

Industrial Policy and the New Economy:  
The Political Economy of High-Tech Development in  
the United States 1970-2015

by

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# KEY TO ABBREVIATIONS

ARPA-E	Advanced Research Projects Agency - Energy
ASAP	Accelerated Study in Associate Programs
ATP	Advanced Technology Program
CDFC	Community Development Finance Corporation
CME	Coordinated Market Economy
DARPA	Defense Advance Research Projects Agency
DOD	Department of Defense
DOE	Department of Energy
ESTD	Early Stage Technology Development
GDP	Gross Domestic Product
GRA	Georgia Research Alliance
HDNS`	Hidden Developmental Network State
HHS	Department of Health and Human Services
LME	Liberal Market Economy
MCRC	Massachusetts Capital Resource Company
MEP	Manufacturing Extension Partnership
MICRO	Microelectronics Innovation and Computer Research Opportunities
MITI	Ministry for International Trade and Industry
NASA	National Aeronautics and Space Administration
NIH	National Institute of Health
NIST	National Institute of Standards and Technology
PCAST	President's Committee on Science and Technology
R&D	Research and Development
SBIR	Small Business Innovation Research program
VC	Venture Capital
VoC	Varieties of Capitalism

Since its founding fathers, the United States has always been torn between two traditions, the activist policies of Alexander Hamilton (1755-1804) and Thomas Jefferson's (1743-1826) maxim that 'the government that governs least, governs best.' With time and usual American pragmatism, this rivalry has been resolved by putting the Jeffersonians in charge of the rhetoric and the Hamiltonians in charge of policy.

— Erik Reinert (2007, 23)

“We fill pre-existing forms and when we fill them we change them and are changed.”

— Frank Bidart, “Borges and I,” quoted in *The Pale King* (2011)

# INTRODUCTION

“Capital is wayward and timid,” Alexander Hamilton wrote in his *Report on Manufactures* (1791). “...[T]he state ought to excite the confidence of capitalists, who are ever cautious and sagacious, by aiding them to overcome the obstacles that lie in the way of all experiments .... it is evident that the interference and aid of their own governments are indispensable.”<sup>1</sup> Hamilton’s ideas helped inspire some of the nation’s first industrial policy efforts, which guided the aggressive construction of canals and railroads in the first half of the 19<sup>th</sup> century. And while Hamilton was one of the first American policymakers to come to the conclusion that the government plays a critical role in guiding and shaping markets, he would not be the last. The government practice of intervening in specific industrial sectors has long been labeled “industrial policy,” but today, with the role technology plays in the US economy, “innovation policy” might be a more accurate name.

Warwick Mills is a high-tech textile manufacturer located in New Hampshire that weaves ceramics, metals, and fiberglass into its fabrics. These fabrics are used to craft industrial safety gloves, as well as body armor. Warwick also embeds semiconductors and sensors into its textiles that can “can see, hear, communicate, store energy, warm or cool a person or monitor the wearer’s health.”<sup>2</sup> In April of 2016, the *New York Times* reported that Warwick Mills is partnering with the Department of Defense, the state governments of Massachusetts and Georgia, about fifty other companies, and the Massachusetts Institute of Technology to build an ambitious \$320 million initiative called

the Advanced Functional Fabrics of America. The goal of this initiative is to make America the center of textile innovation in the digital age.

In America, such collaborative partnerships between government, industry, and academia with the goal of technology development are common. Today, instead of subsidizing the building of miles of railroad, the state builds miles of fiber-optic cable to expand access to broadband technology. Instead of building the roads to carry the cars manufactured in factories, the state helps small technology startups bring their product to market, or it lends capital to a clean energy technology producer making more efficient photovoltaic batteries. Along with the scientific challenge of inventing new technological innovations there is always the parallel challenge of designing and implementing new laws and institutions to govern those innovations. This thesis is fundamentally preoccupied with the latter challenge and its effects on the lives of individual people. In this project, I provide new understanding of the laws and institutions that govern technological-economic transformations in modern America. My goal in doing so is simple: I hope to provide a road map to change the role of technology in people's lives for the better.

Like any good story, this one begins with a problem that needed to be solved. In the 1970s, global economic forces took the nation by storm, catching economic policymakers flat-footed. Rising energy prices, stagflation, and deindustrialization all shook the system that for the decades following the post-war period proved to be one of the most effective wealth-generating systems in the history of the world. Policymakers who had been operating under the assumption that there was a tradeoff between unemployment and inflation suddenly had no tools to make sense the new empirical facts

of the economy. The Keynesian consensus that governed economic policymaking in the postwar period was unseated, and the marketplace of economic ideas opened for competition.

Keynesianism has always held that the most important variables in economic systems are those of aggregate demand and aggregate supply, a fact well captured by Keynes's famous claim that if money were buried for people to dig up, such a practice would effectively stimulate demand and jump-start a stagnating economy. In contrast, industrial policy is founded on one simple principle: that economic development depends not just on the amount of money injected into the economy, but also on *how that money is spent*. This assertion will, to most, seem intuitive and sensible. But as the country faced its greatest economic challenge since the Great Depression, industrial policy found a hostile audience both in the nation's public and in its elite. Even many pro-government liberals were skeptical that the United States government, with its many branches, states, committees, and bureaucracies, could effectively organize a national microeconomic program.

More than anything else, the enduring trope of an unwieldy, corrupt, and incompetent government has for decades now constrained the boundaries within which the American state is able to operate. My assertion is not only that is this trope false and unfair, but that the dedicated bureaucrats who silently and thanklessly work to save the American economy are, all things considered, quite good at their jobs. In fact, when one looks closely at the emergence of various "techno-economic paradigms" or Schumpeterian creative-destructive cycles within American capitalism,<sup>3</sup> from the invention of the steam engine, to the proliferation of the vertically integrated automobile



factory, the government's role in the economy has always been to be its manager or director, rather than the referee keeping a level playing field for other actors, or the engine providing the fuel on which the economy runs.

In response to the crises of the 1970s, a group of economic policymakers and thought-leaders attempted to transform the intellectual framework that governed the US economy by championing the idea of industrial policy as the answer to the nation's problems. These advocates, and the idea they championed, did not succeed in crafting a new federal structure for governing the economy. Instead, the American states took their place as the last line of defense in keeping the American economy afloat, crafting their own set of industrial policies in a pragmatic subnational context that was tolerant of such interventionist measures. The programs piloted and tested at the state level—vocational training program, research and development funds, public venture capital programs, research parks—were then silently recombined at the federal level into a substrate of industrial policies meant to facilitate technology development and commercialization in the decentralized web of small firms that were, and still are, the lifeblood of the innovation economy.

These technology-based industrial policies came into being in conjunction with the hegemonic rise of neoliberalism, a paradigm which has long labeled industrial policy as the failed practice of the government “picking winners” in the economy. The set of programs that came into being in post-stagflation America did so in the shadow of neoliberalism, safely hidden within the bureaucratic body of the state. The need to stay hidden and obscured severely limited the scale of these policies, and as a result the current US industrial policy is stilted towards high-tech innovation. While these hidden

high-tech innovation policies have succeeded in their narrow goals, their narrowness has resulted in uneven growth as the poor and low-skilled have been excluded from the gains in the economy.

Many academics have recently noted the success of the “hidden” industrial policy of the US in the era of the new economy. My argument in part, however, is that scholars have under-emphasized the pivotal role federalism played in its evolution.. Indeed, individual states organized and financed the entities that would build the nation’s first canals and railroads.<sup>4</sup> Similarly, most of the federal programs described in this thesis were first tested at the state level, and then spread upwards in the American system. And as policymakers look to the future, there is a growing recognition that subnational development efforts are vital to sustaining the nation’s economic health.

Counterintuitively, the communication and information technologies that promised to make geography meaningless have increased the agglomeration efficiencies of industrial clusters, making geography more important than ever. I argue that today, once again, the American states, with their local knowledge and regional orientation, represent the best chance to fill in the gaps in the current hard-won industrial policy system.

In Chapter One, I return to the industrial policy debates of the 1980s. Industrial policy’s advocates failed for many already well-known reasons, such as the idea’s inability to recruit a coalition of stakeholders, or its lack of popular appeal. In addition to these reasons, industrial policy’s advocates were unsuccessful mostly because they sought to borrow the policy models of Japan and Germany—models forged by historically specific institutional pathways—and impose those models onto the unique and incompatible American political-institutional context. I look to the varieties of

capitalism literature, which emerged after the industrial policy debates, to show how America's liberal market economic structure differed significantly from that of Germany and Japan's coordinated market economies, and how a different industrial policy model needed to be developed to fit that institutional structure.

In Chapter Two, I turn to the American states and their response to the crises of the 1970s. While the states have historically been complicit in zero-sum competition with one another for capital that has had a net negative effect on the US economy as a whole, a new paradigm emerged at the subnational level that looked to generate wealth within state borders rather than recruit capital from elsewhere. A set of governors, both Republican and Democrat, took advantage of their subnational platforms to implement their own industrial policies in the hopes of facilitating "high-road" economic development with high-skill, high-wage, high-tech industries.

In Chapter Three, I argue that the set of programs implemented at the subnational level then pre-figured and coupled synergistically with a set of federal technology development programs, known as the Hidden Development Network State (HDNS). This set of hidden programs succeeded because it evolved naturally to map onto the decentralized American historical-political setting. Further, this system was well fitted to interlock with the new decentralized system of global production known as the post-Fordist "new economy." These hidden development programs were successful at providing seed-capital to small, innovative firms that could not get funding elsewhere, firms that have played critical roles in the nation's economic growth. Indeed, many of the new economy's most successful firms, such as Apple and Google, were assisted by this system. These programs were also designed to facilitate strategic non-market cooperation

between market actors—a practice that I argue signaled a significant deviation from the traditional narrative of the American liberal market model of capitalism.

In Chapter Four I argue that the undemocratic character of the HDNS severely limits its ability to engage in large-scale public-facing industrial policy efforts. As a result, this lack of scalability excluded the majority of the American workforce from its benefits. The financial crisis prompted a broad reconsideration of the industrial policy paradigm, and President Obama has been an ardent advocate of a “clean” energy industrial policy regime in an effort to correct the failures in the nation’s current system. But President Obama’s efforts have hardly proven sufficient, as neoliberalism survived the blow dealt to it by the financial crisis of 2008. Partially as a result of the austerity policies following the 2010 elections, the American states have been left as the last line of defense to resolve the lasting crisis of American capitalism. I argue that many state-level clean energy industrial policies, in addition to general efforts by the states to resolve the challenges of mass-scale technology deployment, present an opportunity to reverse the trend of wage stagnation for the majority of the American workforce and restore the living standards of the American working class. However, to be sure, the states face a number of significant obstacles in the pursuit of this goal.

Finally, I argue that the presence of many of the technology programs described in this thesis, their non-market orientation, and their origination and variation at the subnational level have significant implications for the political economy literature on varieties of capitalism—namely, that there may be varieties of capitalism between and among the American states. This finding conflicts with the current literature on how

national political economies are organized, and suggests a new theoretical model may be needed.

Joan Robinson, the 20<sup>th</sup> century economist, once said:

It is a popular error that bureaucracy is less flexible than private enterprise. It may be so in detail, but when large scale adaptations have to be made, central control is far more flexible. It may take two months to get an answer to a letter from a government department, but it takes twenty years for an industry under private enterprise to readjust itself to a fall in demand.<sup>5</sup>

It is this premise that I hope might one day be widely shared by policymakers and public citizens alike: that when it comes to restructuring entire industries, bureaucracy, with its many flaws, can at times be the agent we need to protect us from uncompromising consequences of technological change.

# CHAPTER ONE

## THE GREAT DEBATE

“On June 30, 1980, *Business Week* finally sounded the alarm,” began Barry Bluestone and Bennett Harrison’s 1982 book, *The Deindustrialization of America*.<sup>1</sup> American prosperity was eroding, manufacturing jobs were leaving the country, and wages were stagnating. Today, those trends have continued. There is a growing crisis of wage stagnation and income inequality in the United States. Whether or not these economic facts yet fall into the category of crisis that prompts fundamental economic change is not yet clear. But these problems are old: during the 1970s and 1980s, America set out to diagnose and solve the problems of globalization, economic competition from abroad, and deindustrialization. Many wielded a new and protean idea, industrial policy, as a hoped solution to these problems. But efforts to organize and deploy the incoherent network of government programs intervening in the economy at the time—tax breaks and subsidies for businesses, trade policies—into a coherent programmatic vision ultimately faced both practical and political barriers. Advocates attempting to restructure the American economy to match its more strategic, government-reliant competitors such as Germany and Japan failed, and in their stead Ronald Reagan’s neoliberalism took its seat as the chosen answer to America’s problems.

The literature has long held that America’s “weak state” legacy and a lack of political stakeholders were the cause of industrial policy’s failure. Since the 1980s, however, social science has accumulated a new set of perspectives rooted in historical

institutionalism on how national political economies are organized. Using these new perspectives, I argue that industrial policy also failed to take root because the strain of industrial policy that advocates aimed to develop, one that matched the coordinated market economies of Germany and Japan, was unmatchable to the America's liberal market model of capitalism.

### **1.1 Framing the Problem**

In 2013, President Obama declared that income inequality is the “defining challenge of our time.”<sup>2</sup> The US inflation-adjusted median income has increased very little between 1979 and 2015, and it has actually fallen since 1999.<sup>3</sup> Overall, between 1973 and 2011, the median hourly wage barely changed, growing just 0.1 percent per year. While wages have stagnated, productivity has grown, increasing at an average rate of 1.56 percent per year, and accelerating to 1.88 percent per year from 2000 to 2011. In total, from 1979-2014, the median worker received a 5 percent increase in wages, while productivity has increased 75 percent.<sup>4</sup>

There was a time in the post-war period, however, when middle class wages did track with productivity. Rising wages and productivity were the primary contributors to the growth of the middle class after World War II, and from 1948-1973 productivity grew at an average rate of 2.8 percent annually. With this rise in productivity, income inequality fell, with the average income for the bottom 90 percent of households growing at 2.8 percent a year.<sup>5</sup>

There is evidence to suggest that the offshoring of the labor-intensive industries (such as manufacturing) in the US was a major contributor to a decline in the US labor

share of GDP.<sup>6</sup> The theory of skill-based technological change, which holds that jobs in the middle of skill and wage distributions are easily replaced by technology, also provides a convincing explanation for the erosion of the middle class. Some point to educational attainment as the reason why wages have decreased, arguing that US workers' skills haven't kept up with technological needs. This view is perhaps best articulated by the statement that workers in America are being paid what they're worth. Between 1960 and 1980, the rate of growth in the college-educated population fell by almost 60 percent, and between 1980 and 2005, it fell from 3.9 percent a year to 2.3 percent per year.<sup>7</sup> In short, higher economic returns to education and technological innovations have clustered around a narrow band of high earners.

But there are other institutional and political explanations for wage stagnation in America. Many have pointed to the almost perfect correlative link between union membership in the United States and the share of income going to the middle class.<sup>8</sup> Unions require contracts to include compensation adjustments for productivity and cost of living—requirements that played a key role in preserving American workers' quality of life. Unionization offers an institutional counter to neoliberal forces, pushing wages up in labor-intensive industries. In 1953, union density reached its peak, and it has been on the decline ever since. In 2010, public sector union members outnumbered private sector union members for the first time.<sup>9</sup> But by 2004, the US manufacturing sector lost 44 percent of the 22 million jobs it had during its 1979 postwar peak, falling from 23 percent of the labor force makeup to just 13 percent.<sup>10</sup> To further add to the problem, the service sectors that have grown to replace manufacturing employment simply haven't supported previous levels of unionization.



Though nearly all industrialized democracies saw an increase in wage inequality in the 1970s and 1980s, few paralleled the US in magnitude.<sup>11</sup> Theoretical underpinnings of comparative political economy, namely the varieties of capitalism literature, outline how different national economic systems come into being. In particular, the literature outlines a typology with two ideal types: the coordinated market economic (best represented by Germany and Japan) and the liberal market economy (best represented by the United States). Examining these varieties of capitalism will help illustrate how the early industrial policy advocates' attempts to import the Japanese model of industrial policy to the US were ill fated from the outset.

## **1.2 Varieties of Capitalism**

The varieties of capitalism (VoC) literature places the firm at the center of political economic analysis. The central premise of the VoC argument is that a firm's capabilities are dependent on its ability to coordinate with other actors within the political economy, such as labor, the state, peak business associations, and other firms.<sup>12</sup> Williamson's work on transaction costs and incomplete contracts holds that a firm's success depends on how it resolves these coordination problems.<sup>13</sup> Further, the Knightian uncertainty principle suggests that cooperative dilemmas are endemic to political economies, and agreed upon standards resolving the distribution of investment risk are necessary for effective cooperation.<sup>14</sup>

Based on a set of institutional criteria for firms, Hall and Soskice organize national political economies into a typology with two ideal types: the liberal market economy (LME), and the coordinated market economy (CME). Put most simply, CMEs

are defined by strategic interaction among firms and other actors, supported by non-market institutions, whereas in LMEs firm behavior is determined by demand and supply conditions in competitive markets. CMEs depend on institutions that reduce uncertainty between actors and allow them to make credible commitments to one another. These institutions are more rare in LMEs. The literature suggests that such institutions require three elements: the exchange of information among actors, the monitoring of behavior among actors, and the sanctioning of those who defect from the established rules of the institution in question.

Within a nation, the set of institutions that govern the political economy depends on historical pathways. Path dependence in the social sciences has suffered at times from a lack of analytical rigor, and many iterations of the idea could be summarized with the phrase: “history matters.” Historical institutionalist path dependence, however, is the phenomena where particular courses of social action, once taken, are embedded in an institution and extremely difficult to reverse due to increasing returns to that institution.<sup>15</sup> Exiting or switching paths grows more costly over time, and these growing costs outweigh the benefit of switching from an inefficient or undesirable path to a “better” one. The most common example of such path-dependence is the QWERTY keyboard, which was designed to prevent letters often used consecutively from jamming on a typewriter. Since the transition from typewriters to personal computers it has been discovered that there are more efficient ways to structure keyboards. However, to do so would require society to re-learn how to type, which would impose greater costs on society than the benefits from the more efficient layout. This isn’t to say that switching paths is impossible or does not occur, but that path-setting moments are infrequent and

often only take place in a national political economy undergoing exogenous shocks such as wars or economic crises.<sup>16</sup>

The LME category, of which America is the emblematic case, depends on a set of path dependent institutions that prefigure how firms resolve organizational problems. The US system of corporate finance depends on capital markets, which encourage American managers to be attentive to quarterly earning reports and the price of their shares on equity markets, introducing a short-term bias into the system. These factors make firms more susceptible to hostile takeovers, and they make access to capital more volatile. As a result, firms in this system require more flexibility to cut costs to remain profitable.

American firms hire employees through an “at will” labor spot market, where employees are easily hired and fired. This model “resolves” the industrial relations problem by giving top management unilateral control over the firm and its employees. As a consequence, managerial independence leads to anemic union density, as managers are hostile and unsympathetic towards labor. This independence also leads to fragmented employer associations due to intense managerial competition. The lack of strong unions and strong peak business associations in the US makes it difficult for American firms to practice the strategic interaction of CME systems.

Furthermore, American firms support general skills training because they have fluid labor markets. Firms have little incentive to support industry-specific training because there are no institutions guaranteeing that a firm in the same industry won't poach a trained employee, whose training represents an investment on the part of a firm. On the flip side, employees have incentives to cultivate general skills as opposed to industry-specific skills because they have no assurances they won't be fired.

Incentivizing general skills training makes certain production practices that depend on technical and vocational training, such as advanced manufacturing, less feasible.

Inter-firm relations within America are heavily dependent on legally enforceable formal contracts. Business associations in America are weak, partially due to antitrust policies that limit the amount they can coordinate. This makes relational contracts outside of the formal legal system difficult to achieve due to a lack of the three necessary attributes of a coordinating institution (information sharing, behavior monitoring, and defector sanctioning). Sensitivity to profit fluctuation and general market volatility also makes stable relational contracts difficult in the US. Moreover, technology transfer, which is key to productivity, takes place through employee exchange and fluid labor markets, as opposed to the voluntary information sharing practiced in CME systems.

Hall and Soskice note that the typological clustering of different national political economies indicates the presence of what they call “institutional complementarities,”<sup>17</sup> or institutions where the presence or improvement of one increases returns to another. For example, in CME systems, long-term employment is more viable because capital is provided to firms with long-term time horizons. These complimentary form a sort of web of increasing returns between institutions, leading to nations clustering on two poles.

In general, CMEs are more likely to invest in specific or co-specific assets, i.e. assets that cannot be easily repurposed and generally require strategic coordination with other actors. LMEs, in general, favor switchable assets, i.e. assets that are easily repurposed. CMEs are more favorable towards incremental innovations in production, which are generally smaller scale improvements in existing production systems. LMEs, on the other hand, favor radical innovations, which usually involve the invention of a new

good or technology. Finally, CMEs incentivize “high-road” skills and industries dependent on higher levels of expertise and technology diffusion, whereas LMEs incentivize “low-road” skillsets and greater workforce skill polarization between the high and low-skilled.

Due to this clustering in functions, Hall and Soskice posit that different national political economies are better suited for different roles. This logic holds that LMEs are better at inventing new technologies and technological processes, and CMEs are better at producing high-technology products at scale. Correspondingly, Hall and Soskice suggest that the set of policies available to governments may depend greatly on their pre-determined institutional path. Nations should seek to leverage the roles their political economy is best positioned to fill. In the US case, this means that the government should focus on “blunt instruments” to facilitate economic growth, such as deregulation, regional development schemes, tax incentives, vocational programs to enhance skill development, and research subsidies.

Many industrial policy advocates today take issue with the claim that the LME model, which corresponds with the neoliberal world regime, has a natural place in the global political economy. There are enduring concerns about the consequences of pursuing “low-road” development strategies in the United States. An entire economy specializing in radical innovation will distribute the gains of technological change to a smaller band of the workforce, contributing to wealth and income inequality, as has been the case in the US. When the problems of wage stagnation, global competition, and deindustrialization were identified in the 1970s, there was a concerted effort by a group of policymakers to push the US away from what is now known as the LME model

towards the CME model. Their efforts, though laudable and well intentioned, deteriorated over the course of the crisis of the 1970s and 1980s, allowing neoliberalism to embed itself deeper into the nation's economic system.

### **1.3 Industrial Policy Emerges as an Idea**

“You can feel America's eroding status in your bones,” wrote the editors of *Business Week* in 1980.<sup>18</sup> With unemployment and inflation rates high, and with manufacturing communities crumbling, America was in crisis. Political economists have long noted the pivotal role of crises in initiating policy change.<sup>19</sup> During the 1970s, the emergence of stagflation, the simultaneous crisis of inflation and unemployment, undermined the prevailing consensus around the Phillips curve tradeoff between inflation and unemployment. In the subsequent competition in the marketplace of economic ideas prompted by this failure of economic theory, it is generally acknowledged that neoliberalism emerged as the victor in global and US economic policy circles, marked by the electoral success of the regimes of Margaret Thatcher and Ronald Reagan in 1979 and 1980, respectively.<sup>20</sup> But neoliberalism was not the only theoretical framework present in the post-crisis struggle to form a new working economic theory.

Industrial policy, in its broadest conception, is the microeconomic intervention of the government in the economy to spur growth, usually by promoting innovation and targeting specific industries to enhance their competitiveness. Some have argued that the mere presence of microinterventions, such as subsidies and tax breaks for businesses or sectors, constitutes a national industrial policy. This is not always the case. Any set of microeconomic or sectoral state interventions in the economy does not necessarily

constitute an industrial policy if that set of policies is not coordinated to achieve a coherent objective. In *Minding America's Business*, Robert Reich and Ira Magaziner's 1982 book on the subject, the authors defined the objectives that a US industrial policy should pursue: it should integrate the set of targeted government policies—"procurement, research and development, trade, antitrust, tax credits, and subsidies"—into an organized strategy for "encouraging the development of internationally competitive businesses" and for guiding capital and labor towards sectors and industries that have the greatest value added per employee.<sup>21</sup>

In *Minding America's Business*, Reich and Magaziner noted that in the 1970s America witnessed a precipitous decline in its ability to generate private wealth. They wrote that between 1950 and 1960, American real median family income increased 37.6 percent, and between 1960 and 1970 there was an increase of 33.9 percent. But between 1970 and 1979, it increased 6.7 percent, and in 1980, it decreased 5.5 percent.<sup>22</sup> It appeared that the US just wasn't as productive as other nations that were producing the same goods, and as a consequence, the US was generating less income.<sup>23</sup>

In 1983, Barry Bluestone and Bennett Harrison looked to render an understanding of the social costs caused by the industrial transformation taking place in the US. Instead of trying to capture a numerical representation of the jobs moving from manufacturing hubs to service industries, they examined the communities that were left behind by executive boardroom decisions to abandon factories. After abandonment, many former workers had lowered lifelong incomes, especially older workers. Pensions were lost. Fired employees' savings were spent in search for new jobs. People suffered from the mental and physical hardships that come with being unemployed. Excess infrastructure

lay in disrepair. Municipal and state revenues fell. The jobs of these industrial hubs moved to the Sunbelt, largely due to the attraction of state-level “right to work” laws that made effective unionization difficult in those states. Unsurprisingly, these jobs paid lower wages and provided worse job security.<sup>24</sup> This was the “low-road” endemic to the US system. “Displaced blue-collar factory workers are not about to be retrained for the service jobs inside their companies,” said Bluestone in a 1984 debate on the subject that was reported in the *Washington Post*. “They're not going to become managers, accountants, lawyers, engineers or clerical workers. The dislocation problem is much greater than one would believe.”<sup>25</sup>

Some argued that these costs were the natural result of Shumpeterian cycles, and that the nation still retained its industrial base. There was no cause for alarm, argued Brookings’ Robert Z Lawrence.<sup>26</sup> The lack of job generation from manufacturing, Lawrence out forth, was more than compensated for by the economy’s shift to services. While the growth of service industry employment undermined the ability of low-skill workers to acquire the wages and the standard of living they expected, these problems would solve themselves. Markets would adjust. Wage growth would catch up with productivity. History, however, would prove these assertions wrong.

As industrial policy accumulated its partisans in the US intellectual arena, there was a complicated struggle to define what exactly an American industrial policy would entail. As one commentator noted, “[industrial policy] and ‘reindustrialization’ have become shorthand to express a need to deal with an almost panoramic set of problems in search of a definition.”<sup>27</sup> Many initially looked to the developmental states of Asia for a model, and talk of the “Japanese Miracle” penetrated the cultural imagination. When



John F. Kennedy was elected president, 30 percent of Japanese goods imported to America were non-durable textiles and apparel. By 1979, only 10 of exported goods were textiles and apparel. During this transformation, Japan averaged annual growth rates of 9 to 10 percent, overtaking Great Britain's second place spot in world industrial good production.<sup>28</sup> Japan bested the US the areas of semiconductors, computers, and telecommunications, if not as innovators, then in the systems that produce and market products.<sup>29</sup> Philip Caldwell, the chairman of Ford Motors, complained that "in the auto industry, individual US companies are competing against Japan as a country."<sup>30</sup>

But what was the recipe for Japan's industrial policy? In terms of specific policy instruments, Japan's government chiefly leveraged targeted tax breaks for industries of the future. They also ensured an equal allocation of burdens among economic actors during downturns, gave aid and oversight to restructure declining industries, and provided assistance to facilitate commercialization and sales. The key to Japan's success, however, wasn't just in the specific policies they employed. It was in the institutional structure of the CME model to which it belonged.

Japanese businesses enjoyed "patient" capital in the form of financial loans due to closer ties between Japanese banks and industry, which promoted greater information sharing and trust between creditors and debtors. This contrasts with the short-term financial reports of the US system of capital-markets. Patient capital gave Japanese management the freedom to pursue full employment, increased productivity, expansion of market share, cost reduction, and long-term innovation.<sup>31</sup> Japan also accumulated high levels of saving and investment through the postal system, which was then concentrated in government accounts and invested by bureaucrats.<sup>32</sup>

The Japanese *kieretsu*, which were tightly connected vertical industry conglomerates organized around a central bank, heavily mediated the patterns of skill acquisition and technology transfer in the Japanese economy. Employees were encouraged to invest in firm or sector-specific skills by offers of lifetime employment, thus assuring them their investment would retain its value.<sup>33</sup> Labor-management relations were non-adversarial. This was reflected by high levels of lifetime employment, as well as “flatter” wage distributions than in the US. With inclusive employment policies for the infirm, disabled, and undereducated, these factors minimized calls for welfare policies.<sup>34</sup> This non-adversarial relationship facilitated easier adjustment out of declining industries into new ones, in contrast to the US practice of abandoning factories and the communities that depended on them.

In terms of administrative structure, Japan’s developmental efforts were conducted and overseen by a single centralized pilot organization, the Ministry of International Trade and Industry (MITI). The success of MITI depended in large part on an elite and highly effective bureaucratic staff,<sup>35</sup> where each vertical bureau had a corresponding trade organization organized by sector.<sup>36</sup> Essentially, MITI’s goal was to place the strongest possible companies in competition.<sup>37</sup> The *kieretsu* system translated into a comparative institutional advantage towards large-scale production of high-value and high-technology goods—in short,<sup>38</sup> the prototypical example of Hall and Soskice’s CME model.

Reich, arguably the most vocal advocate of industrial policy in the United States at the time, lauded the supply of patient capital available to Japanese companies.<sup>39</sup> While Japan was retooling its industrial complex, US firms were failing to reinvest in their

aging capital stock due to the short-term costs involved. Reich saw the importance of “high-value niches” of “skill intensive products and processes.” Higher value added per employee and more exports of high-technology products in growing industries would be key to restoring the wage growth and standard of living to which the average American worker had become accustomed. He called for enhanced training opportunities and stable job security. If Reich had his way, “‘the era of human capital’ would arrive, in which America’s assets would be cooperation, collective effort, and strategic approaches to decision making.” For Reich, “[e]quity would be the pathway to efficiency, not what must be traded off to achieve it.”<sup>40</sup> Notably, Reich’s emphasis on “cooperation” and “strategic” action closely maps onto Hall and Soskice’s definition of the CME model of capitalism.

In specific terms, Reich called for employment vouchers to compensate workers for the costs of retraining, hoping to promote human capital investments. He called for tax reform to discourage short-termism. He derided “paper entrepreneurialism,” which described the financial and legal rent-seeking practices that have little if any productive value. Regional public development banks seemed necessary to replace the multilayered development efforts at local, state, and federal levels. Finally, he advocated for a national pilot institution tasked with coordinating all these programs, allocating capital, and advising elected officials on the nation’s developmental outlook.

Reich was pioneering an institutionalism of the same color as the VoC theorists which holds that the modern economic system, as it exists, is so distorted by large organizations such as corporations, unions, and governments, that the rules of classical economics are no longer applicable. Institutionalism, in a sense, is a reincorporation of

sociology into the economic discipline. If economics is the study of how people make choices and sociology is the study of how people have no choices to make, institutionalism favors the latter. There was no such thing as the “free market,” as all markets are created and sustained by their governments and the interest groups that influence them—that fact was inevitable. The problem facing nations, then, was to decide *what kind* of markets they wanted to build.

The problem facing Reich was that from an institutionalist perspective Japan’s success depended on many other factors that were difficult, maybe impossible, to replicate: high levels of cooperation between the state and business and social cohesion at least in part due to cultural homogeneity. Both of these factors helped Japan form a national consensus around the goal of development. The CME model in Japan evolved from a long list of historical happenings. Trying to push the American government to build a new kind of market would require the neutralization of a great deal of institutional “lock in” pre-determined by America’s unique history and constitution.

In Japan, the ability to cooperate was both actively cultivated and the natural product of a specific path.<sup>41</sup> The Japanese developed their coordinating capacity largely as a strategy to survive the wars and economic hardships of the 1940s, which forced them to pursue an almost single-minded economic mobilization effort well into the 1960s. The highly effective *kieretsu* conglomerates of Japan were a permutation of the *zaibatsu* industrial cartels that were dismantled under the US occupation. Further, the cooperation inherent to the Japanese model was only possible because of the deep “old boy” networks between business and government officials that, contrary to those in the US, existed because most Japanese businessmen were former bureaucrats. The Japanese cultivated

their bureaucracy as a strict meritocracy, and unlike in the US, to hold a ministry position was the most prestigious occupation in the country.<sup>42</sup>

In terms of political institutions, the Japanese parliament, unlike Congress, is one of the weakest legislative bodies among all advanced industrial democracies. Moreover, at the time the industrial policy question was being litigated in the US, a single party had controlled the Japanese government since 1948. And the Japanese legal system relied far more on bureaucratic competition than formal contracts.<sup>43</sup> Like Hall and Soskice, an American spectator of Japan noted that without the same cultural consensus around developmental goals, the US might be better off focusing on the “blunt” instruments designed to unleash market forces—tax incentives, support for training, and R&D—instead of attempting to mimic the sectoral targeting Japan had mastered.<sup>44</sup>

The American path bared a greater resemblance to the United Kingdom, a fellow member of the LME category, than it did to Japan. America has a cultural and institutional tradition of a “weak state”: constitutional restraints such as federalism, checks and balances, and the separation of powers; and cultural affinities for limited government, the rule of law, and laissez-faire.<sup>45</sup> The US has a noticeable lack of cooperative linkages between government and industry and often an adversarial relationship between the two. The US is also known for a civil service with little industrial experience.<sup>46</sup> Put another way, “political sociology’s conventional wisdom suggests that American state structure is better suited to inchoate, misguided bailouts characterized by political graft than to coherent, disinterested planning on the Japanese model.”<sup>47</sup>

These facts presented difficult obstacles to industrial policy's advocates. But the immediate economic problems remained. Lester Thurow commented that the "US is now developing a horribly inefficient set of industrial policies based on congressional investment banking."<sup>48</sup> These industrial policies hardly constituted a coherent, goal-driven industrial policy along Reich's definition. Advocates in the US faced the same central problem that Japan had solved: how to mobilize government resources towards development goals without being captured by rent seekers.<sup>49</sup> In industrial policy programs that involve sector targeting, the mechanism that dictates how that targeting is conducted, i.e. who receives capital, is what differentiates one industrial policy system from another. This is often referred to in the literature as the problem of "embedded autonomy," or how the state retains close enough ties to or remains "embedded" with industry in order to cooperate, while also remaining "autonomous" enough to resist rent seeking and cronyism.<sup>50</sup>

Some in Congress proposed a federal development bank with a mandate to invest in growth industries and help struggling industries restructure, but there were concerns a bank would be "dollars in search of a problem." There were talks of a tripartite (business, labor, government) forum, which would execute consensus building. Others suggested an executive branch council that would operate in an advisory and analytical role to Congress the president.<sup>51</sup>

Talk eventually turned to the Defense Advanced Research Projects Agency, the agency in American government already conducting industrial policy for the military. DARPA would go on to play a role as the model for key programs that would later evolve in a decentralized, piecemeal, and unacknowledged fashion to serve the goals of

technology development and commercialization. But no industrial policy along the lines of Reich and Magaziner's vision ever came to fruition. Though the programmatic obstacles in the way of an industrial policy regime the US were high, they were only relevant to well-meaning skeptics who sought to engage with idea of global competitiveness. Industrial policy, which was quickly labeled as “picking winners and losers” in the economy by its political opponents, was to do political combat with Ronald Reagan and the Republican's neoliberal vision—a formidable opponent.

#### **1.4 The Politics of Industrial Policy**

Industrial policy's advocates knew at the time that were they to succeed they had to recruit a set of political institutions and interest groups to support their effort. Political economists have paid a great deal of attention to the relationship between ideas and institutions,<sup>52</sup> as American history is full of examples of solutions waiting for problems to solve. Policies and their ideational frameworks need to be linked to interests, groups, and institutions in order to take form, and policy goals need to be tied to individual interests that can drive their execution. Neoliberalism, as an economic idea, was able to recruit a corresponding political movement—a political party, its constituent coalitions. For neoliberalism, institutions were able to map onto a set of ideas successfully. The ideas behind the industrial policy framework, however, failed to engage such a broad coalition of stakeholders.

American organized labor was possibly the foremost contender as a political institution to champion industrial policy. But labor unions in the US were on a steep decline in the 1970s, bleeding membership as firms re-located to the anti-union Sunbelt

with its right-to-work laws and lower labor costs. In 1975, 23 percent of non-agricultural workers in the US were union members, down from 33 percent in the mid-1950s.<sup>53</sup> In the South, union membership was only 10 percent. Moreover, the types of jobs in the country were changing. From 1950 to 1971, goods-related workers declined from 49.8% to 38% of the workforce, whereas service workers, including government employees, increased from 50.2 percent to 62 percent.<sup>54</sup>

During the same period of labor union decline, the Democratic Party became fractured as the activist New Left coalition, which was focused on issues of procedural justice and international affairs, mobilized in protest to Watergate, the Vietnam War, and traditional Democratic policies that were widely denounced as being complicit in corporate liberalism. Trust in national institutions declined dramatically. The people who constituted this group grew up during the post-war period of wage growth, they faced no pressure to demand compensatory policies that would serve their personal economic interests. This activist wing of the party was disgusted by “calculation, self-interest,[and] compromise.” They valued “morality, selflessness, [and] confrontation.”<sup>55</sup> Stein writes that “they [the reformers] pursued the public good, not a plurality of interest groups.”<sup>56</sup> The value system constructed by this key stakeholder group within the Democratic Party was at direct odds with US labor. Political activists “omitted labor from their coalitions, believing that unions had done their work in raising the standard of living but now were a conservative force in US politics.”<sup>57</sup>

Perhaps the most telling moment in the decline of US unions was when President Carter failed to push a labor bill through Congress that would make it easier for workers to unionize nationwide and bolster union strength. Carter was less than enthusiastic in his



support for labor, as he “did not consider that labor reform could help both him and the Democratic Party in the South. Carter viewed the law as a special legislation for labor, something a Democratic president was obliged to support.”<sup>58</sup> While the President supported the bill on its face, he did not push to “twist arms or woo [the bill’s] opponents.”<sup>59</sup> Furthermore, Carter retreated from his earlier-held position supporting the Humphrey-Hawkins Act and its guarantee of a full employment policy, which would have made an entitlement to employment. Instead, by 1977 Carter supported a scaled back version of the bill that included anti-inflationary measures.<sup>60</sup> The President’s reluctance to put all his political capital behind labor contrasted sharply with his dedication to the Panama canal treaty negotiations. In a way, he shared the New Left’s attraction issues of international justice and their distain for compensatory practices.<sup>61</sup> But in the American system, transactional politics are often the only effective way to govern. The labor bill failed, and with it, the Democratic Party’s best hope to sustain the one of its key constituent blocs.

At first, industrial policy was notably encouraged by “heads of corporations and unions...” guided by a “centrist agreement among involved elites from capital, labor, politics and the Academy.”<sup>62</sup> Whether or not such a consensus could possibly hold on its own in the polarizing years of the Reagan administration, conservative resistance quickly abolished it. Many saw the nation’s economic woes as being caused by inflation, which was being attributed to the activist state. Industrial policy was quickly framed in the traditional positive state intervention terms. Such a framing guaranteed mobilized opposition by those clinging to the American tradition of negative liberty from government intervention in the economy.

In Japan, the state and the economy were not separate entities but inextricably co-linked. One expert wrote, “One clear lesson from the Japanese case is that the state needs the market and private enterprise needs the state; once both sides recognized this, cooperation was possible and high-speed growth occurred.”<sup>63</sup> Democratic presidential nominee Walter Mondale, who had at one point said that “[Industrial Policy] will do it for the Democrats,”<sup>64</sup> eventually backed away from the idea because it was framed in the age-old paradigm of tension between government and the market.

By the time the industrial policy debates took on rigor and urgency in the public forum in the 1980s, Ronald Reagan had already been elected president, and in many ways the post-stagflation struggle had already been decided. As Otis Graham Jr. notes: “Such innovations [as industrial policy], in the American setting, tend not to come without crisis. But no crisis came, or none was broadly perceived, in the Reagan years. If American industry was weakening and the overall economy with it, it was dying by a thousand cuts . . . in critical condition without a crisis.”<sup>65</sup> By the end of the 1980s, which had seen the concept of industrial policy warp into “industrial strategy,” and then a need for “competitiveness,” industrial policy had not only lost precise definition, but it had been openly shunned by those who stood as its most likely champions. Skepticism towards the idea grew among broad groups of previously friendly stakeholders. By 1984, business, academia, Democratic economists at the Brookings Institutions, the Democratic presidential nominee, and the House Democratic leadership all shunned industrial policy either in private or in public.

Arguably the greatest reason industrial policy failed to take hold was inaccessibility to the general public. As Graham writes: “This complex, many-versioned

idea with its awkward, conversation-chilling name was difficult to shape to the needs of electoral politics, where, unfortunately, its friends first wished to use it.”<sup>66</sup> This was particularly true when industrial policy was compared to its competitor, neoliberalism. The Laffer Curve, which illustrated the relationship between tax revenue and marginal tax rates as being parabolic, suggesting that a lower marginal tax rates would actually extract *more* revenue, could easily be drawn on a cocktail napkin by a Republican congressman. “Strategic sectoral intervention” hardly held rhetorical weight against the belief that government was the problem.

The public referendum on Ira Magaziner’s \$750 million Greenhouse Compact in Rhode Island was the most glaring evidence that industrial policy was not well suited to the politics of popular opinion. The proposed state compact involved strategic economic planning by consensus among labor, business, and government leaders to maximize competitiveness and growth.<sup>67</sup> The compact aimed to reduce capital flight indirectly through support for research, education, infrastructure, and workforce training.<sup>68</sup> It promoted traded sectors, it subsidized research and venture capital for growing high-tech products and industries, and it outlined plans to restructure declining industries to withstand competitive global forces.<sup>69</sup>

The compact was an attempt to construct a corporatist industrial policy in the United States, in which “representatives of a few select interest groups play a dominant role.”<sup>70</sup> Corporatism, which is often used interchangeably to describe CME models of capitalism, failed to take root in the United States is due in part to business and labor disorganization, which are largely the historical consequence of federalism and highly fragmented political institutions.<sup>71</sup> At its most basic level, corporatism requires

representatives from pluralist interest groups to bargain on behalf of those groups. This necessitates organizations representing various economic interests to exist in the first place. In the case of US labor, this wasn't an option. Further, corporatism is by its very nature undemocratic, and so it is hardly surprising that an explicitly corporatist plan did not carry well in a public referendum.

The public of Rhode Island overwhelmingly rejected the compact in a bond referendum in the state. Aversion to big government and opposition to giving unelected bureaucrats greater power drove the compact's failure. Silver and Burton establish through a survey analysis that the two main sources of public opposition were concern about tax increases and the undemocratic nature of the commission that would carry out the compact's policies.<sup>72</sup> The plan was opposed by some on both the right who supported laissez faire policies and some on the left who took procedural issue with its antidemocratic aspects. Economically marginal but politically powerful interest groups mobilized in opposition to the plan's commission due to a lack of representation.

Magaziner had pressed for the referendum, likely because a public endorsement of industrial policy would send positive signals to the business community about the state's serious development ambitions. More importantly, he thought, it would show the Democratic presidential candidates of 1984 that industrial policy could be popular and effective. His effort backfired. Indeed, many pointed to the failure of the Greenhouse Compact as evidence that the industrial policy debates had been lost.

## 1.5 Conclusion

The Rhode Island Compact was a notable proposed divergence from the post-war economic practices of the American states. After the growth of federal supremacy following the New Deal, many considered federalism a constitutional anachronism—a loophole for states to continue their legacies of white supremacy and racism. Corporate interests often found ways to drive wedges between competing states to compel a broader race to the bottom in wages, regulation, and quality control, as was the case in the 1970s. But as it became increasingly clear that the federal government was not going to adopt an explicit and coherent industrial policy agenda, a group of pioneering policymakers and advocates set out on the mission to transform the historically destructive role of the American states development policies into what they hoped would save their states economic well-beings. Indeed, the role of the states in responding to the forces of globalization would illustrate precisely the kind of flexibility and dispatch the country’s founders had imagined when they assigned to them through the 10<sup>th</sup> amendment those powers not explicitly delegated to the federal government.

At the federal level, the traditional narrative academic of industrial policy in the US is that it failed to take form. It is certainly true that industrial policy failed to take the form of Reich’s vision. The “era of human capital” did not come to America. The US did not develop a centralized bureaucratic structure capable of guiding the nation’s development policy agenda. America’s manufacturing hubs continued to deindustrialize, and the service sector continued to employ a growing slice of the American workforce.

But America’s new industrial policy—the positive intervention of the government in the microeconomy in the service of a coherent objective—was slowly coming into

being as a set of piecemeal programs, grown out of state-level efforts, that would play a key role in preserving America's role as the lead global technological innovator. This substrate of state and federal technology programs both grew organically in the context of neoliberalism and the American institutional setting, seeking to leverage America's political decentralization rather than change or ignore it.

In American political life, the states have always best represented America's contradiction between its government activist roots and its laissez faire ideology. This was especially apparent as a set of governors and their brain trusts tackled the problems of the 1970s with pragmatic goals. They hoped to maintain the prosperity the people of their states had enjoyed for the last three decades. The seeds of policy innovation these governors planted would ultimately grow into a multi-valence network of initiatives with roots in all levels of government—and when examines them critically, they appear to resemble the proposals of industrial policy's original advocates very closely.

# CHAPTER TWO

## A FEDERALIST INDUSTRIAL POLICY

### 2.1 “Rational Parochialism” and the American States

State and regional level economic development has a long history in the US. In 1791, the state of New Jersey incorporated Alexander Hamilton’s private company, the Society for Establishing Useful Manufacturers, as a tool for development policy. Hamilton’s society, armed with state tax exemptions, control over Northern New Jersey’s water supply, and the power to condemn property for its own use, founded the nation’s first industrial park.<sup>1</sup> But during the 20<sup>th</sup> century, up until the 1970s, state-level economic development programs mostly consisted of tax incentives designed to recruit firms from other states. The theoretical justifications, or practical motivations, for that intervention vary widely. However, state and local governments, particularly in the West and the South, engaged in the harmful practice of poaching firms from other parts of the country with incentives that collectively made up a state’s “business-climate.”

In his book, *The Last Entrepreneurs: America’s Regional Wars for Jobs and Dollars*, Robert Goodman argues that the competitive process of states subsidizing costs for business in order to attract firms hurts tax payers who ultimately foot the bill.<sup>2</sup> In 1981, state-administered development programs allocated almost \$19.8 billion,<sup>3</sup> but those monies were rarely allocated strategically toward specific industries, high-tech firms,

minority firms, or distressed regions.<sup>4</sup> In the 1980s, the total sum of corporate incentives offered by the 50 states reached \$300 billion by mid-decade.<sup>5</sup>

The proliferation of “rational parochialism,” the practice of state politicians and administrators pursuing firms in order to attract jobs to their own state, had manifold deleterious effects in the national economy,<sup>6</sup> but it was hardly a new phenomenon. As Graham writes: “in the 1920s and 1930s . . . in the South especially but not exclusively, the idea dawned that state (and local) governments could produce or appear to produce jobs by luring them in from the outside.”<sup>7</sup>

Such tactics dominated state-level development policy throughout the 20<sup>th</sup> century. South Carolina enacted a Balance Agriculture with Industry plan in 1935, which was followed by the creation of state economic development agencies in the southern states by 1943. These agencies gave out subsidies to businesses through local bond financing for land and buildings, loans, tax-exempt bond financing, and tax off-sets. And almost always, these states took great effort to assure businesses that their local labor community was anti-union.<sup>8</sup>

These practices perhaps peaked in the 1970s when the South and West aimed to take advantage of the globalizing pressures facing panicking firms in the industrial Northeast. As a response to the economic slowdown and industrial decline of the 1970s, an “intensification of regional economic rivalries as components of a more footloose industrial apparatus began to migrate toward the Sunbelt.”<sup>9</sup> Moreover, in the 1970s, the West and the South contained 47 percent of all manufacturing jobs, an increase from 28 percent in 1950.<sup>10</sup> These jobs had been lured away with promises of friendly “business climates.”



Motivating states to engage in policy practices that result in net-positive economic growth and job creation is a challenging task. There is a collective action problem inherent to industrial policy among American states, as spillover effects between and among states provides an incentive for states to reduce development expenditures relative to their neighbors, leading to a race-to-the-bottom in regulatory standards.<sup>11</sup> Moreover, greater deregulation was attractive to capitalists seeking lower costs. As one scholar of state economic development practices notes, “attracting the rare major employer from another place seems to pay enormous dividends.”<sup>12</sup>

Federalism also served as a key tool to fracture and dismantle unions, which as has been noted kept wages low. Due to the Taft-Hartley 1947 amendments to federal labor law, states were allowed to enact “right to work” laws, which prevented unions from entering into agreements with employers that spread the costs of unionization to all represented employees.<sup>13</sup> Collective bargaining agreements could not then require membership, and non-members were not required to pay union dues. Yet unions were required to represent the entire workforce, even non-members, who then essentially get a free ride. Today, twenty-six states currently have right to work laws, mostly in the South and West, and their enactment has essentially dismantled organized labor in the United States.<sup>14</sup> The South in particular was able to attract industry with a development strategy focused around low-wage, labor intensive industries.<sup>15</sup> But these zero-sum recruitment strategies perpetuating the cycle of “low-road” development soon became just one element in state-level economic development. In the 1970s, while southern and western states were luring manufacturing jobs with their cheap labor, governors scrambled to find ways to grow new jobs to replace the ones they’d just lost.

## 2.2 The Entrepreneurial State

James Bryce, while touring America, learned from the reports on state government by Albert Shaw at Johns Hopkins that America wasn't the paragon of laissez faire that it had advertised itself to be.<sup>16</sup> It was Shaw who said that "[t]he average American has an unequalled capacity for the entertainment of legal fictions and kindred delusions," living "in one world of theory and in another world of practice." He made the bright observation that this contradiction was "the true genius of social and political life in the American provinces."<sup>17</sup> Similarly Bryce saw state policymakers forging their professed loyalty to Adam Smith as "unconscious philosophers' making a new political economy by daily actions."<sup>18</sup> In the American system, these "unconscious philosophers" are the vanguards at the forefront of the battle for economic productivity.

As they were assaulted by the challenges of the 1970s, state development policymakers recognized the need to develop innovative strategies aimed at more than lure mobile capital away from other states. There was a growing understanding that poaching firms was creating a net-negative outcome in terms of productivity. And more importantly, internally rooted, homegrown innovation became a tool for superior growth and more jobs. As one commentator writes: "beggar-thy-neighbor state economic development game practiced by states competing for the location of new plants has been criticized as ineffective in the long term and inefficient in both the short and long terms."<sup>19</sup>

With the emergence of the new self-designation of states as productivity enhancers, there came a renewed focus on supporting small, innovative firms, often in

high-technology industries. Policymakers began to realize that generating new jobs reversed the process of stagnation into growth, and that small, young companies created those badly needed new jobs. As one policymaker put it, “jobs did not migrate into a region; they were born there, in small, start-up ventures!”<sup>20</sup> These realizations would foreshadow the policy strategies of the 21<sup>st</sup> century. Policymakers at the state level were championing what is widely acknowledged today, that “tomorrow’s industries would be R&D and knowledge-intensive, with global linkages, and thus attracted only to those states whose governments were dedicated to strong educational systems, infrastructure, and public services.”<sup>21</sup>

In the 1980s, states created well over 100 public investment funds. Half the states had public venture capital funds, and others invested public money to create private financial institutions. Forty states created programs to stimulate technological innovation, which by the end of the decade numbered about 200. Tripartite corporatist business labor government boards proliferated.<sup>22</sup> State level observers identified the same problems as Reich and his allies: a poorly trained workforce, adversarial labor-management relations, a lack of patient capital, and an inability of corporations to commercialize new innovative technologies.<sup>23</sup> And while the Reagan administration was winning the conversation about the government’s role in the economy, in the states, governors—both Republican and Democrat—began to embrace “an unprecedented role as economic activists.”<sup>24</sup>

## 2.3 A Tale of Four States

### Massachusetts

“If you follow innovation [in development policy] geographically,” said Bob Friedman, a consultant to economic development agencies during the 1980s, “it does track where the shoe started pinching. It started in New England, which first felt the impact of our entry into a global economy.”<sup>25</sup> In the early 1970s, Massachusetts was particularly devastated by the national slowdown in economic growth. From 1967 to 1972 the state lost more than 112,000 manufacturing jobs. By 1974 the state deficit had run up to over \$350 million. Unemployment peaked at 11.2 percent.<sup>26</sup> In 1975, newly elected Governor Michael Dukakis pulled together a “Development Cabinet.” He planned to use this cabinet as the bureaucratic center of his revitalization efforts. He put Frank Keefe, a bright-eyed 28-year-old planning director from Lowell, MA in charge. Every state agency was to give priority to the development agency—transportation, housing, job training, and education.<sup>27</sup>

This new Development Cabinet pioneered new state economic development practices designed to grow jobs at home. Howard Smith, the administration’s secretary of economic affairs, said smokestack chasing was “mostly showboating. In truth, jobs are homegrown. You grow them by nurturing your own firms, watering them, fertilizing them.”<sup>28</sup> The governor’s team endorsed the concept of community development finance corporations, “third-sector” non-profit institutions with the policy perspective of government but the market orientation of business. They created a one of these corporations to fill capital gaps in urban centers where businesses were nervous to invest. The administration then turned to an identified problem facing small businesses: a lack of

patient capital in the region. Start-ups in the region were having trouble acquiring long-term loans. The venture capital (VC) market for young, growing firms was dried up. To replenish the state's supply of patient capital, the administration created the Massachusetts Technology Development Corporation (MTDC) to provide seed-stage venture capital to new technology companies. Some originally wanted a pilot organization, the Massachusetts Industrial Development Authority, to oversee all the state's development projects, not unlike Japan's MITI.<sup>29</sup>

This was, without a doubt, industrial policy. The government of Massachusetts was providing patient capital where business wouldn't or couldn't do so, and it wanted to engage in economic planning through a centralized pilot agency. While the pilot agency never came to fruition, the capital did. The state's venture fund invested in companies that couldn't get access to private venture capital loans because their concepts were not close enough to commercialization. Private VCs would then piggyback on the state's work and invest in companies the program vetted. A bipartite board of government and business representatives (no labor) ran the fund.

Dukakis also set out to create new public-private partnerships to subsidize private-sector risk taking in under-capitalized markets. The administration made a deal with the state's life insurance industry investment funds to direct \$100 million in a new Massachusetts Capital Resource Company (MCRC). This new company was required to meet certain investment quotas, such as number of jobs created, geographic location of investments, minority owned investees, etc. In exchange, the administration gave the industry a tax cut. The goal of the MCRC was to push private capital to invest in riskier geographic areas that would have greater benefits than captured by market prices. By

1986, this public-private partnership had loaned \$140 million to more than one hundred companies, creating at least eight thousand jobs, not including any multiplier effects.<sup>30</sup>

While these programs were being implemented, joblessness fell from over 12 percent in 1975 to 4 percent in 1985.<sup>31</sup> High-tech jobs in the state increased by 47.4 percent from 1975 to 1983.<sup>32</sup> Many observers accredited this success to the state's activist policies. Subnational development experts from all around the country looked to copy the secrets of the "Massachusetts miracle." It is difficult to prove causality between such results, and it seems unlikely Dukakis' policies might have had such an effect on the economy in so short a time. The state's legacy of high-technology industries, universities, and research institutions likely planted the seeds for the state's growth far before Dukakis was elected.<sup>33</sup> Either way, the time of the "miracle" overlapped directly with Dukakis' economic program, and as a result, policymakers looked to copy it.

Meanwhile, in 1979, MIT economist David Birch wrote a study examining where jobs were being generated America. He found that 52 percent of all new jobs were created in independent firms with twenty or fewer workers, and 80 percent of all new jobs were created by firms four years or younger. The main finding of the study, however, was that small technological innovators were overwhelming the firms creating these new jobs. The results of Birch's study were copied and forward across the country to policymakers in virtually every state. "There's a network of a thousand people out there who care vitally about this," said Birch. "And they started copying this thing—I mean, there must have been ten thousand copies of those original texts. It was very embarrassing, because it was full of typos. It was just a rough draft."<sup>34</sup>

The study found its way into the hands of Michael Barker, a twenty-six-year-old planner who worked for Keefe, the director of planning under Dukakis. Barker then left the administration and went to Washington to work for the Council of State Planning Agencies in Washington, part of the National Governor's Association Center for Best Practices. He had his team incorporate Birch's study into his own report in Washington, which would become, essentially, a new thesis of state-level economic development. This new vision argued that smokestack chasing was a waste of time and did little to generate new jobs. The goal of state development policy should be to stimulate technological innovation, particularly in new and small businesses. He outlined the policy instruments to achieve that goal: R&D; directing capital towards small, innovative firms; and high-tech training. He discussed the programs from Dukakis' administration at length, and his work spread.

One of Barker's followers, economist Michael Kieshnick, did a study on the futility of smokestack chasing that ended up on the front page of the *New York Times*. Kieshnick soon found his way into Governor Jerry Brown's cabinet in 1980 as the director of California's Office Economic Development. And so, the moving frontier in state development policy moved out West.<sup>35</sup>

## **California**

In 1981, the national recession hit California. In 1982, over 4,000 businesses closed and 1.3 million workers were unemployed. Unemployment peaked at 9.7 percent. Returning to the state from his failed 1980 bid for president, Governor Jerry Brown directed attention to the demonstrated importance of R&D, of a skilled workforce, and of

energy efficiency in cultivating a strong engine. He called for new forms of cooperation between government, business, and labor.<sup>36</sup> Strategic sectoral intervention was on the agenda to fix the state's economy.<sup>37</sup>

Brown's administration identified that "too often business remains ignorant of research advances at universities, and academic researchers remain ignorant of business needs."<sup>38</sup> To address this problem, the Governor signed into law California's Microelectronics Innovation and Computer Research Opportunities (MICRO) program, which quickly became a model what would soon grow into the nation's technology-based industrial policy. MICRO was designed to bridge the gap between business, universities, and government by matching one-to-one any business grant made by a California business to a University of California faculty member.<sup>39</sup> The program successfully leveraged its relatively small budget of \$4.4 million to generate \$7.5 million in corporate grants.

Furthermore, Brown created a California Commission on Industrial Innovation, which included financiers, labor, and high-tech business representatives (including Steve Jobs of Apple).<sup>40</sup> "We went through the whole industrial policy debate two years before they did in Washington," said Allison Thomas, the commission's staff director.<sup>41</sup> The commission issued a 1982 report titled "Winning Technologies: A New Industrial Strategy for California and the Nation," in which it was argued that the government should fill capital gaps in the US innovation system.<sup>42</sup> The state created a seed-stage venture capital fund for small tech firms, modeled off the Massachusetts Technology Development Corporation. Brown eventually sponsored the first National Governors Association task force and conference on technology innovation, and his staff put



together the first National Governor's Association book cataloging all the state efforts to spur technological innovation. Hundreds of copies were sent out to governor's offices across the country.<sup>43</sup>

By 1984, unemployment in California dropped to 7.7 percent. The recovery was led by aerospace and high-tech manufacturing,<sup>44</sup> Soon, multitudes of states had their own technology development programs. Governor Hugh Carey's cabinet in New York created their own set of similar technology programs, as did the Republican governors of Michigan, Pennsylvania and Indiana. "With Reagan's coming, with the cutbacks in federal programs, and with the severe recession, a lot of states were hurting," said William Schweke, an expert on state economic development agencies during the 1980s. "Given how politics works, I don't think a governor in that kind of situation could afford to say 'Hey, the market will take care of it, we're just going to wait.'"<sup>45</sup>

## **Pennsylvania**

In 1984, Pennsylvania had four universities among the nation's top 50 graduate research institutions, with specialists in advanced manufacturing, electronics, robots, computer science, and advanced materials. It produced more engineering degrees than all but two other states. It ranked fifth among states in its number of science and engineer degrees, its number of people working in high-technology sectors, and its R&D outlays.<sup>46</sup> And yet, the state was experiencing debilitating economic stagnation. Between 1979 and 1985, 21.5 percent of all manufacturing jobs in the state disappeared. Unemployment peaked at 14.9 percent.<sup>47</sup> Academia and business had not coupled to produce the kind of success seen in Massachusetts or California.

In 1983, Richard Thornburgh, Pennsylvania's Republican governor created a program called the Ben Franklin Partnership. Its purpose was to create a more entrepreneurial economy, principally by stimulating the commercialization of academic research.<sup>48</sup> Thornburgh, widely perceived as a hardened Reaganite, embraced an activist development policy. What he created became "perhaps the best economic development system in the country."<sup>49</sup>

With the Ben Franklin Partnership, modeled and expanded off California's MICRO program, the state matched business grants going to university faculty, seeking to establish greater networks between industry and academia. Four centers were set up, each at a major university, and state economic development staffers were stationed on university campuses. These staffers directed firms towards whatever resources they needed: state-provided seed or venture capital, incubator space, regional loan funds, technology expertise—anything the state could help with. Walt Plosila, the state's director of economic development said, "We're trying to build the kind of informal networks you see in places like Route 128 and Silicon Valley."<sup>50</sup> From 1984 to 1988, the Ben Franklin Partnership funded close to 1,500 projects, involving partnerships between 128 of the state's 135 higher education institutions and 2,500 private firms. With \$77 million in investments, it is believed to have leveraged approximately \$281 million of other capital.<sup>51</sup> For the first time since the 1970s, the state's unemployment rate fell below the national average.<sup>52</sup>

"I'm an activist in a way that does not involve the classic tax-spend-borrow cycle," said Governor Thornburgh. "I think government has a role as a partner and a facilitator. Decisions made by private investors and employers are going to create

economic growth but government can be a catalytic agent that can provide the tip-over component in a particular decision. That's where the real interplay between business and government ought to be."<sup>53</sup> Indeed, Thornburgh's political pragmatism and his commitment to free market rhetoric left him free to pursue one of the most effective technology-based industrial policy programs in the country.

## **Georgia**

Pennsylvania wasn't the only conservative stronghold that would implement an effective industrial policy. In particular, Georgia developed its program relatively late, but in doing so it was able to draw on the lessons of the programs created before it. At first glance, Georgia seemed an unlikely location for such innovations. Georgia's sixth district, for example, was represented by New Gingrich, who authored the Contract with America and led the Republican conservative revolution of the 1990s. The Contract was premised on the need to reduce the role of the government in the economy. Under Gingrich's leadership, the Republicans would win their first House majority since the Eisenhower administration.

In 1990, while Gingrich was still a Republican backbencher, the state's governor, Zell Miller founded the Georgia Research Alliance (GRA), a private non-profit with a board containing powerful business executives and research university presidents. It set the goal of attracting top class researchers with large sums of money through an Eminent Scholars program.<sup>54</sup> By 2010, GRA had garnered sixty star researchers and invested some \$510 million, an investment that it estimates has leveraged another \$2.6 billion from

federal and private research grants, creating more than 5,500 new science and research jobs, and establishing more than 150 new companies.<sup>55</sup> The companies founded at the GRA have been estimated to be responsible for 5,000 high-tech jobs.<sup>56</sup>

Over time, Georgia's program became a studied model for high-tech economic development. In 2002, the GRA started a state-of-the-art program to move technology to the marketplace called VentureLabs. The program provides incubator spaces for startups at university campuses and provides assistance in planning, marketing, and technology development. It lends seed money for startup costs of up to \$350,000 dollars in loans and grants. Since 2002, it has facilitated the startup of 107 companies, employing 460 people and attracting \$300 million in private equity. These companies include a cybersecurity software firm, a high-tech lens manufacturer, a burr-free drilling company for aerospace, and a regenerative medicine startup.<sup>57</sup>

The Georgia Department of Economic Development has a presence on the program's participating campuses, and the state government mostly pre-occupies itself with building relationships between researchers, businesses, and workforce development stakeholders, in addition to traditional service provision. The headquarters of the state development agency lies at the heart of Georgia Tech's campus Technology Square. Also nearby are both the department's Enterprise Innovation Institute, which provides technology assistance to start-ups, and the Quick Start program, through which Georgia's government provides free job training programs through employers.<sup>58</sup>

The Georgia case study is particularly revealing because it illustrates a multi-dimensional effort to leverage the state's role in technology development: it involves seed-capital investments, workforce training, and public-private partnerships facilitating

the commercialization of academic research. And, perhaps most importantly, all of these efforts were designed to take place around a specific geographic hub: the University of Georgia.

## **2.4 Conclusion**

“States have become leaders in confronting the global challenge to American competitiveness,” one expert noted in 1988.<sup>59</sup> By the end of the 1980s, the industrial policy debates were over, but the American states had quietly become the new stewards of America’s economic prosperity.

The American states have always held a greater tolerance for America’s contradictory rhetoric and record when it comes to the government’s intervention in the economy. In many ways, it makes perfect sense that the path of coherent American industrial policy would follow began in the states. The failed efforts to bring industrial policy into the popular fold suggested that the idea could only exist in such contradictory spaces. And everything about industrial policy, from its bureaucratic and obscure label, to its undemocratic pluralist principles, to its unabashed calls for more government, made it toxic to the American public.

The federalist industrial policy of the 1980s wasn’t perfect: it was heavily biased towards high-tech innovation, and it often ignored the poor and the low-skilled. But its significance would lie not just in its immediate consequences. The states, with all their contradictions, unknowingly founded the institutional bedrock for future federal programs. President Franklin Roosevelt once said of the New Deal: “Practically all the

things we've done in the federal government are things Al Smith did as governor of New York."<sup>60</sup> Let us turn now to examine how the set of programs developed at the decentralized level were recombined at the national level to drive innovation-based growth in the new global economy.

# CHAPTER THREE

## THE HIDDEN DEVELOPMENTAL STATE

In 1993, Arati Prabhakar, then the head of National Institute of Standards and Technology (NIST) and today the head of the Defense Advanced Research Projects Agency (DARPA), told the *Washington Times* that “[t]he government is already playing such a major role in the market that it is silly to pretend it isn’t.... The important thing now is to determine how to do it right, how to get the best use out of the government’s efforts.”<sup>1</sup> Prabhakar’s appeal fell flat against the American public’s enduring opposition to the practice of “picking winners” in the economy—of directing government resources to shape and create new and promising industrial sectors. But the opposition to industrial policy among the policymaking community has proven to be more pragmatic than principled. To many in Congress, the need for an American industrial competitiveness strategy in 1980s was obvious. This is the story of how a hidden but coherent industrial policy emerged within the crucible of neoliberalism to meet that need.

This chapter briefly explores the history of this new decentralized industrial policy, which Fred Block describes as the “hidden developmental network state” (HDNS). Upon their establishment in the 1980s and 1990s, the programs that constitute the HDNS were hobbled by a need to obscure themselves to escape political attention. Yet, they were also effective because obscurity and fragmentation protected them from industrial policy’s critics. I argue that obscurity and fragmentation were actually institutionally advantageous characteristics because they supported flexibility, experimentation, and local knowledge in the system. The decentralization of production

that took place in the US in the 1970s and 1980s, the decentralized nature of American political institutions, and the decentralized set of programs in the HDNS all interlocked to form an effective model for technology development shaped to the US institutional setting.

### **3.1 Origins of the Developmental State**

While much of the story of America's technology-based industrial policy begins in the states, it also begins with DARPA. The defense agency was initially created to combat the technological advances of the Soviet Union in the cold war. Over time, however, it would be credited with the invention of everything from the Internet, to the personal computer, to the laser, to Microsoft Windows.<sup>2</sup> During the 1970s, policymakers became aware of DARPA's success in the information technology industry in Silicon Valley.<sup>3</sup> The innovation-based industrial policy described in this chapter borrowed in part from the DARPA model of technology development, which focused on hiring visionary technologists and giving them a great deal flexibility of discretion in disseminating research funding.<sup>4</sup> By keeping their staffs small, DARPA teams were able to remain dynamic and proactive. The agency employed technologically knowledgeable experts, which was critical to its success in evaluating promising "blue-sky" technologies. Moreover, DARPA guided new technology projects towards commercial viability by blurring lines between basic research and applied research. Perhaps most importantly, the DARPA model's number one function was nurturing networks among experts in government, business, and academia.<sup>5</sup> This last function in particular—facilitating



networks—has proven key to the HDNS’s ability to achieve its goals of technology commercialization.

These types of networks can also be traced to policies at the state level. One might argue that the policy programs of the individual states fused with the DARPA model to form what is now the HDNS. Many federal agencies developed their own technology-based venture capital seed funds designed to help early-stage technology research at small, innovative firms. Their development can be traced back to Michael Dukakis’s Massachusetts Technology Development Corporation from the mid-1970s. Like DARPA, Jerry Brown’s MICRO program connected researchers with business representatives. Like Richard Thornburgh’s economic development program, the federal programs in the HDNS could only survive politically because they avoided the public’s attention, and with it, any opposition. And like Georgia’s Research Alliance program, the federal HDNS would eventually streamline and integrate as many programs into the same geographic space to maximize agglomeration economies.

The set of programs discussed in the following sections combine into a complex alphabet soup of initiatives, which can be disorienting. The Small Business Innovation Research (SBIR) program was network of federal technology-oriented small business seed capital funds—each federal agency with a research budget had their own independent program. This program would prove to be one of the most important sources of patient capital for innovative firms. The Manufacturing Extension Partnership (MEP) is a federal program that forms cooperatives of small manufacturing firms with the goal of helping them overcome technological obstacles. The Advanced Technology Program (ATP) was essentially a smaller, civilian analogue to DARPA. These programs all had

relatively narrow policy missions, but they extremely successful in pursuing those missions. In fact, these programs, and others that resemble and coordinate with them, have mostly replaced large, private corporations as the primary drivers of new inventions in the economy.

It used to be that technological innovations in the US took place in private the private labs of Fortune 500 companies, like Bell Laboratories.<sup>6</sup> Today, this is no longer true. Nearly every technology used in Apple's i-Phone: the touchscreen display, the global positioning system (GPS), voice-activated assistant, and the Internet itself, were all invented in labs and institutions receiving significant financial and administrative support from the US industrial policy system.<sup>7</sup> Before Apple became a multi-billion dollar company, it received a grant from the Small Business Investment Company program at the Small Business Administration, where the federal government capitalizes privately run investment funds in a public-private partnership to push patient capital into high-risk technology markets. Similarly, Google's search algorithm emerged from research done in a Stanford lab funded by a grant from the National Science Foundation.<sup>8</sup> In 2005, approximately two thirds of the US R&D 100 Awards given by R&D Magazine came from interorganizational collaboration between a combination of university, business, and public resources.<sup>9</sup> Moreover, of 100 awardees, the number of awards granted to inventions that were funded by public sector entities increased from fourteen in 1975 to sixty-one in 2006, illustrating the transition towards enhanced government support in high-tech industries over the last four decades.<sup>10</sup> The US innovation system has been such a success that international competitors are mimicking it. Sweden has designed policies

based off the SBIR program;<sup>11</sup> and Korea and Japan's innovation systems are pivoting towards the "triple-helix" model of industry-academia-government.<sup>12</sup>

"If the dominant figures of the past hundred years have been the entrepreneur, the businessman, and the industrial executive," wrote sociologist Daniel Bell in his 1973 book *The Coming of the Post-Industrial Society*, "the 'new men' are the scientists, the mathematicians, the economists, and the engineers of the new intellectual technology."<sup>13</sup> Bell foresaw that because of the government's dominant role in scientific research, the increasing importance of technology would lead to the government taking a more central position in the economy. The government technology programs of the past three decades have been fundamentally preoccupied with the "new intellectual technology." Their prominence and success suggest Bell's predictions were correct.

### **3.2 Theoretical Foundations of the Development State**

#### **Network Theory**

Before I outline the programs of the HDNS, I must first explore the theoretical justifications and definitions for the policies involved. Up until now, I have categorized national political economies between "strategic" CME systems and non-coordinated LME systems. Understanding the varieties of capitalism (VoC) literature is critical to discussing the US industrial policy system because VoC measures the effectiveness of a political-economic system by its ability to produce techno-economic innovations. As stated earlier, CMEs favor incremental innovations, such as making a more efficient manufacturing assembly line, or a coordinating a better-designed supply chain. LMEs

favor radical innovations, which are new inventions in technologies, such as the semiconductor or the photovoltaic battery.

In addition to the broader distinction between LME and CME nations, there are two general typologies of state developmental innovation systems. First is the Weberian bureaucracy, labeled the Developmental Bureaucratic State, which is generally a highly expert, centrally organized meritocracy along the lines of Japan's MITI. Second is the Schumpeterian organization, labeled the Developmental Network State, which is made up of networks of smaller, more agile state agencies.<sup>14</sup> The innovation system in the United States is one of these "Schumpeterian" network systems.

Though the set of programs that constitute the HDNS can seem disorganized, they are all designed to meet the same goal: to facilitate the commercialization of technologies through the facilitation of cooperative networks. Schrank and Whitford define economic networks as collections of actors who pursue "repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during that exchange."<sup>15</sup> Among the chief examples of such relationships are networks of academics and researchers who must cooperate to share research, or networks of manufacturers that benefit from coordinating their investments in sector-specific employee training.

According to Schrank and Whitford, economic actors are increasingly governed "not just by price in markets or by fiat in hierarchies, but by custom in networks." As a result, policymakers are learning to "aim not so much to 'get the prices right' in markets, or to 'get the rules right' in hierarchies, but to 'get the relationships right' in networks."<sup>16</sup>

In short, network theory is emerging as a third analog to hierarchy-based organizational theory and market theory.

Network governance tends to be useful in systems of production “characterized by volatile demand conditions, complex interdependencies on the supply side, or rapid technological changes.”<sup>17</sup> There are two key conditions that create network failures—moments when a system of production fails to come into being because networks were not there to support that system.<sup>18</sup> The first of these failures takes place in situations when network governance is inadequate in limiting opportunism among economic actors. The second occurs when actors within a system of network governance lack the knowledge or capacity to adequately meet the expectations and needs of their partners in the network. Both of these failures inhibit trust and cooperation, thereby limiting the system in question. Public policy should respond to these two types of network failures with interventions to correct for both opportunism and incompetence. Network failures rooted in opportunism reveal a need for policymakers to build “confidence building measures and institutions, including trade associations, peak business associations, cartels and cooperatives, mediation services, and alternative dispute resolution procedures.”<sup>19</sup> On the other hand, failures caused by ignorance or isolation among actors should cause policymakers to invest in and leverage “educational and training institutions including not only vocational and technical schools but also industrial extension services, overseas marketing agencies, and supplier development programs.”<sup>20</sup>

One might note that these kinds of non-market coordinating institutions bear more than a passing resemblance to those described in the VoC literature as being necessary for the strategic cooperation of a CME system. Indeed, Schrank and Whitford directly

engage the literature, arguing that the creation of CME-type institutions is the natural response to a network failure.<sup>21</sup> They write that the LME typology “simply does not have the assemblage of associations and networks needed to police the many prisoner’s dilemmas that occur when you ask people to share potentially valuable information without financial compensation and only the hope of learning something valuable down the road.”<sup>22</sup> These problems are particularly relevant in high-tech research and development, and as a consequence, US policymakers have embedded a wide network of such non-market institutions in the nation’s innovation system.

The government programs outlined in this chapter provide the capacity building measures required to correct for incompetence, and they provide the dispute resolution measures required to correct for opportunism. For example, programs like SBIR, DARPA, the Advanced Research Projects Agency - Energy (ARPE-E), ATP, and the National Nanotechnology Initiative distribute capital to cooperatives of researchers in order to incentivize the sharing of basic, early-stage research within a network. This information sharing is key to maximizing technological gains. Collective action problems often arise in research efforts within networks of private firms because “...the profit incentive that motivates innovative activity by an individual firm also discourages information sharing and collaborative R&D activities between companies.”<sup>23</sup> By tying federal money to the condition of sharing research and practices, these programs aim to increase cooperation between firms, and by extension, technological and commercial development. As Block writes, “[t]he hope is that once industry officials see the benefits of this kind of cooperation, they will continue to finance the consortium efforts without government funds.”<sup>24</sup> Moreover, these kinds of funding programs offer dispute resolution

systems. A key example is that the SBIR program uses its application materials as a foundation for protecting the intellectual property rights of firms that it funds. This creates assurances that firms can collaborate through the project without fear of competitors stealing their unpatented research.<sup>25</sup> Another example of a program that corrects network failures is the Manufacturing Extension Program, which provides technological training among supply chains of advanced manufacturing firms to ensure all units within the chain trust and cooperate with one another.

### **Market Theory**

Until recently, the benefits of networks have been conceptualized through the language of markets. The terms used in the policymaking community to describe the growing prevalence of network governance in the economy often include “industry clusters,” “agglomeration effects,” and “knowledge spillovers.” The epistemic roots of the cluster development paradigm go back to Alfred Marshall’s *Principles of Economics* in 1890, when he noted the role agglomeration economics in specific industrial regions in England.<sup>26</sup> But Michael Porter generated a new trend in the policy literature with his work in the 1990s in his article, “Clusters and the New Economics of Competition,” which highlights the productivity gains associated with cooperative linkages and spillovers between related firms in a specific region.<sup>27</sup> In his book, *The New Geography of Jobs*, economist Enrico Moretti summarizes the basic framework of market-based cluster development: “Larger clusters are more efficient because they have a thicker labor market, a more specialized supply of business services, and more opportunities for knowledge spillover.”<sup>28</sup> Moreover, employees from innovative firms often leave to start

their own companies with new returns on innovation, which compounds the returns to cluster regions. Due to agglomeration effects, an aggregation of worker and firms in a geographic space becomes a commons greater than the sum of its parts.

Many policy experts are skeptical that governments have much control over where these hubs take root and where corresponding wealth is generated. In a case study of the bio-technology industry, the number one determinant of where the first cluster-rooting firms grew was presence of academic stars—“researchers who have published the most articles reporting specific gene-sequencing discoveries.”<sup>29</sup> The reasons for this are two-fold. Firstly, scientists and researchers in innovative start-ups need be geographically close to the frontier of their academic disciplines. Secondly, these academic stars are often the individuals creating the startups in question.<sup>30</sup> Moretti claims that policy had little role in producing these stars: “Cambridge, San Diego, and San Francisco happened to have the right kind of stars at the right time.”<sup>31</sup> By this construction, the formation of a cluster is often the product of a single actor or firm that rarely depends on public policy: Microsoft in Seattle, William Shockley and the invention of the transistor in Silicon Valley, and Dell in Austin.

The market-based justification for the role of the government in cultivating clusters is simple: the public sector should identify market failures and collective action problems and correct for them. Moretti supports government-funded human capital and R&D investments, which would correct externalities created by both. This is the classic market failure approach. But Moretti only evaluates the government’s role in *creating* clusters from scratch, and he fails to acknowledge the role governments might have in nurturing nascent clusters into being. Knowledge spillovers depend on public and



communal discursive institutions to occur, such as public-private partnerships, public educational facilities, and public regulatory structures that give private actors the agency and incentives to form collaborative networks. A cluster region depends on open labor markets (regulated by the government) and social networks (nurtured by government programs) to facilitate innovation. This is particularly true in knowledge-intensive technology markets. As the boundaries between private and public in the economy have blurred, the functional boundaries within firms have also become porous and networked. The same is true of the boundaries between firms and other firms, and those between firms and local non-market institutions such as universities and trade associations.<sup>32</sup>

The architects and conductors of the new American industrial policy are fundamentally preoccupied with these porous boundaries, both in ensuring the establishment of stable networks between existing institutions, and in creating the right kinds of non-market institutions, such as “universities and trade associations,” that are needed for such networks to form in the first place. Crucially, the success of these policies was only possible because of changes in the structure of the world economic system. To understand how these programs achieve their goals, it will be important to first understand the decentralizing transformations of the US and global economy of the past thirty to forty years.

### **3.3 Post-Fordism and Political Decentralization**

#### **Emergence of Post-Fordism**

The decentralization of production in the United States, often referred to as “post-Fordism” has been defined as “the decline—if by no means disappearance— of vertically integrated production complexes and the corresponding growth of smaller-scale

suppliers, subcontractors, and middlemen linked by interorganizational networks at home and abroad.”<sup>33</sup> The US no longer relies on mass standardized production to generate wealth. Large, vertically integrated firms like Ford Motors are no longer the center of our economy. In their stead, small networks of firms have emerged as the new center of the economy. And as smaller firms have relied more on informal networks, network governance—informal cooperation facilitated by non-market institutions—has obtained more and more. As a result, policymakers responded by creating a set of programs designed to facilitate that cooperation.

During the 1970s, macroeconomic strains and growing foreign competition generated a strategic shift on the part of large corporations, creating an opening for small firms to take the lead in technological innovation.<sup>34</sup> Investors in large, vertically integrated firms demanded that firms be managed to maximize not growth but rather shareholder value. This practice worsened the short-term bias already endemic to the US capital-market system. These larger firms began to underinvest in early stage research and innovation, a fact that has been illustrated both by the nation’s aging capital stock and its need for patient capital.<sup>35</sup> This also created a need for new government intervention—Reich’s calls for patient capital were finally being heeded.

The current trend of decentralization in the field of scientific innovation and technological commercialization goes back to 1957, when a group of researchers left William Shockley’s firm to start their own enterprise with the support of Fairchild Camera and Instrument Company. In leaving their firm, these pioneers established a new paradigm “where economic growth depended not so much on the consolidation of giant

corporations, but rather on a process of economic fission that was constantly spinning off new economic challengers.”<sup>36</sup>

But decentralization did not only take place in the field of science research and its commercialization. The productive system of the nation as a whole shifted into what is now referred to often as the “new economy,” defined by a growing reliance on smaller, newer, innovative and interdependent firms. Between 1972 and 1992, American manufacturing plants with 500 employees or greater shed 3 million workers, while plants employing fewer than 500 added 2 million.<sup>37</sup> Measuring the effects of entrepreneurship is extremely difficult due to complicated turnover rates among smaller firms. However, the economic literature suggests that in 2014, business start-ups and young firms accounted for approximately 70 percent of gross job creation, and that one successful startup can generate enough jobs to make up for many failed ones.<sup>38</sup> Small businesses employ 40 percent of the US science and engineering workforce. In 2003, fully half of all PhDs employed in the private sector worked for firms with 500 or fewer employees.<sup>39</sup> The Small Business Administration finds that scientists and engineers produce 14 times more patents than their counterparts in large patenting firms, and that these patents are twice as likely to be cited.<sup>40</sup> There is even a growing population of firms that are deliberately keeping their size below 500 employees to remain eligible for assistance from the US government, illustrating how useful these programs have become.<sup>41</sup> In short, small, younger firms catalyze economic growth and job creation, which are the proximate goals of most political actors in the industrial policy arena.

Undoubtedly, This decentralization of production has increased the salience of network failures to policymakers. As production takes place between a more extensively

networked set of firms and institutions, the potential for network failure rooted in opportunism and incompetence grows, and the need for its correction grows with it. But the decentralization of production also has tremendous political consequences, especially in the context of America's traditionally fragmented, decentralized political structure: the constitutional separation of powers and federalism. These constitutional structures were often cited as the main reason why the centralized MITI typology would not and did not come into being in America. This decentralization—federalism in particular—also facilitated the “low-road” practices of the American states. The subsequent development of a post-Fordist economy, however, has inverted the state government practice of “rational parochialism” that previously had a deleterious effect on the US economy as a whole.<sup>42</sup> Now, political parochialism, political decentralization, and the “tyranny of the locality” actually recruit more stakeholders for the nation's industrial policy agenda, helping the US move in part towards a “high-road” path.

### **Political Advantages of Post-Fordism**

The symbol of small business has proven a potent strategic political framing device to protect the program from Congress.<sup>43</sup> It is no accident that the SBIR program, one of the most successful HDNS programs in achieving its goal of technology commercialization, only invests its seed capital investments to small businesses. Though there are many independent iterations of the SBIR program run by dozens of federal agencies, the Small Business Administration loosely oversees them all.

Many have cited the centrality of the SBIR program in the nation's innovation-based industrial policy.<sup>44</sup> Until recently, the initiative required federal agencies with

R&D budgets in excess of \$100 million to allocate 2.5 percent of those funds to the SBIR investment program. After the SBIR was re-authorized by President Obama and a Republican Congress in 2012, that amount will increase to 3.2 percent of each agency's research budget—a signal of its accumulated political clout and programmatic success.<sup>45</sup> The National Science Foundation (NSF) was the first agency to have an SBIR fund. Now, however, there are multiple funds at the Department of Defense (DOD); the Department of Health and Human Services (HHS), particularly the National Institute of Health (NIH); the Department of Energy (DOE); and the National Aeronautics and Space Administration (NASA). In total, the program distributed \$2.1 billion in investments in 2012, up from \$1.4 billion in 2002.<sup>46</sup> The affected agencies initially opposed the program after its creation, seeing it as cooptation of their research budgets. However, the program's value quickly became apparent, as administrators found small firms were valuable in providing new technological capacity building for their agencies relative to established contractors traditionally used by large bureaucracies.<sup>47</sup>

The program began with Roland Tibbetts, who was appointed as a senior program officer at NSF in 1972. Having an industry background, Tibbetts was well positioned to conduct industrial policy—he knew how businesses operated, and what they needed. He championed the public funding of patient capital for small-business innovation until he retired in 1996. He designed the first NSF SBIR pilot program that was authorized in 1974, and is widely credited with inventing the programmatic structure of the SBIR at NSF in 1976 when he unilaterally increased the share of NSF funds going to small, innovative, technology-based businesses. This move prompted the small business lobby to push other agencies to do the same. They eventually took their case to Congress and

the White House, which held a conference on small business in 1980 that produced recommendations for a program supporting small business innovation research. The White House was responding to evidence of declining shares of R&D spending going to small businesses, a lack of small business access to seed venture capital, and research suggesting that small businesses generated jobs (much of which was generated by state-level policymakers). Senator Ted Kennedy was central in advocating for a bill that would take Tibbetts' program structure and apply it to other federal agencies, essentially creating over a dozen versions of the same program—seed venture capital funds competing with each other within the executive bureaucracy.<sup>48</sup> The bill passed both houses of Congress with bipartisan support and was signed into law by President Reagan in 1982.<sup>49</sup> Today, there is an award named after Tibbetts given annually to the fifty SBIR grant recipients whose innovations most directly contribute to challenges facing the United States.

The SBIR completes a set of key policy functions in the US innovation system. Since 1997, the program has accounted for twenty to twenty five of the winners of the R&D 100 Awards.<sup>50</sup> The program generates human capital and knowledge by investing in new innovative firms, which then creates spillover effects between firms. The creation of new high-tech firms also leads to the creation of new firms spun off by employees of the original firm.<sup>51</sup> Moreover, SBIR serves a “stamp of approval” certification function for untested technologies, and SBIR awards generally mark an innovative technology for subsequent private sector investment.<sup>52</sup> Most importantly, SBIR is an important source of Early Stage Technological Development (ESTD) capital for firms to travel through the “valley of death” between concept and commercialization. Spending across a set of different federal programs accounts for 20-25 percent of total ESTD funds, with 6-7.5

percent coming from states and universities.<sup>53</sup> Venture capital funds are generally noted as contributing a small fraction to these efforts, around 2.3-8 percent, as they are risk-averse and prefer to invest in proven technologies that can be rapidly commercialized.<sup>54</sup> Today, the program's website claims to have played a role in facilitating the issuance of 70,000 patents, the creation of 700 public companies, and the investment of approximately \$41 billion in venture capital outlays.<sup>55</sup> The SBIR program is one of the best examples of the government providing large quantities of patient capital to firms that wouldn't have found it elsewhere.

Moreover, the program's administrators have successfully acquired a political coalition to support it. The wider net of firms the SBIR program invests in geographically, the more stakeholders the program has across the country. This is made possible by the structural changes in the economy favoring networks of small businesses. As one writer notes, "the [SBIR] program has developed strong support within the business community because it has helped nurture thousands of successful innovative firms."<sup>56</sup> The program gives more than 5,000 awards to 1,500 firms per year.<sup>57</sup> Jere Glover, executive director of the Small Business Technology Council, part of the National Small Business Association, told the *New York Times* that "[t]he consensus view is that S.B.I.R. is probably the best R.&D. program in the federal government."<sup>58</sup> By spreading business stakeholders across the country in every state, the program recruits a broader coalition of congressional representatives to defend it. Military contracting firms use a similar strategy by tactically setting up manufacturing and business centers across many different states in order to maximize congressional support. This suggests why the

nation's military-industrial policy has often been its most effective (See, for example, DARPA).

New Mexico is a case example of how the post-Fordist decentralization of production has influenced the political sustainability of the HDNS. The state holds two federal laboratories, more PhD scientists and engineers per worker than any other state, and a number of technology-based startups. As a result, the state's governor and congressional delegation are outspoken defenders of federal science and technology policies.<sup>59</sup> There is a growing recognition that the decentralization of production has “tempered—if by no means eliminated—southern opposition to broader government intervention.”<sup>60</sup> Tennessee Senator Bob Corker cooperated with Senate Democrats and Detroit stakeholders to push through an auto rescue package other Republicans attacked as industrial policy, not because he is an ideological supporter of “picking winners,” but because Tennessee holds two Japanese auto transplants, a billion dollar Volkswagen investment, and General Motors parts suppliers who depend on the Detroit auto industry.<sup>61</sup> Other HDNS programs have their own support networks, and large companies that contract out to small businesses often work to protect programs that benefit them.<sup>62</sup> For example, General Electric and Cray (a supercomputing company) support federal laboratories that fund their projects, and biotechnology firms support NIH programs that fund drugs they eventually build on. Evidently, industrial policy is finding the institutional stakeholders that were missing from the debate in the 1980s.

The Manufacturing Extension Partnership, a set of public-private partnerships run by NIST at the Department of Commerce, has possibly been one of the most successful programs in pursuing geographic decentralization to gain political security. The program



is a cooperative effort between states and the federal government—each partnership is geographically based. It is designed to promote public-private partnerships seeking to provide technology training and services to small firms with less than 500 employees. Its goal: to enhance these firms' technological competitiveness and productivity in any way it can (technology transfer and workforce training are the primary tools at its disposal).

While the program design originated in the states, federal support for extension partnerships started in the late 1980s with the 1988 Omnibus Trade and Competitiveness Bill, and continued into the 1990s with the Technology Reinvestment Program.<sup>63</sup> The partnerships seek to overcome a variety of collective action problems in technological capacity building. Rather than have the federal government provide services, MEP awards go to existing service providers, such as “consulting firms, non-profit organizations, academic institutions, public agencies or trade associations.” The program funds these often non-market institutions to promote strategic coordination and cooperation.<sup>64</sup>

Manufacturing firms face “uncertainty, information, and learning costs.” This induces them to underinvest in productive technologies. Suppliers of technical services to manufacturing firms face similar problems. MEPs seek to organize all actors into consortia to overcome those costs and barriers collectively.<sup>65</sup> For example, let us say the individual firms in a regional industry find the costs of a technology-training program too high to justify taking on independently. As a result, all the firms in said regional industry suffer inadequate training and skills. The program seeks to organize these firms into a group to spread the costs of training over multiple firms, thereby lowering the individual costs for each firm and minimizing the chance one of the other firms will poach their

newly trained employees.<sup>66</sup> The MEP is one of the best examples of how the US innovation-based industrial policy is leveraging strategic non-market institutions to achieve its goals.

There are now 588 manufacturing extension partnerships in the country, with multiple centers in all fifty states.<sup>67</sup> Two thirds of assisted companies have fewer than 100 employees—like with the SBIR, the small business lobby is a strong supporter of the program<sup>68</sup> In total, the program hosts a partnership network of more than 3,100 affiliated public and private stakeholder organizations. These organizations contribute to delivering services to manufacturing firms, and they employ 1,200 local field staff. Also critically, MEPs play a key role in focusing economic development efforts into geographic hubs. Ninety-five percent of centers have relationships with both economic development organizations and universities, and universities are politically active in preserving the program.<sup>69</sup> The program's total funding has increased from \$105 million dollars in 2007 to \$141 million in 2016.<sup>70</sup> Since 1988, the MEP has worked with 80,000 manufacturers, and it claims to have supported \$88 billion in sales, 14.5 billion in costs savings, and the creation of more than 729,000 jobs.<sup>71</sup> Every one of those jobs is a reason for Congress to keep the program funded, not because it's good policy, but because the businesses that create those jobs support the program actively. To put it simply, the programs that have found ways to leverage the political advantages of post-Fordism, such as the SBIR and the MEP, are very successful examples of industrial policy.

## **The Politics of the Advanced Technology Program**

While many of these programs have successfully interlocked with the structural changes in the nation's economy, others, however, were not so lucky. The Advanced Technology Program illustrates the political forces that governed the period during which the HDNS was built. Once stakeholders tried to turn the program into a large-scale civilian industrial policy pilot agency, critics quickly targeted it for conducting industrial policy, and it was eventually de-funded.

The ATP was created under the Department of Commerce at NIST, and its purpose was to allocate funds to high-risk ESTD stage technological development for commercialization, a lot like SBIR or DARPA. It was signed into law in 1988 as a part of the Omnibus Trade and Competitiveness Act. Its advocates marketed it as a civilian counterpart to DARPA.<sup>72</sup> The program started with a small budget, only \$50 million dollars in 1992. Then, as Bill Clinton came to office with high hopes for government technology development, his administration championed the program as “the flagship of the Clinton-Gore civilian technology policy.”<sup>73</sup> The program's funding jumped to \$340 million in 1995, and there was hope that it would accumulate \$1 billion by the end of the decade.<sup>74</sup> Clinton appointed Arati Prabhakar to the head of NIST to run the program.<sup>75</sup>

The ATP took advantage of the same key strategies found across HDNS programs.<sup>76</sup> It facilitated cooperation; in a study of the program's results, 69 percent of program participants said ATP participation had greater cultivated collaboration.<sup>77</sup> It focused on facilitating networks with academia; in 2006, 55 percent of all ATP projects had a university partner.<sup>78</sup> It provided patient capital to high-tech firms; between the years 1988 and 1996, 40 percent of all patents awarded by the US patent and trade office

were given to firms or organizations that participated in an ATP project, and one quarter of these patents were attributable to ATP's contribution.<sup>79</sup> Between 1990 and 2006 the program allocated almost \$2.1 billion in funds to technology projects to leverage a total value of \$4.4 billion including matching private investments.<sup>80</sup>

Despite its technical success, the ATP did not take advantage of post-Fordism in the same fashion as SBIR or MEP. The flagship of Clinton's new "technology policy" (read: industrial policy) quickly found itself at the center of congressional attention in a partisan war over the government's role in technology development. Because Clinton had linked his own administration to the ATP program so publically, it made it an easy target for Republicans seeking to solidify their neoliberal credentials. Moreover, the 1990s saw prolonged, stable economic growth, during which the threat of global competition became less urgent.<sup>81</sup> As a result, Congress was less inclined to support the program. In 1994, Republicans retook full control Congress for the first time since the Eisenhower administration, and the ATP was an increasingly appealing target as a symbol of "corporate welfare," and "picking winners."

The program's funds decreased considerably to \$221 million in 1996, staying still at \$200 million for the rest of the decade.<sup>82</sup> Staff scaled back ATP's focused project selection process to a more general one, assuming a more passive role.<sup>83</sup> Under George W. Bush, who opposed the program and repeatedly tried to defund it completely, the program's budget became increasingly smaller. After Senator Ernest Hollings, one the program's champions, retired in 2005, the program was officially killed in 2007 by the America Competes Act.<sup>84</sup>

The primary reason the program was ended in 2007 was that it lacked the business support that other programs used to deflect political attention. Indeed, the only early supporter of the ATP was the American Electronics Association.<sup>85</sup> The program's political troubles created a vicious cycle. Due to constant uncertain funding from Congress, the program's business partners were prone to opportunism. This undermined the program's mission and support, making it less effective, and therefore more vulnerable to criticism. One consultant noted that contractors never expected government support to be consistent, but they "went along because it was new money."<sup>86</sup> Moreover, ATP program staff had to dedicated time to political strategy and survival, which undoubtedly undermined the program's effectiveness. Republicans explicitly called on business stakeholders to eschew support for the program, and business followed those calls out of a fear of alienating Republican majorities in Congress.<sup>87</sup> While the MEP had a "strong base in the 50 states," the ATP presented an inability to "aid companies in a larger number of congressional districts." The ATP's successor program at NIST seemed to learn the lesson of its progenitor. It explicitly encourages university-industry partnerships to recruit a diverse coalition of stakeholders, and it avoids directly funding large firms in order to avoid accusations of "corporate welfare."<sup>88</sup>

There is substantial evidence that Republicans are perfectly willing to support industrial policy if they have the political incentives to do so. First, most of the HDNS was signed into law under president Reagan. The ATP, the MEP, and the SBIR all came into being in the 1980s. The reason for this was that the Republican coalition that governed in the 1980s and early 1990s was defined by an uneasy alliance between libertarians and corporate business interests. As a result, Republican policymakers would

often have to make concessions to libertarians by attacking “corporate welfare” in programs that augured too much attention.<sup>89</sup> In reality, however, Republicans were more than supportive of technology-based industrial policies. George Bush Sr. fired the head of DARPA, Craig Fields, for his decision to invest \$4 million in Gazelle Microcircuits, Inc. a Silicon Valley electronics company. The administration was publically displeased that Fields was acting as a public venture capitalist “picking winners.” However, Bush Sr. also supported the High Performing Computing Initiative that provided support for DARPA’s efforts in the same areas. Fields went on to lead SEMATECH, another government supported technology development program, indicating that the firing took place to give public assurance to the libertarian wing of the Republican party.<sup>90</sup> Similarly, George W. Bush joined the Republican’s long held opposition to the ATP program, eventually eliminating its funding. But Bush Jr. supported other government technology programs with enthusiasm, such as the National Nanotechnology Initiative, which, like ATP had a yearly operating budget of about \$1 billion.<sup>91</sup> Both of these instances indicate that Republican’s opposition to government technology programs is strategic in nature, designed to satisfy a particular bloc of the party. As soon as the post-Fordist economy made it easier for programs to accumulate business support, Republicans were more than happy to support industrial policy when no one was watching. Ironically, it was this pragmatism that required the programs to emerged in a decentralized fashion—hidden from the general public, but beneficial to small businesses. This decentralized evolution, moreover, had many organizational and administrative benefits that made the programs even more effective.

### **3.4 Program Administrative Decentralization**

The HDNS programmatic structure itself is often referred to as being “loosely coupled,” a reference to its fragmented organizational structure. For example, almost a dozen different independent agencies have R&D budgets large enough to qualify for SBIR, in addition to more than a dozen different institutes within the NIH. The HDNS includes more than a dozen national laboratories at the Department of Energy, over five hundred MEP service centers, and dozens of research universities.<sup>92</sup> This is not to mention the wide array of state-level programs that play the key role of conducting this programs on the ground. All of this means that the policy system’s administrative, as opposed to geographic, decentralization comes with a number of widely heralded political and policy advantages as well.

#### **Political Advantages of Administrative Decentralization**

The system’s piecemeal structure obscures it from political attention by frustrating efforts to conduct a comprehensive analysis of the entire network of programs.<sup>93</sup> Furthermore, this decentralization insulates the system from top-down white elephant projects,<sup>94</sup> as well as the mutable currents of partisan power and regime change.<sup>95</sup> Because of its network of independent programs, the system is constantly changing and innovating, further compounding its elusiveness. Program managers are continually adapting to and learning from their peer programs’ successes and failures, both political and substantive.<sup>96</sup> This isn’t to say that agencies don’t issue reports, or that Congress is unaware of their efforts. HDNS programs simply lean towards the abstract and technical in their reporting, which also serves as a political shield.<sup>97</sup>

## **Policy Advantages of Administrative Decentralization**

The mission of technological research and commercialization faces a problem of Knightian uncertainty. Innovation is a highly complex and unpredictable process.<sup>98</sup> As a solution, the overlap and redundancy of HDNS programs provide multiple access points for potential innovators to acquire financial and organizational support.<sup>99</sup> Having multiple teams of technologists working independently on the same puzzle with the freedom to innovate enhances scientific progress.

Finally, though these programs lack centralized administrative control, there is a coherent coordination in their “loose coupling.” As Schrank and Whitford observe: “...[F]ederal laboratories are a key source of SBIR award winners. SBIR winners frequently take advantage of the MEP during the commercialization phase of their projects. And SBIR and ATP have frequently been portrayed as complementary as well.”<sup>100</sup> Schrank and Whitford also find a correlation between federal research and development outlays and SBIR grants.<sup>101</sup> These grants are directed to projects localized in research consortiums and clusters engaged in innovation, which then leverage other HDNS programs. One can see how these programs act in tandem by examining the intellectual property reforms that took place in the 1980s, particularly with Bayh-Dole.

The Bayh-Dole Patent and Trademark Act of 1980 was in essence an overhaul of the US intellectual property regime.<sup>102</sup> The law gave permission for those taking part in federally funded research to patent that research and issue licenses for those patents to other parties as they saw fit—thereby encouraging such practices.<sup>103</sup> One study of Bayh-Dole’s impact on counties surrounding government-funded research universities found



that payroll and average wages grew faster after the Bayh-Dole Act was passed, particularly in industries with linkages to the technological research at the proximate university.<sup>104</sup> However, patent law in the US is not perfect, and certain “patent thickets” have formed in high-tech industries, such as nanotechnology, slowing progress. With that said, these intellectual property reforms do work in tandem with SBIR and other seed development funds geographically. Researchers apply for SBIR grants knowing that if their innovation is successful they will be able to reap the rewards. In essence, HDNS programs all interlock into a surprisingly coherent system.

The reason for this coherence has a lot to do with the way the system developed from the bottom-up. The HDNS fragmentary program structure lends itself well to policy innovation, exchange, and diffusion. Federal venture capital programs at the CIA, NASA, the DoD, and national labs had been tested at the state level in an earlier period.<sup>105</sup> These programs also learned from the Energy Department’s national labs where partnerships connecting commercial technologists to public officials and private business had been effective.<sup>106</sup> Other scholars have noted that the public venture capital model escaped attention from critics because its genesis took place at the subnational level, where “commitment to market fundamentalism is more variegated in the first place.”<sup>107</sup> This model then “trickled up” and “across other agencies similarly trapped by an older and relatively involuted model of procurement.”<sup>108</sup> Today, most federal agencies with research branches have their own venture capital funds.<sup>109</sup>

### 3.5 Federalism and the Developmental State

#### Industrial Policy “Trickling Up”

As illustrated in Chapter Two, Massachusetts is often credited with having created the first government seed capital fund in 1975 with Michael Dukakis’s Massachusetts Technology Development Corporation.<sup>110</sup> By 1990, seventeen states had adopted more than thirty venture capital initiatives,<sup>111</sup> and manufacturing extension and technology transfer programs had been established in twenty-eight states.<sup>112</sup> The Pennsylvania Ben Franklin Partnership and the Ohio Thomas Edison Program influenced the 1988 Omnibus Trade and Competitiveness Act that founded many of the federal programs discussed in this chapter.<sup>113</sup> Paul Hallacher argues that the MEP originated from state-level manufacturing extension programs that are fifty years old.<sup>114</sup> The policy diffusion previously noted as an advantage of the HDNS, and widely heralded in US public policy in general, lends itself well to state-by-state innovation.

The states also carry a significant amount of the system’s financial burden. By the middle of the 1990s, states were spending approximately \$2.7 billion in funds from their budgets on research and technology programs. On the flipside, the 1998 NSF research budget was \$2.5 billion.<sup>115</sup> Furthermore, subnational governments and non-profits invest money to leverage matching grants that deliver millions of dollars in federal funds.<sup>116</sup> And like the network of federal programs that are “loosely coupled,” yet complimentary, states host a set of programs that are complimentary to federal programs. For example, there are “Phase Zero” SBIR programs run by twenty-one individual states designed to assist companies in applying for federal SBIR funds.<sup>117</sup> State policymakers and agencies now serve as stakeholders and partners with small business and university representatives

within HDNS structure, all cooperating to ensure that new innovative firms get passed along from one program to the next.<sup>118</sup>

Perhaps the most critical dimension of the states' role in the HNDS is their role as geographic facilitators and conductors of this network of programs. Instead of the US industrial policy being facilitated by a pilot agency like MITI, the nation's industrial policy is run in part from the bottom up. In *A New Paradigm for Economic Development*, David Schaffer and David Wright outline how states can leverage knowledge-producing institutions to facilitate knowledge spillovers and correct for network failures. The key to successful development policy isn't just the policies themselves. Although, of course, executing the implementation of venture capital, R&D, and research park programs is necessary and critical. Creating an institutional and geographic hub for all those programs to take root, communicate, and coordinate, Schaffer and Wright argue, is the key to leveraging the benefits of networks. The university is most often that institutional locus point.

### **Universities as Knowledge Hubs**

The role of the university in economic development has undergone substantial transition in the past century: it now includes the responsibilities of knowledge retention, knowledge creation, and knowledge diffusion. This latter role has made the university an object of considerable interest to economic policymakers in the context of the new, knowledge-driven economy. Institutional overlap between academia, government, and industry is widely heralded, and university administrators need to support such networks for them to take form and grow.<sup>119</sup> This overlap is most readily apparent geographically

as government innovation and technology programs leverage the university as an institutional hub to drive regional economic growth.<sup>120</sup> Universities now function as knowledge hubs by facilitating the diffusion of both tacit and codified knowledge within regional networks.<sup>121</sup> As regional economies compete in the global economy, and as agglomeration effects are critical to those regions' competitive advantage, universities that establish effective institutions for sharing tacit knowledge are particularly effective in promoting innovation and economic development.<sup>122</sup> As is illustrated throughout this thesis, universities that reimagine themselves as knowledge hubs instead of knowledge factories will lead the new cluster development paradigm, and the new knowledge-driven economy.

More than two-thirds of companies funded by the SBIR had at least one founder that was previously an academic. Twenty-seven percent of projects had university faculty as contractors, and 17 percent used universities themselves as contractors.<sup>123</sup> The Association of American Universities is a vocal supporter of the program.<sup>124</sup> As has been noted, 95 percent of MEPs are partners with economic development organizations or universities.<sup>125</sup> Universities, along with small business, perform both critical policy functions, but they also bring the added benefit of being strong political allies.

The significance of regional geography in economic development has been subject of considerable attention in recent decades. It wasn't long ago that policymakers were predicting "the end of the nation state."<sup>126</sup> It was argued that the globalization of mobile capital would make regional systems the primary business units in the economy, making national governments relics of an old world order. Regional industry clusters and their agglomeration effects have become more and more important—though the nation

state is still the primary unit that governs the global economy. With that said, the hidden developmental network state is effective because of its “multiple embeddedness” in local and global capital, and because of its embeddedness in regionally-centered professional innovation networks.<sup>127</sup> Some have claimed the “triumph of the city,”<sup>128</sup> and the city is certainly the primary beneficiary of the new returns to agglomeration economies.<sup>129</sup> From a legal perspective, however, American states are constitutionally privileged sub-national actors. The states helped pioneer the nation’s subnational industrial policy because they have fiscal tools to do so. States, in a sense, strike the balance of being regionally oriented, while simultaneously enjoying the benefits of (admittedly limited) constitutionally sanctioned political sovereignty. The globalizing effects of mobile capital are not going away any time soon. It seems likely that the individual states’ role in conducting regional industrial policies will only increase in prominence and importance with geography.

### **3.6 Conclusion**

Very much in line with Daniel Bell’s prediction that technology would take on greater importance role in the post-industrial economy, radical innovation has gained in significance. Moreover, we know that the comparative institutional advantage of the LME model of capitalism is that it generally promotes radical innovation. The VoC literature, however, holds that competitive market forces generate such radical innovations. But as we have seen, it was networks, not markets, which played an important role in facilitating radical technological innovations over the past four decades. Moreover, the US government, not the private sector, created those networks.

Policymakers leveraged multiple CME-type non-market institutions, from research cooperatives, to technology transfer programs, to manufacturing extension partnerships, to equip the nation's economy to excel in the digital age. The VoC literature acknowledges that it puts the firm at the center of political economic analysis, and it is not my intention to downplay the importance of the private sector in technology development. It seems clear, however, that the LME model has over-emphasized the role of competitive markets and under-emphasized the role of strategic cooperation in radical innovation.

Also significantly, the new system provides multiple lines of patient capital to the cutting-edge, innovative firms that need it most. This patient capital, the holy grail of the industrial policy advocates of the 1980s, somehow found its way into the American system by natural evolution. Instead of a centralized bureaucracy allocating this capital, it was administered by a wide range of nimble government programs, and also sometimes through public-private partnerships. All the same, the introduction of patient capital into the American system signals another significant deviation from the traditional understanding of the LME model, which has an explicit short-term capital bias.

According to the literature on institutional change, "institutional reform in one sphere of the economy could snowball into changes in other spheres as well."<sup>130</sup> And the evidence from this chapter does seem to imply some kind of change. This isn't to suggest that the United States is now a member of the CME type, but it does suggest that the United States exhibits greater institutional heterogeneity than suggested by the VoC framework. Yet, the US system still suffers from many of the acknowledged deficiencies of an LME system, such as an inability to form systems of mass production in cutting

edge industries. Such production usually depends on incremental innovation practices, and the US public's aversion to industrial policy makes the large coordination projects required for such incremental innovation continues difficult. In 2008, however, the financial crisis created one of those rare pivotal moments in economic thought where change is possible, and the Obama administration saw its opportunity push the US onto a new path.

# CHAPTER FOUR

## INDUSTRIAL POLICY AND CRISIS

“[T]he game, when it comes to supporting specific industries, is changing,” wrote Ezra Klein, a prominent liberal policy commentator formerly of the *Washington Post*.<sup>1</sup> After the financial crisis of 2008, many economists and government officials were forced to concede that the neoliberal economic order that had prevailed for nearly three decades was flawed. Alan Greenspan, longtime chairman of the Federal Reserve Bank and one of the leading champions of free market fundamentalism, conceded to Congress that “the whole intellectual edifice.... collapsed.”<sup>2</sup> The Troubled Asset Relief Program (TARP), signed into law by a President Bush, injected \$431 billion capital into the financial system, but it also allocated funds to restructure Chrysler and General Motors. “By any coherent definition, this is industrial policy,” said an economist quoted about the auto-bailout in the *New York Times* in May of 2009.<sup>3</sup> Scholars announced the “return of industrial policy” a “21<sup>st</sup> century industrial policy,” and an industrial policy “renaissance.”<sup>4</sup> And today more than ever, industrial policy revolves around technology. Most increases in per capita income worldwide today arise from advances in technology—about 70 percent.<sup>5</sup>

After the crisis, there were also declarations of a Keynesianism resurgence. Commentators declared “the return of the master.”<sup>6</sup> After all, the American Reinvestment and Recovery Act (ARRA) of 2009 was a classic demand management stimulus program. While there are ongoing debates over the causes of the financial crisis of 2008, one of the most persuasive causal arguments is that wage stagnation and a lack of social services



forced Americans to turn to credit to support their standard of living. As Monica Prasad argues, where other countries redistributed wealth from the rich to the poor in the pre-crisis era, America redistributed wealth from the future to the present in a practice she refers to as “mortgage Keynesianism.”<sup>7</sup> The story goes: this expansion of credit then took the form of sub-prime mortgage backed securities, which became the backbone of the American economy. For many, the natural response to such a crisis was to address the fundamental problem of finding a sustainable growth model for the nation. Fred Block argues that the proper response to the crisis is for the US is to adopt an industrial policy focused on clean energy. He calls for “a human capital strategy in which income inequality is reduced by diminishing the human capital gap between high and low-wage individuals.”<sup>8</sup> In the year 2016, however, Block’s calls seem to have passed mostly unheeded—with some important qualifications.

The Obama administration has made a concerted effort to address these shortcomings in the HDNS, primarily through its approach to clean energy technology development. Even still, the Republican takeover of Congress halted the administration’s efforts to grow and refine the HDNS into a more comprehensive industrial policy. And today, while the administration continues to champion its industrial policy under the cloaking labels of “innovation policy” and “competitiveness,” the American states carry the responsibility of organizing the nation’s de-facto industrial policy, likely without any significant help from the federal government in the near future.

#### **4.1 Failures in the Developmental State**

Though the HDNS deserves the attention it has received from academics of late, the set of programs it encapsulates hardly serve as a placeholder for a comprehensive

industrial policy. In particular, the undemocratic aspects of the HNDS present obstacles towards its ability to facilitate scalable production capacity building, large-scale deployment of technology in the economy, and coordination between multiple market actors. And, also critically, America's industrial policy efforts to promote human capital investment, prevent labor skill polarization, and stimulate wage growth for lower-income workers have proven inadequate. In short, there are two main shortcomings of the HDNS. First, it could be better designed to promote technology commercialization, especially in markets that require large-scale production. Second, its focus on radical innovation instead of technology scalability results in inequitable growth.

### **Deploying Technology at Scale**

Because the policymakers designing America's industrial policy did so in obscurity, it fails to fill the facilitative role of coordinating public infrastructure investments with private production outlays.<sup>9</sup> "The United States is lagging behind in innovation in its manufacturing sector relative to high-wage nations such as Germany and Japan," writes the President's Committee on Science and Technology (PCAST) in their *2011 Report to the President On Ensuring American Leadership in Advanced Manufacturing*.<sup>10</sup> The US has "relinquished leadership in high-tech industries that employ highly skilled workers." In 2001, the national trade balance in advanced manufacturing products shifted from a surplus to a deficit. From 2003 to 2010, the manufacturing trade deficit of \$17 billion increased to \$81 billion. In recent years, manufacturing generated nearly \$1.6 trillion of US GDP and 11.5 million jobs. However, one must take these figures within a longer timeline. Between 1957 and 2009,

manufacturing has declined from 27 percent to 11 percent. Further, between 1998 and 2010, manufacturing employment declined from 17.6 million to 11.6 million. The US has demonstrated a repeated inability to compete in manufacturing products invented in America. The country's manufacturing base no longer has the knowledge, skilled people, and supply chains to produce "light emitting diodes for energy efficient illumination, components for consumer electronics like the Kindle e-reader, or advanced displays for TVs, computers, and handheld devices such as mobile phones."<sup>11</sup> Indeed, Broadband Internet access, high definition television production, and mass-scale clean energy technologies require coordination between a wide range of market participants. These participants range from local and state-level regulators, to private sector producers, to the citizen-consumer who must be educated about a new technology.<sup>12</sup> The government has few tools to coordinate public-facing projects due to entrenched ideological opposition to industrial policy, as well as due to technology market incumbents who have veto power over the American political system.<sup>13</sup> Such obstacles explain why the US has slipped to 15<sup>th</sup> in the world in citizen access to high-speed connection to the web, though the Internet was invented on our shores.<sup>14</sup>

Moreover, while duplication and overlap in HDNS program networks are desirable in high technology sectors seeking radical innovation, the benefits of such redundancy should not be overstated. Duplication is only beneficial if networked actors can learn from others' mistakes. Without coordinating institutions to ensure information sharing occurs across agencies, such learning is often harder to accomplish.<sup>15</sup> Also importantly, redundancy actively impedes efforts to scale technology production efficiently.

Further, though programs designed to correct network failures have proven effective in facilitating high-skill, high-tech employment for a narrow band of society, workforce skill polarization in the US has had significant consequences for low-skill workers. The HDNS does little to address the problem of “middle-skill” procurement—i.e. advanced vocational training that goes beyond basic secondary education but doesn’t go as far as a full college education. Such training is crucial for advanced manufacturing practices such as laser-assisted manufacturing. Policymakers pay careful attention to ensure the US produces and retains PhD scientists and engineers, and that the US facilitates the immigration of technological experts. But when it comes to determining who will make computer chips and other high-tech projects, rather than design them, the US comes up short.<sup>16</sup> Over the past three decades, the American middle-skill workforce has experienced a “hollowing out,” meaning that older middle-skill jobs in the clerical, construction, and production jobs are declining in number. That said, demand has been rising for more middle-skill labor in other sectors, such as healthcare, advanced manufacturing, information technology, and biotechnology.<sup>17</sup> That demand is not being met. Without the appropriately skilled labor force in the US, new high-tech firms are likely to move their production practices overseas to high-skill, high-value producing CMEs, such as Germany.<sup>18</sup>

The reasons for US deficiencies in skill procurement are, unsurprisingly, the result of a decades old institutional pathway. Kathleen Thelen argues that in the US, skill formation has been historically contested across a class divide between unions seeking to maintain the value of their scarce skills and businesses looking to get the upper hand in labor relations.<sup>19</sup> These conflicts have made it difficult for the US to establish the

apprenticeships and firm-based training typically found in CMEs. Moreover, historical analyses of employment policy in America suggest that the active labor market policies that emerged out of the full employment debates of the 1940s were sidetracked by the War on Poverty in the 1960s. This linked employment policies to the welfare state and the racial undertones that operate in that sphere. As Margaret Weir writes, “By the end of the 1970s, racial divisions and government incompetence had set the terms for debates about employment policies.”<sup>20</sup> In short, the war on poverty resulted in the “welfarization” of employment policy, a practice still seen today. This fact, combined with the neoliberal victory in the competition for economic ideas in the 1980s, has resulted practically no comprehensive federal employment policies in the US.

Currently, most of the United States middle-skill training takes place in community colleges, for-profit colleges, and lower-tier four-year institutions. Today, most Americans who want to go to college are enabled to do so. The real problems in America’s system of skills procurement lie in degree completion and quality, as well as student debt burdens for those who do complete their education. In 2014, Congress reauthorized the Workforce Innovation and Opportunity Act (WIOA), which now distributes \$5 billion a year in federal funds to state and local workforce development boards to spend as they see fit. This is in contrast to the Comprehensive and Employment Training Act, which at its peak distributed \$40 billion in 1980 in training funds.<sup>21</sup> The new workforce law also includes a set of unfunded mandates for states to pursue career pathways.<sup>22</sup> States are being subjected to costly requirements to improve data reporting procedures, without any federal aid. Further, WIOA requires states to consolidate workforce development services into “one-stop shops” with other social service

programs, integrating them with other welfare programs. States are also required to increase the amount of state funds going to unemployed, out-of-school youth, disabled individuals, and illiterate individuals, often without the resources to do so effectively.<sup>23</sup> Changes in WIOA actively linking the nation's employment policy with other welfare programs may be good policy, but it is horrible politics for those seeking to increase outlays going towards skills development programs. In terms of skills training, the US has a long way to travel before it can compete with Germany and Japan. Until that happens, significant wage growth in the US seems unlikely.

### **Inequitable Growth**

There are some who argue that the US innovation system helps alleviate poverty. The presence of high-tech job clusters in a region, they argue, increases overall wages for everyone in that region, including wages for the non-skilled. They also hold that the growth of innovation jobs creates additional jobs in non-traded service sectors. These non-traded service sectors generated most of the 27 million jobs created over the past two decades, about two-thirds of jobs in the US.<sup>24</sup> The other one-third of jobs are produced in traded industries, usually high-tech, that are competitive in the global marketplace. There is evidence that for every new high tech job in a metropolitan area, five additional local jobs are created in service industries in the long run.<sup>25</sup> According to this evidence, two of these jobs are high-skill service jobs, such as lawyers and doctors, while three are low skill service jobs, such as hairstylists, fast-food workers, and taxi-drivers. However, the significance of these jobs in combating poverty is suspect, as the presence of high-tech industries also raises the cost of living in a city. This most likely offsets any gains for

low-income individuals receive from technology cluster formation in their area. In fact, cluster formation has been found to lead to net losses in economic well-being for low-income members of the community affected.<sup>26</sup>

Many criticize regional cluster policy for excluding distressed communities from the networks that have proven so critical to the US innovation system. Some communities have even protested the growth of clusters in their areas. In San Francisco, for example, some 30,000 residents signed a petition that would ban high-tech development that drives up costs of living in the city.<sup>27</sup> Some policymakers and experts have advocated actively engaging these communities as stakeholders and participants in agglomeration networks with the goal of empowering them to collect the benefits of high-tech development. As was outlined earlier in Chapter Three, the most important element of networked-based industrial policies is the social capital and tacit knowledge that leads to agglomeration economies. Connecting distressed communities with the social capital of these networks could prove helpful, if clearly not a panacea.<sup>28</sup> One might wonder whether or not the mutual trust and good will needed to coordinate these networks might be undermined if such an effort was pushed on unwilling business stakeholders. CME-type strategic coordinating institutions succeed because all the actors involved have an interest to collaborate. The inclusion of poverty advocates in innovation networks would require concerted efforts to ensure that all stakeholders benefit, or believe they benefit, from such inclusion. Efforts to incentivize business stakeholders to comply might include providing vocational training for the the low-skilled that would result in a productive, skilled workforce. Planning and executing such an effort could prove difficult to accomplish, as it takes more than just skills training for a community to escape poverty. Moreover, it

would also cost a lot of money. This doesn't mean that such practices wouldn't be taking steps in the right direction, but policymakers should consider if the best way to address income inequality and quality of living for the low-skilled might be to instead correct for the current system's lack of mass scale production capacity, or to create policies designed to help ease workers out of declining industries and into new ones.

In fact, the HDNS does very little to facilitate such easing. The challenges facing deindustrialized communities identified by Bluestone and Harrison during the industrial policy debates still exist. Once-booming industrial hubs suffer huge transition costs associated with deindustrialization. These costs are not inevitable. The absence of industrial policies designed to help transition workers from one industry to another, or to facilitate worker re-location, causes harm to a community that is often difficult to reverse.

All of these problems have had tremendous consequences for American living standards. A study by the New York Federal Reserve Bank found that between 2004 and 2012, total student debt in the US nearly tripled from \$364 billion to \$966 billion. About two-thirds of that debt is owned by borrowers under the age of forty.<sup>29</sup> Thirty-three percent of single mother households with children live in poverty, and 20 percent of children live in poverty.<sup>30</sup> There is considerable evidence that a large portion (40 to 50 percent) of bankruptcies in the US are caused by overwhelming medical bills, injuries, and illnesses.<sup>31</sup> In his recent book, *Our Kids*, Robert Putnam argues that children living in poverty have significantly less emotional, educational, and developmental support. These facts make it difficult for children to escape poverty.<sup>32</sup> One recent study claims that between 1999 and 2013, middle-aged white non-Hispanic individuals saw a dramatic rise in morbidity due to drug abuse, alcoholism, and suicide.<sup>33</sup> No other demographic group in



the US has seen a similar regression in mortality rates. One of the leading explanations for this regression is that low-skill white populations no longer enjoy the standard of living they once did when they could find well paying, low to middle-skill jobs. “Half a million people are dead who should not be dead,” said Nobel Prize winner Angus Deaton, the author of the mortality study. “After the productivity slowdown in the early 1970s, and with widening income inequality, many of the baby-boom generation are the first to find, in midlife, that they will not be better off than were their parents.”<sup>34</sup>

Even if the government can design a supply side industrial policy—the coordination of large-scale production project, an effective system of skill procurement—to ensure the industries of the future grow here in America, the government also faces difficulties on the demand side of the industrial policy equation. Like much of the nation’s industrial policy, mass scale technology deployment in the economy is often left to subnational levels of government. While some states have proven effective at leveraging HDNS programs and federal funds to support scaled production practices in the areas of clean energy, it is unclear if people will buy the products being made. Without federal programs to subsidize demand for developed technologies, the US ability to establish market share will remain in doubt.<sup>35</sup> Even still, the Obama administration has taken steps, in partnership with the states, to take on these unquestionably large problems facing the economy.

## 4.2 The Obama Administration: A Mixed Success

### A Discursive Shift

Unlike during the industrial policy debates of the 1980s, the current presidential administration is both aware of and trying to solve the problems in the American industrial ecosystem. During his 2013 State of the Union Address, President Obama was vocal in supporting the US government's role in technology development:

[E]very dollar we invested to map the human genome returned \$140 to our economy. Today, our scientists are mapping the human brain to unlock the answers to Alzheimer's; developing drugs to regenerate damaged organs; devising new material to make batteries ten times more powerful. Now is not the time to gut these job-creating investments in science and innovation. Now is the time to reach a level of research and development not seen since the height of the Space Race. And today, no area holds more promise than our investments in American energy.<sup>36</sup>

Obama has also framed the government's role as an investor in terms of international competition, declaring that "if we want to compete with China, which is pouring hundreds of billions of dollars into this space, if we want to compete with other countries that are heavily subsidizing the industries of the future, we've got to make sure that our guys here in the United States of America at least have a shot."<sup>37</sup> And yet, despite the President's public record advocating for the government's role in shaping the economy, the 2011 PCAST report on manufacturing declares that "[w]hile the United States should avoid industrial policy—making bets on particular companies and industries—we should be unabashed in pursuing an innovation policy."<sup>38</sup> It seems that the Obama administration, and industrial policy advocates more generally, have pivoted in their discursive strategy away from the language of industrial policy towards "innovation

policy,” “technology policy,” and “competitiveness.” The current administration has evidently learned well from the mistakes of the industrial policy debates of the 1980s.

### **Obama’s Industrial Policy**

Despite deliberate efforts to avoid applying the term “industrial policy” to its development programs, the Obama administration has enthusiastically supported efforts to fill in the gaps in the HDNS, particularly the problems of mass-production and deployment through its climate policy initiatives at the Department of Energy.<sup>39</sup> The most prominent obstacle facing administrators and stakeholders alike seeking to solve the problems of technology mass deployment has always been clear: austerity. But after the financial crisis of 2008 unfolded, the American Recovery and Reinvestment Act was assembled as a demand management stimulus policy, and the Obama administration packed the bill with \$81.39 billion dedicated to climate and energy technologies, in addition to \$30.73 billion in its FY 2010 budget and a FY 2011 budget request of \$54.63 billion.<sup>40</sup> Furthermore, the DOE has funded forty-six new energy frontier research centers over five years, split mostly between universities and national laboratories.<sup>41</sup> Matching funds and loan programs at the DOE have been established to build solar panel facilities, electric car battery supply chains, photovoltaic rooftop deployment programs, and scaled demonstration projects for biofuels.<sup>42</sup> The administration pushed early and often to transform the US into the center of climate-technology development worldwide.

In 2009, Congress founded a new sub-agency at DOE: the Advanced Research Projects Agency - Energy (ARPA-E), an energy-focused civilian analog to DARPA dedicated to ensuring the US “maintains a technological lead in developing and

deploying advanced energy technologies.”<sup>43</sup> It achieves this mission by issuing grants and funds to promising “blue sky” technology development projects, much like DARPA at the Department of Defense. ARPA-E has been largely successful, as firms who cannot find patient capital on the US stock market have turned to the DOE and ARPA-E for help. A recent Government Accountability Office review suggests that private investors would not have alternatively funded most firms receiving ARPA-E grants. As we know from SBIR’s success, private venture capitalists are hyper risk-averse. Most ARPA-E project investments (91 of 121) had initially unproven technological concepts, and nearly all ARPA-E loan winners were at least three years or more away from commercialization. Few ARPA-E applicants who did not receive funding did receive alternative funds from the private sector. All of this evidence suggests the program is filling an important gap in clean energy technology capital markets.<sup>44</sup> And perhaps most importantly, ARPA-E seems to be adopting a decentralized strategy similar to other HDNS programs. In 2011, the projects selected were located in twenty-five states, with 50 percent of projects led by universities, 23 percent by small businesses, 12 percent by large businesses, 13 percent by national labs, and 2 percent by non-profits.<sup>45</sup> Staffing salary outlays at the agency increased from 26 million in 2013 to 54 million in 2015,<sup>46</sup> suggesting that program has found a way to escape the attention of austerity driven members of Congress. By February 2015, ARPA-E outlays totaled \$1.1 billion across more than 400 projects, and its funding levels have increased year after year.<sup>47</sup>

Despite the Obama administration’s enthusiasm in pursuing a green industrial policy, the project has come with significant political setbacks, most notably with the failure of the DOE-backed photovoltaic cell producer Solyndra. The company received

\$535 million in loan guarantees from the 2009 stimulus through the Department of Energy, but by August 2011 the company was bankrupt.<sup>48</sup> The company invested in producing photovoltaic batteries that used an alternative semiconductor, CIGS (Copper Indium Gallium Selenide), rather than silicon, because silicon prices were high when the DOE signed off on Solyndra's loan guarantee. After the deal was signed, silicon prices subsequently dropped due to new production coming from China, leaving Solyndra at a cost disadvantage.

The Solyndra bankruptcy received a great deal of attention, and Republicans were quick to criticize the administration and the DOE for failing to anticipate the company's failure. The Republican controlled house energy committee issued a report criticizing the DOE:

The lack of available competitor information for Solyndra and the rapidly dropping price of polysilicon and panel prices should have prompted DOE to reconsider the Solyndra loan guarantee or, at the least, postpone the Solyndra closing so it could examine how the Solyndra loan guarantee would be impacted by the Chinese pricing pressures.<sup>49</sup>

The Obama administration, embarrassingly, championed the company as a prime example of its green industrial policy success. Solyndra was heavily advertised as an emerging company in a winning future industry, and the US government was one of its chief investors. Energy Secretary Steven Chu and Vice President Biden held press conferences at the company to announce the DOE loan in March 2009, and the President also visited the company in California in May 2010. The White House website even had a video advertising the company.

Further, the evidence that the Solyndra failure was a quintessential example of crony capitalism was damning. The *New York Times* reported that Solyndra "spent nearly

\$1.9 million on lobbying activities over a period of 43 months from 2008 to 2011,”<sup>50</sup> which was relatively high among energy companies.<sup>51</sup> It did not bode well that George Kaiser, the principal investor in Solyndra, was a fundraiser for the president’s campaign while meeting with him in the White House.<sup>52</sup>

Critics now point to Solyndra as the prime example of why industrial policy can’t work. In May 2014, the libertarian Cato Institute published an article by K. William Watson outlining the typical arguments against industrial policy, resurrected from the debates of the 1980s:

The inconvenient truth is that green industrial policy isn’t going to lead to a future of renewable energy, but it does benefit cronies and politicians. Bureaucrats who don’t make decisions based on market realities still respond to incentives, making them susceptible to capture by special interests at public expense (see Solyndra). Even if bureaucrats are enlightened saints, the centralization of decision-making benefits large firms at the expense of entrepreneurs and other innovative competitors. Over time, the relationship between commercial success and political acumen leads businesses to invest more in lobbying and leads to a culture of rent-seeking and privilege.<sup>53</sup>

This characterization of industrial policy, specifically of DOE’s loan guarantee program, is largely anecdotal. Basic investing principles tell us that the value of a loan program is based on its returns on investment, not the results of one bad investment. From 2009-2014 the DOE has issued thirty-eight loans, four of which were cancelled before being disbursed. Of the remaining thirty-four, five have defaulted, from which the DOE only lost \$807 million.<sup>54</sup> In comparison, the program has issued \$28 billion in total loans, suggesting that the program has been largely successful. And importantly, the DOE loan portfolio also contains winners. Tesla Motors, most notably, received a \$465 million loan from the DOE in 2009. By 2013 Tesla’s share value rose substantially, and its Model S

was Motor Trend's 2013 Car of the Year. Traditionally, it is understood that public financing of innovative firms benefits the government the expanded tax base caused by a company's growth. By contrast when Tesla paid the DOE loan back nine years early, it prompted criticism that the government should have extracted more value for its investment.<sup>55</sup>

This evidence suggests the DOE has learned how to drop losers, which is perhaps more critical to a successful industrial policy than picking winners. The problem with industrial policy isn't that the government makes bad investment decisions, it's that the government is easily tied into lock in and policy "stickiness" that make divesting from bad decisions difficult.

Beyond the initiative at the DOE, the Obama administration has also focused on one of the most crucial barriers to an explicit, large-scale US industrial policy: the civil service. As Mazzucato argues, the narrative that government is wasteful, inefficient, and prone to pick losers discourages talented young people from wanting to work for the government. As a result, the government often lacks the enthusiastic workforce it might need to execute an effective industrial policy. The enduring trope of the government's incompetence, in a sense, becomes a self-fulfilling prophecy. As she puts it, "If we continue to depict the State as only a facilitator and administrator, and tell it to stop dreaming, in the end that is what we get..."<sup>56</sup> The literature on industrial policy tells us over and over that the key to successfully implementing industrial policy is balancing state embeddness with state autonomy. A skilled civil service with a strong esprit-de-corps is critical to striking that balance.

The Obama administration is the first administration to push hard for data-driven innovations within the executive administrative body. Recall that healthcare.gov failed spectacularly and became a highly visible example of government waste and inefficiency attached to the President's signature health law. After the website failed, the White House established the first United States Digital Service, an elite corps of software engineers, procurement experts, and digital gurus dedicated to transforming "how the federal government works for the American people."<sup>57</sup> Due to the success of the White House program, the state of California is considering starting its own service modeled off the USDS as part of a set of reforms to "improve the public's trust and confidence in government."<sup>58</sup> And today, more civic technology innovators are looking to restore confidence in public institutions than ever before. Jennifer Pahlka at Code for America, a non-profit that embeds engineers in local and state governments to improve service provision and digital procurement, has described government as the newest "technological platform."<sup>59</sup> It's easy to imagine how such digital efforts could help restore public faith public institutions by making government service provision more efficient. As it consolidates into a coherent political bloc, Silicon Valley's technology industry is emerging to be a potentially invaluable partner with the government in implementing industrial policy. Gregory Ferenstein has done extensive research into the political ideology of Silicon Valley and concludes that among many other things technologists see the government as an "alpha venture capitalist."<sup>60</sup>

Moreover, the Obama administration has made considerable progress in facilitating broadband deployment, particularly in underserved communities. There is growing evidence that access to broadband stimulates economic growth.<sup>61</sup> The stimulus



bill allocated \$7.2 billion to broadband deployment targeting economically distressed communities without access to the Internet in an attempt to remedy the “digital divide.” The largest program funded, the Broadband Technology Opportunities Program (BTOP),<sup>62</sup> is designed to “increase broadband access and adoption; provide broadband access, training and support to schools, libraries, healthcare providers, and other organizations; improve broadband access to public safety agencies; and stimulate demand....”<sup>63</sup> The program invested \$4 billion in 233 projects benefitting every state—another program leveraging American political decentralization.<sup>64</sup> The role broadband plays as an information superhighway is, needless to say, significant in the new economy. This is particularly true when it comes to network facilitation. Indeed, it seems we are in a path-setting moment in broadband technologies, and the decisions being made now will likely lay the groundwork of the regulatory framework for years to come.

Despite all this progress, the Obama administration’s federal industrial policy program comes well short of what struggling Americans need to achieve a quality of life they’ve come to expect. Though the stimulus presented an opportunity to push money into the industrial policy system, the Republican capture of the House in 2010 presented an obstacle to any new spending initiatives. On election night in 2010, John Boehner, leader of the Republican House, gave a speech promising to take a “new approach” to government. That approach entailed “cutting spending” and “reducing the size of government.”<sup>65</sup> Six years later, it appears that Boehner was successful. Since 2010, Congress reduced the ten-year projection of the deficit by \$4.1 trillion dollars. Of that \$4.1 trillion reduction, spending cuts were responsible for 77 percent, and 23 percent came from tax increases.<sup>66</sup> The political fights over these cuts were public and

contentious. Republicans refused to increase the debt ceiling in protest to government spending levels, prompting Standard and Poor's to downgrade the credit rating of the US government from AAA rating for the first time in history. Congressional Republicans shut down the government in 2013 trying to "defund" Obamacare. And despite the fact that House Republicans have largely been successful in reducing federal spending, John Boehner was recently ousted as speaker due to grassroots dissatisfaction with his commitment to austerity.<sup>67</sup> In short, there has been little opportunity for the Obama administration to acquire the funding to further pursue its industrial policy agenda. To be sure, the administration has still championed its industrial policy agenda within the executive administrative body and wherever Congress is willing to turn a blind eye. But otherwise, the industrial policy renaissance seems to have stopped in its tracks, leaving the nation's de-facto industrial policy, once again, to the American states.

Even still, the administration has adapted well to this new fiscal landscape. It has embraced its role as a partner to the states' industrial policies rather than the other way around. Obama procured federal investments of around \$500 million for the National Network for Manufacturing Innovation have leveraged nearly \$1 billion in private capital to create seven manufacturing research institutions in metropolitan regions across the country. These centers are typical of the place-based networked industrial policy that has characterized the multi-layered industrial policy of recent years.<sup>68</sup> Susan Crawford of the White House Office of Science and Technology Policy said that the Obama administration is "committed to the idea of regional economic clusters and their role in growth and innovations.... [innovation] cannot happen top-down alone, or bottom-up alone."<sup>69</sup> Indeed, while the federal government is unlikely to produce a new industrial

policy any time soon, the states have been embracing their roles as facilitators of mass technological deployment, and they are likely to continue to do so.

### **4.3 Federalism Filling Gaps**

As noted previously, there are, conceptually, two waves of economic development policies that have grown in the states.<sup>70</sup> First, there were industrial recruitment efforts that intensified zero-sum competition and “low road” practices in the states. Second, entrepreneurial policies evolved among states as a response to the regulatory race-to-the-bottom across the Sunbelt, and these policies resulted in strategic planning, industrial targeting, and the “high-road” cluster-development paradigm. Martin Saiz performs a factor analysis using the programmatic data on individual state economic development funding streams. He concludes that state development programs can be categorized between a location-based strategy characterized by “low-road” competition and an entrepreneurial strategy that takes an interventionist approach to shaping markets.<sup>71</sup>

There is significant statistical evidence to suggest that states that engage in strategic technology development policies—those associated with “high-road” cluster development practices—significantly enhances agglomeration effects in a region.<sup>72</sup> States have also taken the lead in filling in the same gaps in the HDNS that the Obama administration has focused on, particularly in areas of clean energy technology markets. Furthermore, the states have been trying to stimulate demand for new promising markets. Twenty-two states have “renewable portfolio standards” requiring that energy be generated from renewable technologies, and thirty-nine have passed laws requiring that

utilities connect clean renewable technologies to their energy grids. Forty-five other states have provided financial incentives for private utilities to deploy renewable technologies, and dozens of states have signed onto cap and trade programs pricing carbon, encouraging the adoption of new renewable energy technologies.<sup>73</sup> Some of these state programs, like New York's Reforming Energy Vision and Green Bank, have been particularly successful at filling capital market gaps for clean energy firms.

Subnational governments are also taking the lead in broadband deployment. Next Century Cities is a newly established non-profit organization representing 100 local municipalities across the country dedicated to "expediting the expansion of the country's broadband infrastructure to ensure access for all."<sup>74</sup> Moreover, a broad set of states has created their own programs to facilitate broadband deployment.<sup>75</sup> For example, Georgia offers tax credits to stimulate demand for broadband; and California and New York have distributed large capital outlays to build miles of fiber-optic cable infrastructure.

In addition to clean energy and broadband, there are many innovative state-level middle-skill development programs. One of the primary obstacles in the way of helping workers acquire advanced degrees is that they often lack the basic skills they should have learned in high school. Due to the lack of social spending in most recent decades, the US faces a significant gap in the basic human capital needed to then acquire more advanced skills. Many states are organizing many innovative programs to target this problem. New York State's Accelerated Study in Associate Programs (ASAP) was designed to improve community college graduation rates, especially among students who require remedial courses to build up their basic math, reading, and writing skills. Fifteen percent of students with remedial education needs attending a two-year college earn a degree or

certificate within three years nationally. Participants in the program saw a doubling of graduations rates within three years relative to the control group; the program raised graduation rates from 22 percent to 40 percent.<sup>76</sup> Even though these students aren't necessary being trained to operate complex machinery, catching up the nation's population in basic skills will be a critical step in helping the disadvantaged make the leap to even higher skills that will bring them higher wages. By providing students enrolled in the program with a support network of councilors and advisors to help them navigate community college and the job market afterwards, these students have a much better chance to find a middle-skill job later in life. The program is currently being expanded due to its success.

Moreover, some states have been pursuing their own apprenticeship programs to help workers gain the technical skills they need to move on to a job. For example South Carolina began the Apprenticeship Carolina program in 2007, which has been a success. The program subsidizes apprenticeships through an employer tax credit and places students at high-tech manufacturing firms, like BMW. This strategy couples on the job training with vocational education, often at the community college level. Between 2007 and 2015, the program has trained 10,000 students and placed them at over 650 companies.<sup>77</sup>

Furthermore, more states are shifting towards high-road industrial policies. Problems of interstate competition still exist today, just as they did in the 1970s. But development policymakers are beginning to realize there is less reason to engage in zero-sum competition than previously presumed. Recent attention paid to North Dakota's "Drone Valley," where the state has established the leading drone industry cluster in the

world, has pushed some to rethink how they go about forming clusters.<sup>78</sup> There are countless states that have pursued their own information technology sectors looking to replicate the Bay Area's success. More recently, however, states are learning that cluster policies are often beneficial when targeted towards nurturing a specialized base industry that doesn't compete with an incumbent industry cluster elsewhere. As growth industries become more and more technology-dependent, and more high and middle-skill dependent, agglomeration networks will be more valuable. Non-competitive regional industry specialization policy between states begins to make a great deal of sense. But whether or not it's possible to simultaneously recruit firms from other states, pursue native-growth policies, and still have an effective engine for economic growth remains to be seen.

With the proliferation of state-level efforts to scale technology markets, might it be possible that such practices will be adopted vertically, just as took place with the current system of technology development? One specific policy instrument in particular presents itself as a potentially fruitful model for states to pursue. As has been thoroughly documented, the government is currently providing the patient capital for high-risk long-shot technology projects, though it fails to capture the returns when those projects succeed. When those projects become extremely lucrative, as was the case with Google and Apple, the government only captures the benefits of an expanded tax base. And it is well documented that Apple and other companies have found innovative ways to escape taxation.<sup>79</sup> Furthermore, these companies outsource their production facilities off American shores. In the current system, risk for innovation projects is assumed by the taxpayer, while the returns to those investments are privatized. This is particularly

obvious in biotechnology, where firms typically focus on developing new permutations on publicly funded drugs and then selling those drugs back to the American people at prices they can't afford.

Many gains-sharing programs designed to socialize the returns on public investment in innovation are promising solutions to this problem. Allowing the government intellectual property rights over innovations that it funds would require successful entrepreneurs to later pay royalties on the use of that technology.<sup>80</sup> Income contingent loans and government held equity would give the government non-controlling shares in firms it invests in. By this model, when a firm makes money, the state would benefit with it. Such practices have proven effective in Sweden, which invested in and owns a portion of Nokia.<sup>81</sup> Finally, development banks have shown promise in other countries, which have been able to generate profits as well as direct and create markets for new technologies. State development banks are responsible for 34 percent of the funding in the global “climate finance landscape,” the highest of any investment actor,<sup>82</sup> and the industry is still in need of more patient capital.<sup>83</sup> Such investment banks, and the capital they provide, will be critical in fostering incremental innovations and broad technology deployment in the economy. Furthermore, all these policy instruments could be easily appended to the current set of high-tech seed capital funds employed by the federal government. The wealth generated by these gains sharing programs could be directed towards both human capital investments and vocational training for middle-skill jobs being created in high-tech industries. Or, that money could be dedicated to stimulating demand in order to generate stakeholder buy-in to the program. Either way there is ample room for improvement and policy innovation in the current system.

#### 4.4 Limits of a Federalist Industrial Policy

“More Georgians are living on the desperate side of the federal poverty line than at any time in the state’s recent history,” begins a report by the Georgia Budget and Policy Institute. Nineteen percent of Georgians lived in poverty in 2012.<sup>84</sup> Sixty percent of Georgia third graders lack necessary reading comprehension and vocabulary skills.<sup>85</sup> An expert on Georgia’s economy notes that “[t]he recent recession caused pain both for people already living in poverty and people who fell into it for the first time. Yet the long-standing barriers that continue to block Georgians from moving out of poverty stubbornly persist.”<sup>86</sup> One might recall from Chapter II, however, that Georgia University’s Research Alliance is often cited as one of the best state-level high-tech industrial policy programs in the country. As it turns out, even with the successful programs outlined above, making headway against the forces of wage stagnation for the low-skilled is incredibly difficult in the post-recession period. And there are reasons to doubt that the states are equipped to start the kind of revolution that was observed in the 1970s.

The 2008 recession drastically reduced state tax revenues.<sup>87</sup> More than forty states had budget deficits in the billions of dollars,<sup>88</sup> and unlike the federal government, because most states have balanced budget laws on the books preventing them from running continuously high deficits, many states had to implement austerity policies. At least thirty states are providing less funding per student for the 2014-15 school year than they did before the recession hit. Fourteen of these states have cut per-student funding by more than 10 percent.<sup>89</sup> These facts suggest significant barriers in place even for state efforts to implement a scaled technology deployment policy.



Up to this point, the word “partisanship” has notably been absent from this thesis. Along with wage stagnation and the growth of income inequality, increased partisan ideologies among elected officials and the electorate at large is likely one of the defining trends of our time. And while Republican governors in the 1980s may have been more open to expanding their administration’s role in the economy, the same may no longer be true today. Partisanship has increased significantly since the 1980s.<sup>90</sup> Jessica-Bulzen Pozen argues that with this polarization in party ideology, state governments have been more frequently eschewing their roles as Madisonian wards of their states’ institutional interests to pursue partisan goals. As she puts it:

Republican-led states challenge the federal government when it is controlled by Democrats, while Democratic-led states challenge the federal government when it is controlled by Republicans. States oppose federal policy because they are governed by individuals who affiliate with a different political party than do those in charge at the national level, not because they are states as such.<sup>91</sup>

In short, partisanship is influencing state-governments not to act in their “institutional” interests, but instead act as partisan nodes of their national party. A state’s institutional interests have been operationalized as “the acquisition of federal funding or otherwise procured fiscal power, and the expansion of the state government’s regulatory authority relative to the federal government.”<sup>92</sup> A case study of the Affordable Care Act illustrates how Republican states have actively rejected their institutional interests in favor of partisan ones. By declining to accept federal Medicaid grants, many Republican states have chosen not to capture large sums of federal money. Moreover, many states have chosen not to set up a state health insurance exchange under the President’s health law.

As a result, they have relinquished significant regulatory authority over their state's insurance market.<sup>93</sup>

Considering recent state-level partisan behavior, it seems possible that Republican governors are less likely than ever to pursue more activist industrial policies. This is particularly important considering the make-up of down-ballot offices in the country. At present, the offices of 70 percent of state legislatures, more than 60 percent of governors, and 55 percent of attorneys general and secretaries of state are controlled by Republicans. Democrats have unified (legislature and executive) control of only 7 states.<sup>94</sup> This is particularly problematic, as the policy problems states need to solve involve very public-facing intervention. Large coordination projects to facilitate technology deployment attract a great deal of political attention, meaning the likelihood a Republican official would be able to engage in such projects and maintain their anti-government credentials are low.

#### **4.5 Conclusion**

I do not mean to overstate the promise of the American states in resolving the nation's problems in this thesis. There are, undoubtedly, significant barriers facing state efforts to transform markets in the United States to better facilitate wage growth. Even further, there are still barriers facing states that hope to create new social services for struggling Americans. I merely hope to examine how the states have in the past, and may in the future, play key role in paradigmatic shifts in the American political economy. Moreover, there is substantial evidence that while the federal government is widely recognized to be hamstrung by partisan gridlock, the American states continue to govern. Even those states with strong legacies of laissez-faire undoubtedly engage in one

world of theory and another of practice—the particular genius of American political and social life identified by Shaw years ago. This political economy of daily action was apparent in the natural evolution of the nation’s technology-rooted industrial policy. It began with the states, and today, the President of the United States is one of industrial policy’s most ardent supporters—though he would hardly say so out loud. This set of facts may not be enough to reverse the tide of problems facing the American economic system, but it certainly represents a change. This change, I hope, can teach us a great deal about the nature of the American political economy and comparative political economy more generally.

# CONCLUSION

## FORGING NEW PATHS

The most common narrative of industrial policy in the US is simple: the nation doesn't have one. But now, we know this isn't true. The nation has, over many decades, accumulated a set of technology-based industrial policies that are highly effective at pursuing the goal of innovation. Despite the failure of the industrial policy debates to prompt an explicit paradigmatic shift at the federal level, and despite the presiding hegemony of neoliberal economic thought in America, we can see how the US government organized a system of policies to maintain its competitive edge through technology policy. Moreover, these programs were defined by their use of non-market coordinating mechanisms and their provision of patient capital—both elements typically ascribed the CME model of capitalism. The Manufacturing Extension Partnership made skill acquisition possible in advanced manufacturing—it organized firms into cooperatives to solve collective action problems. Only through these cooperatives can employees acquire the industry-specific skills that remain elusive in the American LME system. The Small Business Innovation Research program provided long-term loans to smart people with good ideas who couldn't get a loan anywhere else in America. While the programs that constitute the HDNS may not have solved the fundamental social problems facing the country, they signal a significant qualitative shift in the American political economy.

Indeed, the nature of these policies raises many questions about the theoretical foundations of comparative political economy. The empirics of the American system

simply do not fit to the current model described in the theoretical literature. If the varieties of capitalism literature has previously ascribed the US ability to produce radical technological innovations to competitive markets, how then, does the literature explain the central role of CME-type non-market institutions currently embedded within the American innovation system? And how does the current federalist industrial policy landscape, and federalism's role in forging the US innovation system, influence our understanding of the US political economy more generally?

In their work on the nation's new industrial policy, Schrank and Whitford argue that the varieties of capitalism literature overlooks heterogeneous deviations from the CME-LME binary. They suggest that the network of non-market institutions in the US are precisely the kind of process-focused institutions that distinguish CMEs from LMEs, and that the current literature fails to capture variation at the regional level:

Hall and Soskice argue that the national-specific character of “so many of the institutional factors conditioning the behavior of firms” means that variation at the regional level is largely insignificant. We argue, by contrast, that it is a grave mistake to ignore the implications of federalism, the separation of powers, and other decentralized elements of the American polity. To do so too quickly dismisses viable options hidden in interstices and inconsistencies in an American national institutional framework that is not nearly so coherent as theory would have it be.<sup>1</sup>

But exactly how coherent is the VoC theoretical framework? How well does it hold up in the empirical world of American federalism, and the world more broadly? Hall and Gingerich have shown through an array of sophisticated regression analyses that political economies with greater degrees of institutional coherence—namely, those that fall more neatly into either LME or CME specializations—are more likely to see greater economic

growth.<sup>2</sup> This finding fits with Hall and Soskice's institutional complementarities argument.

Many critics, however, object to the bipolarity of Hall and Soskice's framework.<sup>3</sup> The argument that all national political economies lying somewhere in between LME or CME categories will gravitate towards one pole or the other over time relies a great deal on static comparativism. Scholars have argued that this argument is functionalist—that it explains something by looking at where it is, not by how it got there. This functionalist view fails to incorporate institutional origin, agency, history, conflict and change in its understanding of comparative political economy.<sup>4</sup>

America isn't the only nation to provide empirical evidence contradicting the institutional complementarities argument. Campbell and Pederson identify Denmark as a national political economy that developed a mixed set of both coordinated and liberal market institutions, and yet the combination has proven effective at generating wealth. This finding contradicts both the VoC theoretical framework and Hall and Gingrich's empirical analysis. Denmark combined LME-type labor spot market flexibility with state-supported skills attainment and unemployment programs typical of CME economies into a hybrid model of labor "flexicurity." In fact, Denmark's successful mixed CME/LME market economy sounds remarkably similar to system of hybrid institutions employed in the US innovation system. While the Danish system involved heavy amounts of CME-type coordination, that coordination took place in a largely *decentralized* fashion.<sup>5</sup> Corporatist bargaining at the regional and local level involved "a discovery process where firms, unions, other interest groups, experts, and the state learn about costs and opportunities and then engage in strategic coordination"<sup>6</sup>As they write, "On one hand,

there was more nonmarket coordination across policy areas, as one would expect to find in a CME. On the other hand, the mechanisms of coordination were less centralized and more inclusive, as one would expect to find in a LME.”<sup>7</sup> This shared trend of effective coordination taking place at the decentralized level may signal something greater about the nature of economic organization that we already to some degree know—that post-Fordism and the decentralization of production are revolutionizing the study of political economy. To what extent this is true on global scale, however, deserves further study.

The literature on the US innovation system is not the first time commentators have suggested America is not as “pure” as the traditional narrative has it. Crouch argues that the US government’s role in the defense industries could be defined as “state enhancement” of the nation’s economic productive capacity, a practice that is not in line with the LME model.<sup>8</sup> Moreover, much of the US advantage in the information technology industry evolved due to coordination between corporate hierarchies and government leadership, which is not described in Hall and Soskice’s LME model. But most importantly to this thesis, Schneiberg has identified coordinating institutions within American state government structures that don’t fit to the national LME category. As he writes, “scholars have effectively ignored the incursion and elaboration of ‘coordinated or cooperative market economies’ within the American ‘liberal market’ order.”<sup>9</sup>

The traditional institutional account of the US political economy revolves around two key claims. The first that the economy was, until recently, for the most part governed by large vertically integrated corporations in a system of mass production through impersonal markets in the service of private for-profit enterprises. The second is that impersonal markets and for-profit enterprises precluded alternative forms of economic

organization from growing during the “era of consolidation” in the 19<sup>th</sup> and 20<sup>th</sup> century, sending the US deterministically down its LME pathway.<sup>10</sup>

There is a great deal organizational variety within the US capitalist system that suggests this narrative isn't as accurate as many think. Schneiberg maps out an alternative path to the one traditionally ascribed to the US and provides a new theoretical framework explain how “flotsam and jetsam” from alternative paths of political economic systems travel alongside the dominant historical pathways. He identifies alternative paths of economic organization geographically clustered in places where constitutional struggles over the nature of American economic organization took place. Through a regression analysis, he finds a correlation between the emergence over time of a series of state and community owned industries in the early 20<sup>th</sup> century, ranging from electricity to agriculture to insurance. When examined in detail, Schneiberg found that state-owned electrical utilities and consumer-owned cooperatives controlled more than half the market share in some states. In these states, more than half of the electrical industry was controlled by systems of economic organization other than private-firm centric, for-profit capitalism—a truly path-breaking empirical finding. He argues that it seems possible these forms of organization grew together in the same communities—the same set of states, primarily in the Midwest and the South—over time due to some other institutional factor.

Schneiberg's addition to the literature greatly informs that of this thesis. While the growth of the post-Fordist economy has made agglomeration effects and subnational governance more important than ever, subnational systems of economic organization and growth have always been important. Indeed, further research should investigate whether



there are any significant correlations between which states pursued “high-road” industrial policies and which ones contained Schneiberg’s “flotsam and jetsam.” Perhaps the same factors that led to Schneiberg’s identified subnational heterogeneity influenced the state-level industrial policies identified in this thesis. One should note that many of the programs that pre-figured the design of the American innovation system grew out of subnational programs originating in the Midwestern and Southern states—the same states identified as being locations of constitutional conflict and of “flotsam and jetsam” by Schneiberg. For example, the Pennsylvania Ben Franklin Partnership and the Ohio Thomas Edison Program were models for the 1988 Omnibus Trade and Competitiveness Act, which created the MEP and the ATP.

With this knowledge, perhaps it is possible Schneiberg’s abandoned pathways might be more robust and influential than scholars have previously thought, particularly in the critical apparatus of technology development that has evolved over the past four decades. Or, perhaps the 1970s witnessed their own period of struggle over the organization of American capitalism—separate from but comparable to those identified by Schneiberg. For those who would like to see America regain some of its broad-based wealth generating capacity, this is exciting news. The institutional presence of non-market coordinating institutions might signal a kind of hybrid flux, where these institutions “snowball” the in US system, taking it towards the CME model, or perhaps some new hybrid model, to forge “wholly new pathways within the womb of the old order.”<sup>11</sup>

In short, the American story of subnational economic development is far more heterogeneous than Hall and Soskice have presented in their theoretical model. National

political economies, it seems, may be organized by a different typology than the VoC literature provides. This finding certainly brings into question whether or not nations should really attempt to “specialize” their systems in one direction or the other to get the benefits of institutional complementarities. It may even suggest that the VoC literature represents an attempt by social scientists to impose order and systematize on a world that, by its very nature, evades systemization.

And importantly, though the institutions identified within the US innovation system that contradict the VoC literature are significant to the study of political economy, we should not overstate what the current system can achieve. It must be acknowledged that though these programs are important in their qualitative shift away from the LME form of capitalism, and it is equally important that they have played such a key role in the nation’s development, it seems unlikely that they might soon overthrow the overwhelmingly dominant forces of neoliberalism and austerity. If anything, they merely suggest that other alternatives are, or were, possible. One might look to the example of the Obama administration’s failure as evidence of the “stickiness” of the American path. Indeed, Obama’s attempt to shift the nation onto a new path is laudable, and the current administration has likely made a great deal of progress towards a more sustainable model of economic growth. But they certainly have not lifted the nation’s working class out of poverty. And the states’ efforts, though similarly laudable, are ultimately bound by their fiscal constraints and their political realities. This isn’t to say, however, that those boundaries prevent the states from making any progress at all.

On April 5<sup>th</sup> of 2016, Governors Jerry Brown of California and Andrew Cuomo of New York enacted an increase in their states’ minimum wage to \$15 dollars an hour.

Secretary Hilary Clinton, who is running for president, spoke at a rally with Governor Cuomo celebrating his new bill. Robert Reich is a vocal public advocate of increasing the minimum wage to \$15 dollars. “Raising the minimum wage to \$15 dollars an hour isn’t just smart economics,” he says in a video on his website. “It’s the right thing to do.” It seems Reich has mostly given up on the enterprise of industrial policy. In *Aftershock*, one of his recent popular books, Reich advocates for a redistribution of wealth to stimulate demand—basic Keynesianism.<sup>12</sup> Even Reich, when he was arguing in the 1980s, admitted that industrial policy could only solve “about 40 percent” of the nation’s economic problems.

Hillary Clinton, on the other hand, seems to be the new candidate of industrial policy. One of her main policy proposals is to restructure the tax code such that capital gains taxes are lowered for investors who provide longer-term loans, incentivizing the provision of patient capital. And yet Clinton is notably represented as the “moderate” candidate in the Democratic primary for president. Might this signal that industrial policy is a “third-way” neoliberal accommodationist stand-in for real progressive public policy? After all, Bill Clinton, the foremost representative of the US “third-way,” championed technology-based industrial policy during his presidency. He oversaw the consolidation of a great number of HDNS programs. Moreover, Bill Clinton and “third-way” democrats have long championed the public-private partnership, a staple of the US innovation system. The public-private partnership has been widely ridiculed as a neoliberal institution. There is a great deal of evidence that the contracting out of government functions to private actors makes it difficult for the government to take credit for those functions,<sup>13</sup> limiting chances for people to recognize the positive role the government

plays in their lives. Obscuring the role of the government is likely the reason these policies have become so effective, and why they are so favored by politicians on both sides of the political aisle.

But despite these hesitations, the appeal of industrial policy is obvious. I chose industrial policy as the subject for this thesis because I wanted to examine the forces that drove the greatest period of equitable growth in the history of the world. In studying industrial policy, I hoped to inform potential strategies to achieve that same equitable growth.

And yet, the conclusions drawn by this thesis are mostly grim. It seems unlikely that the labor-intensive manufacturing jobs that were once the cornerstone of the US model are ever coming back. Many of those jobs haven't just left; they've been replaced by technology. America may need to face the prospect that the broad-based employment opportunities in traded sectors that have been the key drivers of shared prosperity are going to continue to disappear. It is very likely that the service economy is going to hold a central role in the nation's industrial makeup for the foreseeable future. Such a prospect suggests that more than industrial policy will be necessary to forge an equitable American political economy. We will need to consider that paying people "what they are worth" is no longer a sustainable, or a morally responsible, option.

Technology in the cultural imagination has always been represented as the tool by which society will achieve a utopian vision where people are treated fairly, no matter what job they have, or who they are. Perhaps society is nearing the point where the main constraint in reaching that vision is no longer technological capacity building, but is instead something more human: political economy. Today, the states seem like the most

realistic vehicle to achieve the kinds of policies that might bring that vision. The states have the power to increase wages and benefits for service workers. And meanwhile, the federal government is still locked in what sometimes seems to be a constitutional disaster. The separation of powers, designed by the founders to balance ambition against ambition, appears to have failed as two highly polarized political parties have colonized the federal government. For this reason, the American states, with their deeply flawed history, seem to be the most promising unit of governance in the American system of government. This is true even beyond industrial policy, and there are no doubt plenty of other problems for the states to solve. We might hope this to be the one benefit of living in a decentralized, fragmented policy: that though public policy in America is for the large part static, often disastrously so—there are and always will be those unconscious philosophers to turn to, the American states.

# NOTES

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## INTRODUCTION

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<sup>4</sup> Frank Dobbin, *Forging Industrial Policy: The United States Britain, and France in the Railway Age*. (New York: Cambridge UP, 1994)

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## CHAPTER ONE

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<sup>2</sup> Rebecca Kaplan, “Obama: Income Inequality ‘The Defining Challenge of Our Time’” *CBS News*, December 4, 2013.

<sup>3</sup> Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies* (New York: W.W. Norton and Company, 2016), 132.

<sup>4</sup> Craig Becker, “The Pattern of Union Decline, Economic and Political Consequences, and the Puzzle of a Legislative Response.” *Minnesota Law Review* 98 (2013): 1637-1650.

<sup>5</sup> U.S. White House, *The 2015 Annual Report of the Council of Economic Advisers*, by Jason Furman, Betsey Stevenson, and Maurice Obstfeld. 31.

<sup>6</sup> Michael Elsby, Bart Hobjin and Aysegul Sahin. "The Decline of the US Labor Share." *Brookings Papers on Economic Activity* 2 (2013): 1-63.

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<sup>8</sup> See Becker, “The Pattern of Union Decline,” 1639; David Jacobs and Lindsey Myers, “Union Strength, Neoliberalism, and Inequality Contingent Political Analyses of US Income Differences Since 1950.” *American Sociological Review* 79, no. 3 (2014); Tali

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<sup>10</sup> Josh Whitford, *The New Old Economy: Networks, Institutions, and the Organizational Transformation of American Manufacturing*, (New York: Oxford University Press, 2015), 1.

<sup>11</sup> David Rueda and Jonas Pontusson, "Wage Inequality and Varieties of Capitalism." *World Politics* 52, no. 3 (2000), 354.

<sup>12</sup> See Hall and Soskice, *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. (New York: Oxford University Press, 2001).

<sup>13</sup> Oliver Williamson, *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. (New York: Free Press, 1985).

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<sup>16</sup> Mark Blyth, *Great Transformations: Economic Ideas and Institutional Change in the Twentieth Century*. (New York: Cambridge University Press, 2002).

<sup>17</sup> Hall and Soskice, *Varieties of Capitalism*, 17.

<sup>18</sup> Graham, *Losing Time*, 1.

<sup>19</sup> See Frank Baumgartner et al. "Punctuated Equilibrium Theory: Explaining Stability and Change in Public Policymaking." *Theories of the Policy Process* (2014). ed. Paul Sebatier (Colorado: Westview Press, 1999); Fred Block, "Crisis and Renewal: The Outlines of a Twenty-First Century New Deal." *Socio-Economic Review*, 9, no. 1 (2011); Robert Higgs, *Crisis and Leviathan: Critical Episodes in the Growth of American Government* (Oakland: The Independent Institute, 2012); Blyth, *Great Transformations*.

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<sup>21</sup> Robert Reich and Ira Magaziner, *Minding America's Business* (New York: Law & Business Inc., 1982), 343.

<sup>22</sup> Ibid 12.

<sup>23</sup> Ibid 34.

<sup>24</sup> Graham, *Losing Time*, 73.

<sup>25</sup> "Democrats Face New Debate Over an Industrial Policy," *The Washington Post*, November 11, 1984

<sup>26</sup> Graham, *Losing Time*, 73.

<sup>27</sup> Ibid 50.

<sup>28</sup> Ibid 85.

<sup>29</sup> Ibid 50.

<sup>30</sup> Ibid 48.

<sup>31</sup> Johnson, *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925-1975* (Stanford: Stanford UP, 1982), 313.

<sup>32</sup> Ibid 313

<sup>33</sup> Hall and Soskice, *Varieties of Capitalism*, 34.

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- <sup>34</sup> Graham, *Losing Time*, 86.
- <sup>35</sup> Johnson, *Miracle*, 315.
- <sup>36</sup> Ibid 312.
- <sup>37</sup> Graham, *Losing Time* 87.
- <sup>38</sup> Hall and Soskice, *Varieties of Capitalism*, 35.
- <sup>39</sup> Graham, *Losing Time*, 66-68.
- <sup>40</sup> Ibid 68.
- <sup>41</sup> Johnson, *Miracle*, 323; Graham, *Losing Time*, 86.
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- <sup>43</sup> Barfield and Schambra, *Politics of Industrial Policy*, 189.
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- <sup>60</sup> Eisner, *American Political Economy*, 113.
- <sup>61</sup> Stein, *Decade*, 187.
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- <sup>63</sup> Johnson, *Miracle*, 318.
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## CHAPTER TWO

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<sup>3</sup> Larry C. Ledebur, "Washington: Let's Try a Federalist Industrial Policy." *Challenge* 26, no. 5 (1983), 58.

<sup>4</sup> Ibid 58.

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<sup>7</sup> Graham, *Losing Time*, 191.

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<sup>9</sup> Ibid 193.

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<sup>11</sup> Ledebur, "Federalist Industrial Policy," 58.

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<sup>21</sup> Ibid 197.

<sup>22</sup> David Osborne, *Laboratories of Democracy: A New Breed of Governor Creates Models for National Growth* (Cambridge: Harvard Business School Press, 1988), 1.

<sup>23</sup> Ibid 2.

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## CONCLUSION

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