However, there is a distinct difference between this energy transformation and the ICT technology revolution on which the Valley grew to prominence. The Venture Capital model rode radical shifts in technology paradigms, revolutions that

were occurring from within and which the Venture Capitalists did not themselves have to create. The semiconductor revolution, the emergence and application of the semiconductor itself, or the crucial microprocessor, initially required only changes in companies, in how products were designed and made. Crucial American government action, in the form of anti-trust policy, meant that AT&T, and later IBM, would not be able to control the pace and direction of these innovations. The anti-trust decisions cleared the market space for the merchant semiconductor firms such as Intel, AMD, and National semiconductor. Likewise the internet emerged in an environment in which the basic rules in communications – the breakup of AT&T and a newly competitive communications environment – had been going on for decades and preceded the emergence of the internet. The core network technologies were funded by the government for national security reasons, not at the urging of commercial firms. So the rise of the internet hinged on two things that favored the capacities silicon valley brought to bear: a basic deregulation of the telecommunications networks for antitrust reasons dating back before the full force of the digital revolution open the door for an array of entrants; and state funding, principally through the DOD, basic research into communications protocols generated an alternate networking strategy.

But, can the Silicon Valley model serve to force the changes required to unleash energy transformations? By contrast, the cost of imported oil and the economic and fundamental security vulnerability of importing energy means that some governments have in earlier years attempted to wean themselves away from fossil fuels and imported fuels altogether. They have made change in energy system a deliberate outcome. The French emphasized nuclear power, radically altering the structure of their energy system, the Danes emphasized energy efficiency and wind, dramatically changing their consumption patterns. The innovation models of the two countries are very different from each other and each is distinct from Silicon Valley. From the national point of view, it is not clear which would promise to deliver more sustainable local economic growth in the future.

It is well understood that the pain of the energy system transformation comes now through adaptations by industry and consumer alike forced by limits on emissions and rises in the price of carbon. This will be difficult in the advanced countries, and even harder in the emerging economies. The gains from a more efficient energy system and the development as well as deployment of clean efficient energy technologies will come in the future. In addition, these gains are not likely to be evenly divided. Consequently, one of the demands in the run up to

the Copenhagen negotiations by emerging economies, China in particular, is for significant transfer of clean technology (See xxxx Copenhagen Climate Council Global Business Summit may 2009). Emerging economies do not want the shift in energy system to become a new form of Western technological domination. A quick review of, for example, Japanese industrial strategies suggests that these concerns are not fanciful.[li] Of course, the concerns do not go one direction. Steve Chu, the Nobel Laureate physicist and American Secretary of Energy, suggesting in an interview that advances in battery technology is sufficient for us to envisage fleets of pure electric cars, stated that his concern is not whether the technology will be available, but whether it will be dominated by the Chinese.

IV. Staying Wealthy in the Shifting Global Economy: The Policy and Politics

Clearly, the policy debates have moved from arguments about limiting the State and liberating markets to arguments about how to contain market risks and channel innovation. The ideological debate hides the complex policy choices.[lii]

Part of the story is about rules and rule making, regulation. As we have noted, the financial crisis reminded a world lulled to apathy by the illusion of a self-regulating market of the critical importance of rules, and hence of regulation, to the operation of all markets. The ICT fueled transformation of services, for

example, is as much about the reformulation of market rules as about the technology itself. The array of regulatory issues is endless. Who defines property rights in the digital era, or rather, how are property rights transformed by digital goods and services? What is a tradable service, and who regulates the services that are "Traded" across borders? Concretely, which jurisdiction decides who should be allowed to read lab and radiology tests, and who is to blame in the case of misdiagnosis? Are Indian radiologists licensed to judge looking at information about patients in California? What is "private information," and what constraints are there on the companies that collect that information? [liii] Similarly, and along a completely different line of rules and regulations, the energy system transformation will hinge in significant ways on proper regulation. It turns out to matter massively if an energy company is paid for the "production" of energy or its "delivery". Traditionally production and delivery have been the same thing, since storing electricity on a large scale was not really possible. Renewable energy sources are intermittent, that is the sun does not always shine and the wind does not always blow, and conversely, the sun shines and the wind blows even when demand for energy is low. Consequently energy from these sources requires either storage so the excess can be absorbed and delivered when demand, or a more traditional fossil fuel source as an offset so that energy is available when needed. Accordingly, to bring renewables into the grid in a major way, not just a marginal,

way, may well require regulations that Pay on delivery of energy to the grid, not on its production alone. And of course the tightest rules about carbon emissions in one country are irrelevant if all of its goods are imported from countries that tolerate emissions. Thus, if one country's industry is operating under standards that allow massive pollution, should its trade partners tax its exports in an attempt to fight global warming?[liv] For some purposes markets need to be reregulated to permit innovation and the emergence of new business models; often markets need to be reregulated to manage systemic risk, protect competition itself, and certainly the consumer.

Part of the story is purposive government action: aimed, defined, and with specific objectives. Consider the energy systems transition, the shift from a high carbon inefficient system to a low carbon efficient system. Here governments have specific objectives: reducing energy use. Should government dictate the rebuilding of the electric grid; finance it, or, as in the case, of ICT, principally create rules to guide private investment and competition? The answer about how to regulate the electricity networks, the electric grid, is not likely to be the same as the answer we found for data networks and mobile telephony, although many of the issues are similar. Since the skills required for a competitive work force have changed, how should the education system be adapted, and who organizes and

pays for those changes? In some cases direct state intervention usefully promotes development and growth, and in others distorts markets and wastes resources.

Sustained growth requires resolving a simultaneous equation, that is providing compatible solutions to two quite different tasks: 1) Productivity increases that support real and rising incomes rest on solving the question of how to sustain the continuous transformation of what is produced and how it is produced and distributed. 2) The distributional question of who gets what. Often those are seen as in conflict.

The New Politics in Political Economy: But before turning to the policy debates and policy shifts, and the lessons countries might learn from each other, we must consider briefly the politics of all this.

Policy shifts, of course, are not intellectual debates judged by some independent authority. Policy re-formulations always involve political conflict. Significant policy shifts that involve changes in the role of the state are usually accompanied by new political coalitions and, often, the emergence of new political parties, movements, and groups. In some cases fundamental new policy directions are required, changes in the purposes of, and political support for, government. Indeed, in the past all major transformation of the organization and management of production have led to major upheavals in the social organization of societies and

states. The Great Depression saw a sequence of policy experiments and the emergence of an active state as a result of a diverse, and often unexpected sets of political deals among labor, farmers, and business interests.[lv] In other cases, seemingly narrower fights, the revision of old rules, their extension to new circumstance can be cumulatively very significant rules. Privacy and property rights in the built up, seemingly over centuries, are subtly but significantly altered when applied in a digital world.[lvi]

There are several distinctive political consequences of globalization and the decomposition of production, which should be noted. First, and much discussed, globalization really means that major firms are no longer intimately tied to the fate of their home governments, nor the home governments able to assume support of the local firms for policies supporting sustained productivity at that home base. Yet, we would note, the fate of company and country is often more woven together than is generally acknowledged. Samsung's success is tied to Korean policy. The difficulty of Japanese firms to find firm global footing in the present generation of mobile telephone is rooted in national regulatory policies.[lvii] Intel's initial success was built on national policies; including, ironically given its present legal difficulties, antitrust policies that constrained AT&T and IBM. Last but not least, General Motors was saved by the US federal government in 2009, specifically

because it was deemed a local company, the American national champion of the car industry.

Second, the decomposition, the modularization, of the production-distribution of goods and services and the emergence of cross-national supply networks that generate final product and service delivery changes more than the logic of value creation. This decomposition of production alters the political logic as well. As the production of services and goods is deconstructed, political interests are fundamentally fragmented; molecularized if you will. It is not just that workers and management have different interests, or that workers are relatively immobile and capital mobile. Nor is it simply that the interests of subgroups of workers, or subgroups of capital, have different, often contradictory interests. Rather, the modularization in production of goods, as well the decomposition and growing tradability of service offerings with the often abrupt relocation of jobs, makes it difficult to identify how the interests of different groups are affected by the changes of the global economy, where the boundaries around economic interests are, and what the groups are in the first place. Crucially, coalitions of labor and business in the face of foreign competition, as for example in the Steel or auto industries in the 50s and 60s, are no longer so straightforward, and often impossible. Since the effects are diverse and molecular, the question of

how political groups are constituted and reconstituted, how interests are formed, defined and redefined become crucial. As the economic foundations of political groupings become more unclear, the politics of creating groups and interests in the political economy becomes more central. Political and even economic groupings must be seen more clearly for what they are, *political* constructs. The politics of political economy become more central.

This suggests that our understanding of the constituent political elements of a political economy may need to be revisited. A classic logic in comparative politics has been that, using a variety of methods, we could look at economic sectors, or segments of sector, and the core functions within them, to locate the interests of groups in society. Steel makers and cotton growers, runs the argument from Rogowski through Gourevitch, are distinct groups and often have different interests.[lviii] Workers as a group in the steel industry have common interests, interests different from their managers or the company owners. From that vantage, the production profile of an economy, what is made and how, purportedly gave a first cut at the economically drawn lines of political interest and conflict. Of course, in reality political groupings can never be read off the economic map. Political groupings are always created through political acts. But the production profile can give a starting point, a source of initial propositions. We infer

groupings and interests from the production profile as a useful and hypothetical first cut. Alexander Gerschenkron and later Peter Gourevitch tell a story of how the quite varied agriculture interests in what is now Germany were aggregated and defined by Prussian landlords[lix]. Similarly a hundred years later the integrated steel companies in the United States defined the political interests and policy objectives of the sector as a whole. Political actors transformed potential interests, unders from position in the market, into political interests and policy preferences.

However, now, as industries decompose, sectors fragment, firms outsource and offshore, and services transform, the ability to define political interests from a production map of the economy diminishes The modularization and unbundling of activities further fragment the interests of the workforce, including management. In the resulting ambiguity, then, supposedly post-industrial interests such as religion, ethnicity, and sexual and gender identity can come to play a core role in organizing political groupings and defining political interests.[lx] Modularization involves the decomposition of production and services, the molecularization of the production, and the emergence of cross-national supply networks that generate final product and service delivery. As production of services and goods is deconstructed, political interests are fundamentally fragmented. It is not just that workers and management have different interests, or that workers are relatively

immobile and capital mobile. Nor is it simply that the interests of subgroups of workers, or subgroups of capital, have different, often contradictory interests. the modularization in production of goods, as well the decomposition and growing tradability of service offerings with the often abrupt relocation of jobs, makes it difficult to identify how the interests of different groups are affected by the changes of the global economy, where the boundaries around economic interests are, and what the groups are in the first place. Since the effects are diverse and molecular, the question of how political groups are constituted and reconstituted, how interests are formed, defined and redefined become crucial. As the economic foundations of political groupings become ever less clear, the politics of creating groups and interests in the political economy becomes more central. Political and even economic groupings must be seen more clearly for what they are, *political* constructs, *not* pre-define groups based on economic interests that can be deduced seamlessly from the position in a specific production regime. The politics of political economy become more central. Thus, the use of a rough production profile is still necessary, but is much less clear guide to initial policy preferences.

Approaching Policy Design: That said the question is clear: how should governments, places, rather than companies, address the problem of sustaining growth, employment and productivity? There are certainly lists of policies to

assure the infrastructure and skills and rules required to compete effectively in the global economy. The mandates certainly include assuring the tools of the digital era are widely available, the digital networks, and the information appliances – from mobile telephones for peasant to assess markets in the city to laptops for students. Certainly the digital technologies change the required workforce skills. Those changes in skill requirements extend beyond new bodies of information to be mastered about new technologies or new places. Suddenly, the standards of reasoning and learning go up, the competitive bar is raised.

But can governments go beyond these now conventional litanies? A first conclusion of our analysis is that places, locales, no longer simply compete in particular sectors – such as autos or electronics – but in specific nodes in the process of generating, designing, producing and distributing goods and services. Note that we refer to locales, places, or regions rather than nations. Large countries will have a diverse set of regions, of places, with competitive positions in an array of industries and spots in the value networks.[lxi] A crucial debate is whether the national rules about finance or labor significantly influence the regional options, creating nationally distinct sets of regional options. Startups for example are undoubtedly easier to found and grow into giants in the United States than in France. Learning organizations that rapidly share production knowledge

and apply it in diverse settings may be easier to create in Denmark than in the United States.[lxii] In fact, the national rules may make one set of industrial strategies easier than others; or may make it harder to adopt some strategies than others. Let us set aside that argument for now.

In a world of commodities, the challenge is to find the sweet spot in the value network. It is not a matter of which sector you are in, but where you locate in the value network. There are high value nodes in textiles and low value nodes in electronics. The skills and capacities required for production of cars and electronics may be quite similar. The question, for our purposes, is that places now often specialize in specific phases of production. Places can be characterized by where they fit into the production networks as much as by the sectors of final products. Thus, rather than just speaking of an electronics industry, Silicon Valley is clearly specialized in the conception design and development of fundamentally new goods and services. So let us develop the notion that there are phases, if not precisely stages, in the development, design, and production of goods and services that allow for particular sets of innovation and economic growth opportunities while necessitating specific sets of capacities and competencies. The question for places is what investments to make, and how, so that firms at their particular locations can develop distinct strategies to generate specific advantages. The core

idea is to consider what a place is competent to do, and how to deepen those competencies, expand the list, and assure the local capacity to combine competencies into productive activity.

But how should we think about the relevant domains of competencies and capacities? One method to identify "phases" or "roles" in the value network, and the appropriate policy approaches for each role, is to consider the flow from conception of products and services to their actual production. We define four broad "roles or phases", in which we can empirically locate different places. While in reality the exact borders between such stages and particular locales are murky, they still serve as a useful tool with which to analyze reality. Likewise, we would emphasize that a country, or even a specific region, may be home to more than one of these "stages" or phases. However, as we will see, the requirements for success in each are specific, and consequently the requirements may collide.

For convenience, we present this in reverse order, since production, the final stage, is the most concrete. The most basic role in terms of capacities and competencies is production and assembly. In this stage, be it in services or in manufacturing the focus of the activities is in producing a product that had been fully defined elsewhere, many times assembling high value components that were manufactured/produced elsewhere. Some might view this stage as utterly

commoditized, relying solely on cheap labor. To certain degree they are correct. However, there are highly defensible strategies around this stage which goes beyond the usage of cheap unskilled labor. For example, many view Southern China, particularly the Pearl River Delta area adjunct to Hong Kong, as the optimum locale of this faceless and brand-less manufacturing service, and argue that this is exactly its Achilles heel; predicting either significant changes in capacities or economic doom as the future.[lxiii] However, the region's success rests on particular capacities, distinctive advantages to succeed in this particular and in fact quite difficult phase. The region occupies a distinctive place in the global production system.

Consider that, in order to truly excel in the production and assembly stage, companies must be able to produce, within a few short weeks, an array of extremely sophisticated products such as Iphones, electronic book readers, or in the case of software supply a working corporate-scale software system to spec. Furthermore, these companies must be able to ramp production up to millions of units within couple of weeks or fully abort it, at a moment notice, and still somehow stay profitable on extremely low margins. Accordingly, as we have shown elsewhere, China's competitive advantage does not rely on sweatshops employing a few thousands worker in inhumane conditions, but on the full mastery

of flexible-mass production. The ability to orchestrate production of tens of different products, within the same location, using quarter of millions of workers and engineers that needs to be able to move from one product line to the next without missing a beat.[lxiv] This is a feat that most, if not all, American and European companies are incapable of doing. The same goes for either software development or back office service delivery. It is one set of capacities and competencies to offer semi-skilled workers, mid-level programmers, and a few English speaking back-office services personal. It is a completely different set of capabilities to be able to manage project teams that grow to the size of few hundred if not thousands within several weeks, and still deliver the same consistency of product, on time, within budget. The number of countries which posses companies that can deliver world class production and assembly stage competencies is less than a dozen, with China and India leading the way, one in manufacturing and one in services.

Prior to production, is the phase of design, proto-type development, and production engineering. If the ideal type production and assembly firm takes fully defined products design and make them a reality, the design and production engineering companies take product concepts which were only partly defined by its customers and makes them into reality; using an array of production and assembly

suppliers and sub-suppliers. Apart from design competencies, the design and delivery (production engineering) companies also bring to the table the capacity to create a working product or a system from an array of components and sub-system produced by many different and constantly changing, companies. Any modern electronic or software products have multiple, many times thousands, different components and sub-systems in them and the competency of making them work together and fitting them all within the ever shrinking confines of the latest gadget gives the design and delivery companies significant competitive advantages. Taiwan is seen by many as the locale that master this stage of production. However, looking at different industries such as life sciences, we should quickly realize that ever countries, such as Denmark and Singapore, have become specialized location for design, proto-type development, and production engineering.

Somewhat apart, not exactly in a sequence, is the phase of second generation product and component innovations. This phase, wrongly seen by some as only being that of "fast following" or "incremental" innovation is often the unsung (and sometime despised) hero of economic growth. Fascination with novelty, often novelty generated in Silicon Valley, obscures importance. Firms working in this stage specialize in how to make already existing products and technologies, more reliable, more appealing to wider crowds of users, and last but not least better.

Accordingly, one of two modes of operation are usually followed in this phase of second generation product and component innovations. First, working within the confines of already established products and markets, companies improve, expand, and many times redefine these products.[lxv] The consumer product VCR was, for example, based on an industrial professional video recorder and player. Moore's law, the steady increase in computing power which has been the basis for much of the ICT revolution, is a perfect abstraction of second generation innovation in work which has been transforming the way we work, play, think, and communicate for the last fifty five years.[lxvi] Moore's law points to the steady doubling of the number transitions placed on integrated circuits. Consequently, every two years or so, the possibilities and capabilities of electronic devices are radically increased.

Second, the second generation innovation in final product often rests on innovation in the underlying components and constituent elements of products, that is, integrating science and technology advances. This may be innovation in screen technology or micro processor design, or the production technology for semi-conductors. Each module, each unbundled process, is a marketplace target for innovation.[lxvii] Science based engineering schools such as Berkeley, Stanford, MIT, and Georgia Institute of Technology link to companies that often "buy' their

innovation in this manner. One mechanism for such investment is in advanced engineering communities and the appropriate institutions to link them to the private market.

The most dramatic phase, associated in the popular mind with innovation and Silicon Valley, corresponding to a fourth location in the value network, is fundamentally novel product creation, often resulting in the creation of entire markets and new industries. There are several variants of this phase. One is the Silicon Valley version, the entrepreneurial company driving change. Cisco with the internet router, Intel with the integrated circuit and the micro processor and Apple with the Apple 1 and the Ipod may be the embodiment of firms that created components and products that have redefined entire industries. A second variant involves fundamental systems innovation, which is why we call it System-Driven. In some cases, electricity or the original telephone are systems innovations. The electricity system was often innovated by individual entrepreneurs, such as Edison, who were at the time able to imagine and develop the entire system. Now, such radical systems shifts are more complicated. Huberty and Zysman have argued that the energy systems must shift from from a high-carbon, low-efficiency energy system to a low-carbon, high-efficiency alternative. Success requires the development, commercialization, and diffusion of many "suites" of

complementary energy technologies throughout society [lxviii] The innovative agent in these cases is often a government forcing significant changes. The French ability to create a nuclear industry based electricity system or the Danish ability to generate leadership in Wind generation represent parts of a system's shift that involves both government conception of a "new system" and various forms of technological innovation.

Each variant, Silicon Valley Entrepreneurial and Systems-Driven requires a distinct set of competencies beginning with conception, definition, and design. We emphasize that there is a major difference between the ability to come up with a new product, or a new system, altogether and the ability to define it and design it. That competency to conceive fundamentally new products and system needs to be distinguished from production engineering.[lxix]

As these examples make clear we see this stage is the most collective in nature. It is in this stage where the famed "communities of innovation" are the most crucial.[lxx] This of course is the cornerstone of what makes this stage quite "sticky" to specific places.[lxxi] Nonetheless, as the numerous corps of failed attempts to create new "Silicon Valleys" attest to, this is also the main reason why policies aiming to achieve the capacities and competencies needs to excel in the novel product creation stage, are the hardest to pull off.[lxxii]

Are Policy Experiences Transferable?

Given the decomposition, modularization and unbundling, there are diverse successful competitive strategies and an array of defensible nodes in the global economy. There evidence is that there is no single path to competitive success, there is no single bullet.

Indeed, we have argued elsewhere that Places – be they countries, regions, or cities – must in this new competitive environment focus on, target, the core competencies that underpin diverse activities, firms, and sectors that are central to the competitive advantage of companies, and consequently of locales. [lxxiii] In a world of commodities, the challenge is to find the sweet spot in the value network. There is no single path to competitive success, so regions are not necessarily rivals. While a company must find its defensible place in dispersed value network, the sweet spot of value creation, its success depends on all the other nodes and elements of that value network. Similarly, a "Place" must find its defensible node, and that node depends on its relation to other regions. The question for Places is what investments to make, and how, so that firms at their particular locations can develop distinct strategies to generate specific advantages. The core idea is to consider what a Place is competent to do, and how to deepen those competencies,

expand the list, and assure the local capacity to combine competencies into productive activity.

A critical issue is whether the development of one set of capacities required for one role in the value network interferes with or supports the development of capacities for a different role. Can two different sets of competencies co-exist in a particular place? Or will they interfere with each other? Rephrased, the proposition is that each set of competencies and capacities requires a distinct set of institutional foundations, so the question becomes whether those institutions can co-exist in the same place, and within the same national sets of rules. Some argue that size is the definitive factor, and that only large countries in terms of both land mass and population can have regions that specializes in different phases. This is only, if at all, a partial answer. We do not view the production roles, phases, as completely exclusive. Furthermore, we have repeatedly stressed that there is always a need to have certain competencies from other phases in order to excel in innovating in a specific one. Therefore, locales not only can, but must, keep competencies from several phases in order to fully master one. The competencies principally required for a particular role, say product design, do not entirely stand alone. They require at least access to complementary capacities. And access to those complementary capacities demands at least adequate local resources to absorb knowledge and coordinate with others. Hence, if Israel now appears to be

an embodiment of novel-product-creation focus, a deeper analysis reveals that Israel also excels in many of the activities suited to second generation and component innovations. Indeed, a more prudent long term strategy for any region is to specialized in one phase but keep competencies in another to allow it to coordinate and collaborate with other places, and when needed to transform its core activities as the markets, industries, and technologies in which it specialized change over time.

Countries are not necessarily rivals, indeed successes in one country can open opportunities in others. The Western companies supply networks have in fact created entry points for national development. So the questions pose themselves: "Can supply networks be ladders to development? Is the international economy, at least in some ways, a bit like training to a charity racing in which all win?" This image is certainly close to the classic economist's image of gains from trade. Or are countries bitter rivals in a zero sum game, closer to boxing where you win only if you knocked your opponent senseless, a more mercantilist world view? Here we try to move beyond these questions and ask somewhat different ones.

The classic question arises: "Can countries learn from each other?" Can the diversity of experience provide lessons countries can take from each other as they respond to the several current crisis? What clues do the diverse evolutions of

national policies present? Can the apparent successes of one country work in another. Can the strategies that work for one country be transported to another.

Drawing useable lessons from national cases will be difficult. One difficulty is that with the overlapping swirls of crises, the question becomes which policies are relevant to which outcomes, and in which specific context. In the US, for example, the fundamental shift in the logic of value and the distribution of production , commodization, modularization, and the services transformation, produced concerns, and policies, focused on the off-shoring of production. The financial meltdown, by contrast, leads to a focus on government capacities to restart the economy and the need for financial market reregulation to avoid a repeat. Meanwhile the climate debate and the need to enable energy transformation call for active state strategies for innovation and domestic production of new generations of energy technology.

More importantly, a particular national government tends to use similar policy tools to address quite different problems, often if the tools are not exactly the same, to use similar processes.[lxxiv] There is a striking regularity in policy within countries across sectors. Policy strategies and particular policies are embedded in specific institutional and policy contexts. Even when objectives are similar,

countries have to pursue those objectives in starkly different ways. Countries facing similar crises, often resolve them, for the most part, in different ways.

Consider labor market flexibility. The Danes, with extensive social protections, and the Americans, with limited social protections, achieve labor market flexibility in very different ways. The success of the Danish approach, knows as flexicurity, sparked a recent debate as to whether France, Britain, or the United States have the option of copying the Danes, without having a similar institutional environment.[lxxv] We argue that a labor market strategy successful in Denmark may not be transportable to the US.[lxxvi] However, we contend that the Danish policy objectives of sustaining employment rather than defending particular jobs, of assuring a skilled workforce and the social protections for workers required to permit market flexibility, are valuable principles and interesting clues for policy makers across the developed economies.

The underlying questions of policy maker and academic are, in this case, converge. Policy makers seeking innovative solutions must ask, of course, which policies worked abroad. But what worked abroad may not work at home; the institutional and policy environment may not be "accept" policy strategies devised in a distinctly different institutional environment. The policy maker asking which lessons can be borrowed from abroad must evaluate whether policy abroad can be

transposed from one policy setting to another. A country's historical heritage shapes and limits the array of policy choices it might make, and hence the lessons it can implement from a different experience. France and the United States represent very sharp contrasts, one with a highly centralized administrative and political system providing leverage for concerted action by the central government on projects with and the other a dramatically decentralized Federal system. Not surprisingly their approaches to energy and finance are sharply different. They appear to be on separate, distinct trajectories of governance and policy. It is evident that policies formulated in one environment and one set of institutions are not automatically transferable to another.

Though formulated differently, academic debate suggests addresses many of the same questions that policy makers might pose. There is loosely an agreement that there are diverse capitalisms; that market economies rooted in private property are not all the same; that there are separate enduring trajectories of capitalist development distinguished by identifiable differences in market and policy institutions and rules.[lxxvii] The core debate is about how tightly woven together are the elements of the system. The several institutions and arrangement are clearly complementary, but how tightly bound together they are is a matter of debate [lxxviii] The more tightly woven, the more changes in one institution or arrangement

requires changes in others, the harder it is to transport policy ideas from one environment to another. The answer is entangled with the origins of the differences in the national systems and the dynamics of change.

One school of thought argues the difference in the trajectories are rooted in the political solutions at critical moments such as the creation of the nation state, the initial creation of markets, the entrance of labor into politics. [lxxix] The centralization of the French state precedes and defines the course of industrial development. The political divisions in the French labor movement, a radical communist labor movement, similarly defined how labor relations in France would be structured. Changes in the system occurred at moments political crisis, after World War II the States role was augmented. Radical change in the financial system was driven by the State itself and imposed on firms and finance. This implies that trajectories are defined by political solutions, but that political action and political choice can permit abrupt change. In this first vantage, there are defining moments setting the trajectories. The distinct versions of capitalism are separated by defining parameters, established at moment of industrialization and modernization, when key features of markets and states were established. [lxxx] The parameters evolve with the political deals set at the moment emergence of welfare systems in the late 19th and 20th century that structure the dynamic of the labor

markets, or more broadly that define labor markets, and thus define the very character of the several national economies.[lxxxi]

An alternate school of thought focuses on the firm. It argues that different national models reflect different firm level solutions to technical problems of agency and minimizing transaction cost problems of coordination and control of activity.[lxxxii] As useful as this approach is in highlighting the interplay among and relationships a national political economy, it has serious shortcoming. Certainly, it cannot have a theory of the sources of variety of capitalism. In our view the firm solutions emerge within the framework set by the resolution of more basic political problems? Firms all face common problems, but they are solved in different national arrangements in differently. The question of why there are differences, of origin, is simply not addressed. That of course means that the underlying relationships, the political foundations, of finance, labor, and corporation, for example, are not effectively addressed. Everything in a political economy seems woven together, and the dynamics cannot truly be observed. Yet, the perspective has the great advantage of focusing on the choices firms make as they compete in the market and try to create value.

We come back, then, to the core question, are the elements of each system so tied together that real change in policy direction would require an alteration of

the "system" as a whole, or can the constituent loosely bound permitting elements to evolve.[lxxxiii] How much possibility for evolution is there within these different systems, and is there a variance with regards to the ease of change between them? Can they learn from each other? Is the government – the State – a distinct and autonomous player in these stories?[lxxxiv] How do distinct and innovative economic development strategies emerge, and to what extent are they caught within the frames of earlier solutions, how do institutions evolve?[lxxxv] In sum, this crisis, with its pressures on existing arrangements and the urgent need for new creative solutions by firms and governments, will provide substance for all these debates.

For now let us highlight the issues that any theory of political economy must address.

- Creation: The creation and consolidation of different institutional and political economy systems
- Constraints: The constraints that existing institutional arrangements establish on the choices of firms and governments in each system
- Complementarity: The extent to which the several elements of any national system, such as banking and labor markets, are linked to each other. That is the extent to which subsystem are constrained by their relation to the whole.
- Change : The process, institutional and political, by which the systems and institutions evolve change.
- Categories. The utility of grouping economies into categories that defined specific flavor of capitalism, for example the distinction between liberal markets or coordinated market economies, or between statist and non statist nations

In a concluding chapter we will consider why the two perspectives are both essential to answering these questions, and why ultimately the must be combined to understand two crucial issues: the logic of the market in different national political economies and the character of the interplay between different national economies, and of firms with different national in a global marketplace.

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[ii] See D.W. Jorgensen, "Information Technology and the Us Economy," *American Economic Review* 91, no. 1 (2001), Jack E. Triplett and Barry P. Bosworth, *Productivity in the U.S. Services Sector* (Washington D.C.: Brookings Institution Press, 2004).

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[vii] {Ornston, 2009 #1347}

[viii] Dan Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland* (New Haven: Yale University Press, 2007), Dani Rodrik, *One Economics, Many Recipes: Globalization, Institutions, and Economic Growth* (Princeton, NJ: Princeton University Press, 2007).

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[x] Steven Kent Vogel, *Freer Markets, More Rules : Regulatory Reform in Advanced Industrial Countries*, Cornell Studies in Political Economy (Ithaca, N.Y.: Cornell University Press, 1996).

[xi] Lawrence Lessig, *Code and Other Laws of Cyberspace*, 2.0. ed. (New York: Basic Books, 2006)., Abraham Newman, *Protectors of Privacy : Regulating Personal Data in the Global Economy* (Ithaca, N.Y.: Cornell University Press, 2008).

[xii] Floyd Norris, "A Retreat from Global Banking," *New York Times*, July 24, 2009 2009.

[xiii] This is a particularly effective presentation of this issue.

[xiv] Cohen, Stephen and deLong, Bradford: *The End of Influence: What Happens When Other Countries Have the Money* (2010

[xv] F.H. Knight, *Risk, Uncertainty, and Profit* (Boston, MA: Hart, Schaffner & Marx, Houghton Mifflin Co., 1921). University of Chicago economist Frank Knight established the important distinction between risk and uncertainty:

> …Uncertainty must be taken in a sense radically distinct from the familiar notion of risk, from which it has never been properly separated.... The essential fact is that 'risk' means in some cases a quantity susceptible of measurement, while at other times it is something distinctly not of this character; and there are far-reaching and crucial differences in the bearings of the phenomena depending on which of the two is really present and operating.... It will appear that a *measurable* uncertainty, or 'risk' proper, as we shall use the term, is so far different from an *unmeasurable* one that it is not in effect an uncertainty at all.

[xvi] Nothing has as of yet truly challenged the neo liberal economic paradigm. The belief that perfect competitive market utopia exists on this earth is still too strong an intellectual drug for most economists to resist.

[xvii] John Zysman, *Political Strategies for Industrial Order: State, Market and Industry in France* (Berkeley: University of California Press, 1977).

[xviii] R. Abdelal, M. Blyth, and C. Parsons, *Constructing the International Economy* (Ithaca, NY: Cornell University Press, forthcoming), Emanuel Adler, "Cognitive Evolution: A Dynamic Approach for the Study of International Relations and Their Progress," in *Progress in Postwar International Relations*, ed. Emanuel Adler and Beverly Crawford (New York: Columbia University Press, 1994), Mark Blyth, *Great Transformations: Economic Ideas and Institutional Change in the Twentieth Century* (Cambridge: Cambridge University Press, 2002), ———, "Structures Do Not Come with an Instruction Sheet: Interests, Ideas and Progress in Political Science," *Perspectives on Politics* 1 (2003), Dan Breznitz, "Ideas, Structure, State Action and Economic Growth: Rethinking the Irish Miracle," *Review of International Political Economy* (forthcoming), Bai Gao, *Economic Ideology and Japanese Industrial Policy: Developmentalism from 1931 to 1965* (New York: Cambridge University Press, 1997), Peter Hall, ed. *The Political Power of Economic Ideas: Keynesianism across Nations* (Princeton: Princeton University Press,1989), ———, "Policy Paradigms, Social Learning, and the State: The Case of Economic Policymaking in Britain," *Comparative Politics* 25 (1993).

[xix] A double bind in psychological terms means, in crude terms, that you are damned if you do and damned if you don't. It seems rather appropriate in this context. **Dictionary**.com says that: *Psychology*. a situation in which a person is given conflicting cues, esp. by a parent, such that to obey one cue is to disobey the other. **Wikipedia** tells us that: A **double bind** is a dilemma in communication in which an individual (or group) receives two or more conflicting messages, with one message negating the other. This creates a situation in which a successful response to one message implicates a failed response to the other, so that the person will be automatically wrong regardless of response. The person can neither comment on the conflict, nor resolve it, nor opt out of the situation. **Answers**.com says that: Gregory Bateson coined the term *double bind* in 1956. In trying to understand the characteristic effects of communication in schizophrenics' families, Bateson and his collaborators identified a specific constraining interaction, the paradoxical injunction that they called the *double bind*. The double bind fits into one of the three types of paradox, the pragmatic paradox. The effects of the paradox in human interactions were first described by Gregory Bateson, Don D. Jackson, Jay Haley, and John H. Weakland in a document entitled *Toward a Theory of Schizophrenia*, published in 1956. Bateson and his collaborators were looking for sequences of interpersonal experience that could lead to a type of behavior that would justify the diagnosis of schizophrenia.

[xx] Sven W Arndt and Henryk Kierzkowski, eds., *Fragmentation: New Production Patterns in the World Economy* (Oxford: Oxford University Press,2001). The unbundling label was popularized by Richard Baldwin; see, Richard

Baldwin, "Globalization: The Great Unbundling(S)," ed. Finnish Prime Minister's Office (2006). The debate dates back several decades with an array of significant contributions from diverse sources.

[xxi] For an example of UK business offshoring, see: L. Abramovsky, R. Griffith, and M. Sako, "Offshoring of Business Services and Its Impact on the Uk Economy," in *IFS Briefing Notes* (Institute for Fiscal Studies, 2004).

[xxii] Many writers use the term product chain to describe this growing decomposition. However, product chain may imply linear manufacturing processes of specific products from basic inputs to final assembly. The reality, in contrast, is of manufacturing processes built from multiple relationships between suppliers, each with different power structures between actors involved in the production of numerous products. These products may be the final products and/or components for other products. For these reasons we prefer to use the term production networks, which implies many suppliers with different relationships producing multiple products. Especially in the case of the IT industry, the term global production networks describes reality much better than product(s) chains with its linear implications. For papers outlining the different terminology used in the literature, see Jeffery Henderson et al., "Global Production Networks and the Analysis of Economic Development," *Review of International Political Economy* 9, no. 3 (2002), J. Timothy Sturgeon, "How Do We Define Value Chains and Production Networks?," *Institute of Development Studies Bulletin* 32, no. 3 (2001).; for a longer discussion, see Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*.

[xxiii] See Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*.

[xxiv] See J T Sturgeon, "Modular Production Networks: A New American Model of Industrial Organization," *Industrial and Corporate Change* 11, no. 3 (2002), J. Timothy Sturgeon and Richard Lester, "The New Global Supply-Base: New Challenges for Local Suppliers in East Asia," in *Global Production Networking and Technological Change in East Asia*, ed. Shahid Yusuf, Anjum Altaf, and Kaoru Nabeshima (Oxford: Oxford University Press, 2004), J. Timothy Sturgeon, "Turnkey Production Networks: The Organizational Delinking of Production from Innovation," in *New Product Development and Production Networks*, ed. Ulrich Jurgens (New York: Springer, 2000).

[xxv] Douglas B Fuller, Akintunde Akinwande, and Charles G Sodini, "Leading, Following or Cooked Goose: Successes and Failures in Taiwan's Electronics Industry," *Industry and Innovation* 10, no. 2 (2003).

[xxvi] By contrast Samsung, has created highly integrated operations that focus on particular points in the value network. Samsung uses its state supported capacity to focus capital as a base of a strategy to reach the market with standard, commodity like products, very rapidly before others can compete down the price. In the case of memory chips it tries to be very rapidly to market in each generation with a quite standard product.

[xxvii] Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*., Douglas B Fuller, "Globalization for Nation-Building: Taiwan's Industrial and Technology Policies for the High-Technology Sectors," *The Journal of Interdisciplinary Economics* 18, no. 2 (2007), Fuller, Akinwande, and Sodini, "Leading, Following or Cooked Goose: Successes and Failures in Taiwan's Electronics Industry.", John A. Mathews and Dong-Sung Cho, *Tiger Technologies: The Creation of a Semiconductor Industry in East Asia* (Cambridge, UK: Cambridge University Press, 2000).

[xxviii] H.W. Chesbrough, *Open Innovation: The New Imperative for Creating and Profiting from Technology* (Cambridge, MA: Harvard Business Press, 2003).

[xxix] Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*, D. Breznitz and A. Zehavi, "The Limits of Capital: Transcending the Public Financer- Private Producer Split in Industrial R&D Research Policy," no. 39 (2010).

[xxx] D. Breznitz and M. Murphree, *Run of the Red Queen: Government, Innovation, Globalization and Economic Growth in China* (New Haven: Yale University Press, 2010).

[xxxi] Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*, J T Sturgeon, "Modular Production Networks: A New American Model of Industrial Organization," *Industrial and Corporate Change* 11, no. 3 (2002), J. Timothy Sturgeon, "What Really Goes on in Silicon Valley? Spatial Clustering and Dispersal in Modular Production Networks," *Journal of Economic Geography* 3 (2003).

[xxxii] Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*, Breznitz and Murphree, *Run of the Red Queen: Government, Innovation, Globalization and Economic Growth in China*.

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[xxxiv] Glimstedt, Henrik, Bratt, Donald, Karlsson, Magnus P.; "The Decision to Make or Buy Critical Technology; Semiconductors at Ericsso, 1980-2010" Unpublished paper.

[xxxv] John Zysman, "The 4th Service Transformation: The Algorithmic Revolution.," *Communications of the ACM* 49, no. 7 (2006).

[xxxvi] The debate about the precise role of services in the economy really begin with Baumol's views. William J. Baumol, "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," *American Economic Review* 57 (1967).

[xxxvii] Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*. This was a central argument in: Stephen S. Cohen and John Zysman, *Manufacturing Matters : The Myth of the Post-Industrial Economy* (New York: Basic Books, 1987). For more on the definition of services, see I. Miles et al., "Knowledge- Intensive Business Services: Users, Carriers and Sources of Innovation," (Luxembourg: European Innovation Monitoring System (EIMS), 1995).

But what are services? It is most commonly said that services are those economic market activities that don't produce or transform material objects and exhibit co-terminal production and consumption relationships; they cannot be stored or shipped and have immaterial natures. We can see problems with these definitions. Some services do indeed involve material transformation (barbers) and can involve shipments (consulting reports). In fact, what we delineate as services characteristics may actually just be historically specific circumstances to service production, defined by the technology and tools set given at the time. Furthermore, services are extremely diversified and heterogeneous; should we really be looking for one uniform definition to apply to all services, or should there be definitions fit for different types of services? This work on characterizing the heterogeneous landscape of services is what some scholars are now preoccupied with, albeit still with limited success.

[xxxviii] Baumol, "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis."

[xxxix] Interestingly, there is a specific technology development project that has come out of our discussion of these issues. The Center for Information Technology Research in the Interests of Society (CITRIS) at the University of California has teamed up with research teams from Denmark and Finland to develop and experiment with sensor based home monitoring systems to replace home nursing and permit elders to remain at home.

[xl] As part of a research project on services, we have done extensive interviewing.

[xli] Stephen S. Cohen and John Zysman, *Manufacturing Matters : The Myth of the Post-Industrial Economy* (New York: Basic Books, 1987).

[xlii] There are a variety of definitions of "services" as an economic category. The ideal types we have defined most effectively clarify the economic dynamics we observe, and we believe are the categories most useful for

understanding the influence of services on productivity, investment and growth as well as the competitive dynamics of the marketplace.

In our view any analysis or definition of services must begin by noting that "services" was the box in national accounting to hold the residual left over from agriculture and manufacturing. As this residual grew, scholars tried to detail out the character of services. The World Bank, for example, defines services as "intangible goods that are often produced and consumed at the same time." The intangibility of services means that they don't produce or transform material objects, and cannot be stored or shipped. The World Bank's definition is perhaps the most commonly held. However, we can see problems with this conception. Some services do indeed involve material transformation (barbers) and can involve shipments (consulting reports). In fact, what we delineate as services characteristics may actually just be historically specific circumstances to service production, defined by the technology and tools set given at the time. Furthermore, services are extremely diversified and heterogeneous; should we really be looking for one uniform definition to apply to all services, or should there be definitions fit for different types of services? There is a large literature with competing taxonomies on the way services should be broken up. Marja Toivonen (2006) suggests a good taxonomy on these taxonomies, consisting of three categories: 1) those based on the type of demand, 2) those based on the form of supply, 3) those based on the nature of the service process or on the content.

Taxonomies based on the type of demand focus on how the service is consumed. In this group there are two main types of consumption: intermediate services and services targeted to end-use (cf. Gershuny and Miles 1983). The reversals of this are taxonomies based on the supply sources, split into two dichotomies: public-private and profit (marketed)-non profit (non-marketed). Lastly, the majority of classifications on services are formed around the nature of the service process or on its content. These can be subdivided into classifications that categorize services based on their functional basis (e.g. Miles et al. 1995) or their relationship to information, knowledge, science, technology, and strategies for innovation (eg. Soete and Miozzo 1989). The last category, a taxonomy on services based on their relationship to information, knowledge, science, technology and innovation, is one with the bulk of the literature and the most workable material.

It should be stressed, however, that the landscape of these taxonomies shows that a field that is still developing. None of the proposed taxonomies have been very adequate in defining the nature and characteristics of services. This work on characterizing the heterogeneous landscape of services is what some scholars are now preoccupied with, albeit still with very limited success.

For more on the definition of services, see Marja Toivonen, "Expertise as Business: Long-Term Development and Future Prospects of Knowledge-Intensive Business Services (Kibs)" (Helsinki University of Technology, 2004), J.I. Gershuny and I.D. Miles, *The New Service Economy: The Transformation of Employment in Industrial Societies* (London: Frances Pinter Publishers, 1983).

[xliii] John Zysman, "Strategic Asset or Vulnerable Commodity? Manufacturing in a Digital Era," in *BRIE Working Paper 147A* (Berkeley, CA: Berkeley Roundtable on the Internatinoal Economy, 2003).

[xliv] Stephen S. Cohen and John Zysman, *Manufacturing Matters : The Myth of the Post-Industrial Economy* (New York: Basic Books, 1987).

[xlv] Douglass North, *Institutions, Institutional Change and Economic Performance* (Cambridge, UK: Cambridge University Press, 1990).

[xlvi] John Zysman and Abraham Newman, eds., *How Revolutionary Was the Digital Revolution? National Responses, Market Transformations, and Global Technology* (Stanford, CA: Stanford Business Books,2006).

[xlvii] Consider the example of health: the matter of how to use data is entangled with privacy regulations. The matter of who reads X-rays is part of professional certification. The use of nurse practitioners is linked to the professional role and income of doctors. Each service industry is a web of rules and roles that will have to shift and change for productivity gains to be captured.

[xlviii] John Zysman et al., "Competency Based Growth Strategies: Creating Value in a Digital Global Era," in *BRIE Working Paper 178* (Berkeley Roundtable on the International Economy).

[xlix] The choices are made in 1612. The parliamentary record as to why is thin, however. Consequently a convincing explanation is difficult.

[l] For example, the triumph of oil as the preferred fossil fuel for transportation (and not just heating and lightning), was deeply tied with the decision of the world navies to move from coal to oil. While not being the first nation to do so, the critical step happened when British Royal Navy, then the most crucial military force of the world's biggest empire, adopted oil in 1912 under Winston Churchil, then the first Lord of the Admiralty. The consequence of these decisions was that the supply of oil has become a critical strategic security issue, and the nationality of oil companies as well as the control of access to oil-rich territories was perceived as essential. In the case of Britain, the decision of the Royal Navy to switch to oil led directly to the British state getting a 51% equity stake in APOC a spin-off of Burmah Oil developing oil field in Persia (Iran of today). APOC later bought British Petroleum (ironically a German company confiscated during World War I) and renamed the merged company under this brand, and proceeded to entangle the British government in Persian politics, the consequences of which forever changed the politics of the Middle East. see Winston S. Churchill, *The World Crisis*, vol. 1 (New York: Scribner's, 1923).

[li] , (paper presented at the Energy Efficiency Policy in Comparative Perspective Workshop, Stanford University, 2009).

[lii] In some cases direct state intervention usefully promotes development and growth, and in others distorts markets and wastes resources.

[liii] Abraham Newman, *Protectors of Privacy : Regulating Personal Data in the Global Economy* (Ithaca, N.Y.: Cornell University Press, 2008).

[liv] Herman Daly, "Free Trade: The Perils of Deregulation," in *The Case against the Global Economy*, ed. Jerry Mander and Edward Goldsmith (Sierra Club Books).

[lv] Peter Gourevitch, *Politics in Hard Times: Comparative Responses to International Economic Crises* (Ithaca: Cornell University Press, 1986).

[lvi] John Zysman and Abraham Newman, "Frameworks for Understanding the Political Economy of the Digital Era," in *How Revolutionary Was the Digital Revolution? National Responses, Market Transitions, and Global Technology in a Digital Era*, ed. John Zysman and Abraham Newman (Stanford, CA: Stanford Business Press, 2006).

[lvii] Kenji E. Kushida, "Wireless Bound and Unbound: The Politics Shaping Cellular Markets in Japan and South Korea," *Journal of Information Technology and Politics* 5, no. 2 (2008).

[lviii] Ronald Rogowski, *Commerce and Coalitions: How Trade Affects Domestic Political Alignments* (Princeton, NJ: Princeton University Press, 1990), Gourevitch, *Politics in Hard Times: Comparative Responses to International Economic Crises*.

[lix] Gourevitch, *Politics in Hard Times: Comparative Responses to International Economic Crises*, Alexander Gerschenkron, *Economic Backwardness in Historical Perspective, a Book of Essays* (Cambridge, MA: Belknap Press of Harvard University Press, 1962).

[lx] Michael J. Piore, *Beyond Individualism* (Cambridge, MA: Harvard Univeristy Press, 1995).

[lxi] Richard M. Locke, *Remaking the Italian Economy* (Ithaca, NY: Cornell University Press, 1995).

[lxii] Niels Christian Nielsen and Maj Cecilie Nielsen, "Spoken-About Knowledge: Why It Takes Much More Than Knowledge Management to Manage Knowledge," in *How Revolutionary Was the Digital Revolution? National Responses, Market Transitions, and Global Technology in a Digital Era*, ed. John Zysman and Abraham Newman (Stanford, CA: Stanford Business Press, 2006), Tobias Schultze-Cleven, "The Learning Organization: A Research

Note On "Organizational Change in Europe: National Models or the Diffusion of a New 'One Best Way'?" By Edward Lorenz and Antoine Valeyre," in *How Revolutionary Was the Digital Revolution? National Responses, Market Transitions, and Global Technology in a Digital Era*, ed. John Zysman and Abraham Newman (Stanford, CA: Stanford Business Press, 2006).

[lxiii] S Edward Steinfeld, "China's Shallow Integration: Networked Production and the New Challenges for Late Industrialization," *World Development* 32, no. 11 (2004).

[lxiv] Breznitz and Murphree, *Run of the Red Queen: Government, Innovation, Globalization and Economic Growth in China*.

[lxv] An example of such strategy aimed at the top end of the market is Toyota's redefinition of a 140 years old product – the commercially produced car – and creating the Hybrid powered cars with the Prius project. However, such strategy can also be aimed at the low-end of the market, for example the $100 laptop project aims to create a simplified, much more reliable version of an extremely well define product – notebook computers – so some of the poorer people in the world living under severe conditions can afford to use it.

[lxvi] Gordon E. Moore, "Cramming More Components onto Integrated Circuits," (1965).

[lxvii] Ibid.

[lxviii] John Zysman and Mark Huberty, "An Energy System Transformation: Framing Research Choices for the Climate Challenge," *forthcoming, Research Policy* (2010).

[lxix] Apple is the icon of a company whose market advantage begins by innovative product conception and definition. G. Linden, K. L. Kraemer, and J. Dedrick, "Who Captures Value in a Global Innovation System? The Case of Apple's Ipod," (Irvine, CA: Computing Industry Center, 2007).We must also differentiate between the companies that own and sell the product/services and these that actually defined it. For example, IDEO, is a company not widely known to final consumers, but is an instance of a company that sells aspects of this capacity as a service to other firms, helping them to define products and designs. For example, IDEO defined the first production mouse for Macintosh and Lisa. This is different from example Motorola at its prime. With the advent of digital technology, people tend to forget that not so long ago this American company was world famous thanks to its competency to come with many a new analog mobile communication device, from the first commercially successful pagers, to the early, analog, mobile phones. Indeed, the core of Motorola's current crisis is that it has lost both the capacity and the competency to create novel products and/or engage other companies in the creation of such products.

[lxx] Walter. W. Powell, Kenneth W. Koput, and Laurel Smith-Doerr, "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology," *Administrative Science Quarterly* 41, no. 1 (1996), Cristiano Antonelli, "Collective Knowledge Communication and Innovation: The Evidence of Technological Districts," *Regional Studies* 34, no. 6 (2000), Dan Breznitz, "Collaborative Public Space in a National Innovation System: A Case Study of the Israeli Military's Impact on the Software Industry," *Industry and Innovation* 12, no. 1 (2005), S. M. Breznitz, Rory. O'Shea, and T. Alan, "The Role of Research Universities in the Development of Regional Bioclusters: A Study of Mit and Yale Commercialization Strategies," *Journal of Product Innovation Management* Forthcoming (2008), Philip Cooke and Kevin Morgan, *The Associational Economy* (New York: Oxford University Press, 1998), David Keeble et al., "Collective Learning Processes, Networking and Institutional Thickness' in the Cambridge Region," *Regional Studies* 33, no. 4 (1999), Richard K. Lester and Michael J. Piore, *Innovation -- the Missing Dimension* (Cambridge, Mass: Harvard University Press, 2004), Kevin Morgan, "The Learning Region: Institutions, Innovation and Regional Renewal," *Regional Studies* 31, no. 5 (1997).

[lxxi] Ann Markusen, "Sticky Places in Slippery Space: A Typology of Industrial Districts," *Economic Geography* 72, no. 3 (1996).

[lxxii] Walter W. Powell, Kelley Packalen, and Kjersten Whittington, "Organizational and Institutional Genesis: The Emergence of High-Tech Clusters in the Life Sciences," in *The Emergence of Organization and Markets*, ed. John Padgett and Walter Wl Powell (Forthcoming), J. Lerner, *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed- and What to Do About It* (Princeton, NJ: Princeton University Press, 2009), Dan Breznitz and Mollie Taylor, "The Communal Roots of Entrepreneurial-Technological Growth? Social Fragmentation and the Economic Stagnation of Atlanta's It Cluster," in *Industry Studies Association Annual Meeting* (Chicago2009), Steven Casper, "How Do Technology Clusters Emerge and Become Sustainable? Social Network Formation and Inter-Firm Mobility within the San Diego Biotechnology Cluster," *Research Policy* 36, no. 4 (2007), Steven Casper, "Social Structure and Marketplace Formation within California Biotechnology," in *Industry Studies Association Annual Meeting* (Chicago2009).

[lxxiii] Zysman, Nielsen, and Breznitz, "Building on the Past, Imagining the Future: Competency Based Growth Strategies in a Global Digital Age."

[lxxiv] See Peter Hall and David Soskice, eds., *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage* (New York: Oxford University Press,2001), Andrew Shonfield, *Modern Capitalism: The Changing Balance of Public and Private Power* (New York: Oxford University Press, 1969), C. Crouch, *Capitalist Diversity and Change: Recombinant Governance and Institutional Entrepreneurs* (New York: Oxford University Press, 2005).

[lxxv] See Tobias Schulze-Cleven, "Diverging European Trajectories toward Labor Market Flexibility," in *PhD Dissertation in Political Science* (Berkeley, CA: University of California, Berkeley, forthcoming).

[lxxvilxxvi] See Ibid., forthcoming.

[lxxvii] In many cases these issues are referred to as the Varieties of Capitalism. However, the book of that title embeds a particular analytic framework and empirical interpretation. While we share a concern with the questions and issues, we have problems with the theoretic formulation. Consequently to avoid confusion, we will try to avoid the particular phrase.

[lxxviii] We turn to this debate later

[lxxix] John Zysman, "How Institutions Create Historically Rooted Trajectories of Growth," *Industrial and Corporate Change* 3, no. 1 (1994).

[lxxx] Ibid, Alice Amsden, *Asia's Next Giant: South Korea and Late Industrialization* (Oxford: Oxford University Press, 1989), Gerschenkron, *Economic Backwardness in Historical Perspective, a Book of Essays.*

[lxxxi] Gosta Esping-Andersen, *The Three Worlds of Welfare Capitalism* (Princeton University Press, 1990).

[lxxxii] Hall and Soskice, eds., *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*.

[lxxxiii] Colin Crouch et al., "Dialogue on 'Institutional Complementarity' and Political Economy," *Socio-Economic Review* 3 (2005).

[lxxxiv] Breznitz, *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*, John Zysman, *Governments, Markets, and Growth: Financial Systems and the Politics of Industrial Change*, Cornell Studies in Political Economy (Ithaca [N.Y.]: Cornell University Press, 1983).

[lxxxv] Paul Pierson, *Politics in Time: History, Institutions, and Social Analysis* (Princeton: Princeton University Press, 2004), {Streeck, 2005 #1346}