Herbert Hoover's Last Laugh:

The Enduring Significance of the "Associative State" in the U.S.

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Bio

Hart is an assistant professor of public policy at the John F. Kennedy School of Government, Harvard University, and co-organizer of the Boston-area Workshop on American Political Development. This paper draws on his book, Forged Consensus: Science, Technology, and Economic Policy in the United States, 1921-1953 (Princeton: Princeton University Press, 1998).

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Abstract

The vision of an Aassociative state,@ which would facilitate cooperation among businesses and between business and government in order to stabilize the economy and make it grow, dates back to Herbert Hoover=s tenure as Secretary of Commerce. While never fully triumphant as a guide to American state-building, this vision has not disappeared either, experiencing occasional periods of popularity. Focusing on the governance of technological innovation, this paper traces the influence of the associative vision from Hoover=s heyday through the New Deal and World War II and argues that its revival over the past decade is not coincidental. The enduring significance of the Aassociative state@ in the U.S. is explained by reference to the limits on ideological discourse in economic policy-making, the structural incentives for policy entrepreneurship, and the availability of legacies from earlier rounds of associative policy entrepreneurship.

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State-building in America is a tortuous process. Policy entrepreneurs who seek to establish new state capacities face significant ideological and institutional constraints. These constraints often limit the scope of their entrepreneurship and typically force them to compromise or adapt their ideals to fit political circumstances. Yet, although its path of development has been convoluted, there is an American state and not a trivial one at that. Indeed, the same features of the polity that constrain state-building can also motivate and support it.

This paper explores these tensions by tracing the fate of science, technology, and industrial policy proposals that have drawn on what Ellis W. Hawley labels the "vision of an associative state." Beginning in the 1920s, as I describe more fully below, associationalists believed they had discovered a way to solve the troublesome coordination problems of capitalism without trampling on managerial prerogatives. By fostering cooperation among firms and between firms and the government, associationalists hoped (and still hope) to remold the self-interest of businessmen to accord more closely with the public interest, eliminating stampedes of bulls and bears and fostering steady, rapid economic growth.[1]

The associative vision reflects the ideological constraint imposed by the American liberal tradition. "Planning," to use the characterization of Keynes=s biographer Robert Skidelsky, is out of bounds. "Freedom," on the other hand, has not always worked well enough, as the country's periodic crises illustrate. As a result, policy entrepreneurs have undertaken a perpetual search

for a Amiddle way@ between the two poles. Keynesianism is one product of this search; associationalism, another. If liberalism provides a boundary constraint on entrepreneurs, so too does it provide fertile ground for them to rework its basic terms as times change.[2]

The associative vision has never been triumphant as a guide to American state-building, and yet it rises like a phoenix after every defeat. The ideological promise of a middle way is part of the explanation for its endurance. Another part of the explanation is institutional. The American institutional order, particularly the separation of powers, helps in some regards to maintain the liberal tradition. Conflicts among institutions over jurisdiction, for instance, may leave the American state Ahapless,@ as Stephen Skowronek puts it, reinforcing antistatism.[3] Yet, the diversity of institutions also spawns policy entrepreneurs who link policy change with the expansion of institutional authority. Moreover, because the winning coalitions vary across institutions and conflicts among them need not necessarily be resolved, the system can generate a diverse range of policies and implementing agencies, which are not always coordinated and may in fact be contradictory.

Despite a weak Congressional base, associationalists have occasionally been able to establish modest institutional outposts that keep their vision alive, thanks in part to Presidential support. These pockets of programmatic innovation, both inside and outside of government, produced tantalizing evidence of success in solving economic problems. When later policy entrepreneurs sought to address these problems more fully, associative solutions were there to be found. Private intransigence and attacks from both ends of the ideological spectrum tarnished the associative vision in practice, but not enough to prevent the wheel from coming around again and again.

The next section of the paper describes the associative vision of the state more fully. The bulk of the paper is empirical, illustrating my argument by analyzing an historical sequence of policy debates. During that 1920s, associationalism remained a subordinate theme in U.S. economic governance, despite Herbert Hoover's activism on its behalf as Commerce Secretary. As President, Hoover retreated from the associative vision; it was his successor, Franklin D. Roosevelt, ironically, who carried out the most ambitious tests of it. While these experiments, notably the National Recovery Administration (NRA), were widely perceived as miserable failures, associationalism did not disappear. The core of Hoover's vision -- a state oriented to remedying the informational failures of capitalism through cooperative interfirm and business-government interaction -- was carried forward in some major industries after the 1930s and offered as a governing principle during World War II. Obscured by alternative approaches to governance and the profusion of Federal agencies after the war, the associative vision reappeared in the 1980s. The associative experiments of the 1920s, 1930s, and 1940s left hidden legacies that are being drawn upon in contemporary U.S. politics and should not consigned, as they often are, to the historical dustbin.

Herbert Hoover and the "Associative State"

About twenty-five years ago, historians working from materials held by the newly-opened Herbert Hoover Presidential Library began a major reevaluation of Hoover's career and influence. Painted by most earlier historians as rigidly conservative, Hoover emerged from revisionist scholarship as an administrative innovator. Ellis W. Hawley's seminal 1974 article synthesized this work, arguing that Hoover, especially as Commerce Secretary, was motivated

by "the vision of an 'associative state.'" Skeptical that a modern society could solve all its problems spontaneously, Hoover believed that the state had to catalyze the reform of private institutions.[4]

Hoover saw economic difficulty, such as the steep recession of 1921-22, as the result of ill-informed individual decisions that could be remedied by learning. Businessmen who reacted to bad news by cutting prices and production, thereby driving the economy in its downward phase, for instance, might come to recognize that the business cycle was an artifact of irrational herd behavior. Given a basic scientific understanding of the economy and mechanisms for sharing their knowledge of current activity, they would realize that it was in their self-interest to maintain a steady hand in the face of adversity. As Hawley=s student Guy Alchon has put it, Hoover took "a microeconomic approach to macroeconomic coordination."[5]

Trade associations were to be the primary instruments for achieving this coordination. Despite his aspirations for higher office and years of public service, Hoover retained a deep skepticism of politics and government, which were prone to ignorant demagogues and bureaucratic placeholders. In place of legislation, which he noted is Aalways clumsy,@ Hoover preferred Aself-government@ by trade association committees that bridged the public and private sectors, bringing together representatives of key organizations and neutral experts. Being private and voluntary, trade associations were flexible and could easily adapt to changing circumstances. The state could play a useful role by helping to organize such associations and by providing technical support to them upon request, but they were most adamantly supposed to be non-governmental.[6]

Science and technology were particularly important objects of Hoover=s efforts. To the

AGreat Engineer,@ who became the first President to put a telephone on his desk, the aggressive pursuit of scientific knowledge and technological innovation was a matter of faith, essential to economic growth and social improvement. If unenlightened self-interest ran amuck in the absence of coordination by trade associations, firms and the nation as a whole would underinvest in science and technology. Unmitigated economic competition inspired fear that the risks incumbent in innovation would not be rewarded; great ideas were stifled for fear of being stolen. AWasteful@ competition also contributed to the atomization of industry, which hindered long-term, large-scale investments in modern research and development (R&D).[7]

An ideal associative state would see to it that the latest research findings and information about best practices were diffused, so that industry would be continually rationalized toward ever-higher efficiency. Industry-wide research facilities, typically operated by trade associations (perhaps in conjunction with government bureaus), would generate such knowledge efficiently. These institutions would foster close relationships among research executives and among bench-level scientists and engineers across the industry to set R&D priorities and harmonize expectations of future change. Such collective efforts would perfect the market by Agiving the small unit the same advantages which are already possessed by big business" and by providing consumers with better products.[8]

Hoover=s associative vision stemmed in part from the brief but intense experience of World War I. The War Industries Board (WIB), which had been headed by Hoover=s great rival, Bernard Baruch, provided both a model and personnel. By organizing industry and infusing it with patriotic sentiment and economic information, the WIB had tried to harmonize public and private purposes, avoiding both government domination that might be carried over into

peacetime and price-gouging that would disrupt the war effort. Many of the Progressive scientists and engineers who had helped to formulate the WIB=s approach and the Adollar-a-year@ men on loan from business who had tried to put it into practice migrated to Hoover=s side in the late 1910s and early 1920s. Hoover=s chief vehicle for policy entrepreneurship was the Commerce Department, which was little more than a hodgepodge of disconnected bureaus when he was confirmed as Secretary in 1921. He sought to mold it into a into a broad and coherent organization that could promote the associative vision, with his men as the Aeconomic general staff.@[9]

As Hawley, among others, has noted, associationalism existed inside Hoover in uneasy tension with more traditional conservative ideals. Associative mechanisms perfected a fundamentally sound market economy. Hoover opposed the exercise of coercive power on behalf of associative goals and the delegation of such power to industrial associations by the state. He abhorred the German cartel system, although he worried about its technological dynamism in global economic competition with the U.S. As Secretary of Commerce, therefore, Hoover focused his efforts at the margins. General Electric and General Motors were doing nicely, but the so-called "sick" industries needed a Federal push to govern themselves more productively and efficiently, while brand-new high-technology industries had to be encouraged to develop the appropriate institutions of self-government.

Associationalism in the "Sick Industries"

The sick industries were old and composed of small units that did not benefit from economies of scale. No matter how low their taxes were, they lacked the incentive to invest in

new technology, instead competing on price by sweating labor and cutting wages. They also faced the threat of the "new competition" across established industry lines, which suddenly put them at the mercy of corporate giants. Textile makers, for instance, were beginning to encounter competition from synthetic products introduced by chemical firms that had large internal research programs. Associationalists aimed to solve the industrial collective action problem that inhibited investment; the Anew competition" was to be met with the "new cooperation." Trade association research programs, supported jointly by the membership, could develop and diffuse improved practices and equipment. Consumers, workers, managers, and shareholders would all share in the benefits.[10]

The Department of Commerce's aid to sick industries was primarily provided through the Bureau of Standards. The Bureau's ten-point program took as its blueprint Waste in Industry, a postwar study by the Federated American Engineering Societies (FAES), of which Hoover was president, that grew out of the work of the WIB Conservation Division. This program included among its ten points simplification, standardization, and scientific research.[11]

The Bureau's new Division of Simplified Practice was supposed to bring the benefits of Ford-style mass production to the sick industries. Fewer product lines meant longer runs; greater interchangeability meant that suppliers competed on quality and efficiency, rather than locking customers in to their products. With Hoover at the controls, the Division launched a publicity crusade in 1922 to spread Aproductivity consciousness@ and get firms involved in a seven-step process of simplification. The centerpiece of the simplification process was a conference run by a trade association to develop a consensus on the revision of practices; the association then bore the responsibility for promoting the results. By the end of Hoover=s Secretaryship in 1928, the

Division claimed credit for the adoption of its recommendations in 95 industries and estimated the benefits to the nation=s $18 billion manufacturing sector at $600 million.[12]

AWaste,@ as understood by Hoover, encompassed the inability of firms to develop new technological opportunities through research as well as the failure to exploit existing opportunities through simplification and standardization. The Bureau of Standards advanced cooperative scientific research in sick industries through its research associates program. Begun after World War I, the program entailed the stationing of scientists paid by private sources at the Bureau. Each associate worked on an agenda designed by a joint committee of Bureau personnel and experts from his industry. This work was required to be published and disseminated widely; it could not be patented. At the program's peak in 1929, the Bureau hosted 98 associates from 48 industries at a cost of about $200,000 to the Bureau and an estimated $500,000 to outside sponsors. Another 900 industrial researchers participated in program planning.[13]

The cement, textiles, lumber, and housing industries were among those that took advantage of the Bureau's services. The Portland Cement Association, for instance, put eight research associates to work. The Cotton Textile Institute, formed under the benevolent gaze of Secretary Hoover in 1926, sponsored a man at the Bureau through its New Uses Division in the late 1920s. The lumber industry sought simplified practices and improved products in cooperation with the Bureau through the Hoover-organized Central Committee on Lumber Standards and the National Committee on Wood Utilization. The Bureau=s new Division of Housing sought to cut construction costs by 10-20% by developing model building codes and zoning regulations and conducting research in conjunction with building materials trade associations.[14]

The sick industries' importance lay in their large employment and the danger that their instability would infect the entire economy. At the other end of the spectrum were brand-new industries of little present consequence but enormous growth potential. Beyond these lay unknown future industries that only fundamental scientific research would reveal. Associationalists saw a role for the Federal government in creating the institutions, whether public, private, or mixed, that would ensure the full development of these possibilities. The new industries' difficulties were more varied than those of the sick industries, in which a consistent remedy of organization and technological rejuvenation was applied, and Hoover and his aides struggled to adapt their associative ideals to each.

Aviation, for instance, was subject to an extraordinary boom and bust because of World War I. From a peak rate of 21,000 planes per year when the Armistice was signed, production fell to just 263 in 1922. Without military demand, the large investments needed to commercialize air transportation intimidated potential investors from joining this risky business. Hoover characteristically tried to solve this problem by organizing a trade association, the Aeronautical Chamber of Commerce, to stabilize and promote the business, to be supported by cooperative technical research. The National Advisory Committee on Aeronautics (NACA), an independent Federal research agency established in 1915, conformed reasonably well to the associative vision, despite the fact that it was a government organization; it conducted its work under the direction of industrial-government-academic committees. The NACA brokered an industry-wide cross-licensing agreement for aviation patents, although disputes over design

rights left the industry far from the harmonious technical community that the associationalists dreamed of. Hoover also aided academic aeronautical researchers, not from the Federal purse, but by inducing the Guggenheim family to establish a $2.5 million fund for their support.[15]

The radio craze of the 1920s was unforeseen by manufacturers or policy-makers. The technology of radio appeared to be stalled at the end of World War I by a patent deadlock. Goaded by the Navy, which wanted the technology for intercontinental communication to remain in American hands, the leading patent-holding firms formed the Radio Company of America (RCA) to pool their patents, jointly develop technology, and divide the market. Broadcasting came as a surprise. This market proved to be so big and the technology so simple that start-up firms simply infringed RCA's patents with impunity. Hoover tried, with some success, to bring order to the chaos, exerting influence over the Federal Radio Commission, but complaints that RCA was a ARadio Trust@ persisted. In 1930, RCA, under pressure from the Justice Department, offered to license its patents to all comers for a reasonable royalty. This "open patent pool" in radio seemed to be a useful model for preventing both monopolistic abuses on the one hand and the failures of collective action characteristic of atomistic industries on the other. Yet associationalists found the practice faintly troubling, since it required the employment of Justice=s coercive power, superseding the voluntary cooperation that Hoover esteemed.[16]

While the radio and aviation industries avidly sought government oversight and assistance, academic scientists were more mistrustful of Federal power. This sentiment was evident in the organization of the National Research Council (NRC), which was conceived in 1917 as a private organization carrying out the public function of war research. The NRC metamorphosed after the war into a sort of Atrade association for science,@ promoting

cooperation, defining interdisciplinary research agendas, and administering foundation-funded graduate fellowships. Secretary Hoover saw the NRC=s significance to lie not only in the pursuit of truth, but in industrial development as well. "Pure research," he often said, "is the raw material of applied science." Hoover enthusiastically led an effort to broaden the NRC=s funding base by seeking $20 million from business for a National Research Endowment (NRE). This Endowment was intended to take the Atrade association for science@ one step further, embodying private cooperation to produce a good, scientific knowledge, that was in the self-interest of all businesses. Hoover and his allies labored to make the connection between academic research and industrial profits plain to men like Baltimore & Ohio Railroad president Daniel Willard, but public and private interest too obviously diverged. As Lance Davis and Daniel Kevles have shown, what little fund-raising success the NRE had was with monopolists, who had a much higher probability of extracting benefits from their gifts than firms in competitive industries. The effort dragged on into the Hoover Administration until the Depression finally put an end to it.[17]

President Hoover=s Paralysis

Although they were relatively small, these associative programs were wreathed in fanfare, much of which was prompted by Hoover's public relations apparatus. Some of the praise was deserved. R&D done by NACA and the Guggenheim Foundation, for instance, advanced aircraft technology significantly, although the industry never approximated Fordist mass production. More commonly, however, the programs= effects were less than impressive. Of the 95 industries that adopted simplified practice recommendations made by the Bureau of

Standards, for example, some were trivial, like hotel china, while in others, firms simply ignored the recommendations. Most trade associations were too plagued by contention and defection to make the long-term investments that were needed for research to pay off. The housing industry=s situation was more ominous than most; construction fell by nearly half between 1925 and 1929 and proved to be the leading edge of the coming Depression.[18]

As the nation's economic problems gathered force after October, 1929, the vehicles of the associative state in science, technology and industrial policy that President Hoover had relied upon while serving as Secretary of Commerce were gravely weakened. The Bureau of Standards' research associates program, for instance, was cut in half by 1933. Direct funding for industrial research at the Bureau dropped by 70%, as Congressional Democrats laid siege to Hoover=s old Department. The National Research Council approached bankruptcy in the same period, and its hierarchy forced the Division of Engineering and Industrial Research (DEIR), its strongest associationalists, to absorb the brunt of the Council=s budget cuts. DEIR staff had to seek outside support for their trade association research promotion project, with grim prospects. Falling prices directly undermined industrial trade associations, too, as firms found it much more difficult to cooperate on long-term projects. Trade association research naturally declined.[19]

Yet, the cancer in what the President had previously regarded as the economy=s vital organs did not provoke his Administration to undertake radical measures. Rather than seeking to use the state to accelerate technological innovation as part of the Federal response to the Depression, Hoover exhorted economic actors to cooperate voluntarily, blamed foreigners, and fell back on the old tool of budget economies. Conservatism trumped associationalism in this policy area. Hoover rejected a plan offered in September, 1931, by Gerard Swope, the president

of General Electric, that was supposed to remove the Depression-induced "psychology of fear" by requiring firms to join trade associations. These associations would manage prices and production under government supervision, while ensuring that workers received an array of welfare benefits, including unemployment insurance and pensions. Swope called for trade associations to mandate simplification and standardization as well as any other activities that would support industrial growth and development. The benefits that Hoover hoped to achieve through voluntary cooperation were to be accomplished under the Swope Plan by coercing the recalcitrant minorities that seemed to scuttle every voluntary plan. But Hoover would have none of it. Coercion made the plan a step toward European fascism -- Athe most gigantic proposal of monopoly ever made in history@ -- rather than the realization of enlightened American individualism.[20]

New York Governor Franklin D. Roosevelt defined himself during the 1932 Presidential campaign largely by not being Hoover, while Hoover became a veritable apostle of the laissez-faire faith. This dynamic made it possible for the new President to build on the ideological and administrative legacy of his despised predecessor. The associative undercurrents of the conservative 1920s became the wellsprings of Abold, persistent experimentation@ in the 1930s. Without acknowledging it, ADr. New Deal@ prescribed a hefty dose of the new, improved associationalism.[21]

Cooperation for Progress and Protection: Science and Technology in the NRA

The most important industrial legislation of 1933 was the National Industrial Recovery Act (NIRA), which bowed to practically every theory of the Depression in a hodge-podge welter

of statutory objectives. The NIRA delegated authority to industrial trade associations that were supposed to write and enforce codes of fair business practice under the supervision of a National Recovery Administration (NRA). The statute was so vague that its meaning was inevitably fought out in its implementation, shifting the central arena for policy-making from the legislative branch to the executive branch and the quasi-public Acode authorities@ themselves. The critical issue in this fight was whether industry would truly govern itself, as the associationalists who joined the grand NIRA coalition expected, or whether government supervision would have real teeth, as more radical reformers who had supported the NIRA hoped. Although the associationalists were perceived to be victorious in the year following enactment, it proved a pyrrhic victory when the entire NRA edifice collapsed in 1935.[22]

In research and development, the new, improved associationalism promised an end to free-riding and the security to invest funds without fear of crank inventors and nuisance patents. By taking prices and wages out of competition, the policy was intended to make firms compete on the basis of service and quality, to which technological innovation could make major contributions. New Deal associationalists, like the sociologist S.C. Gilfillan of the University of Chicago, hoped that the NRA code authorities would extend the Hoover Commerce Department=s policies by mandating fees on individual firms for the support of industry-wide research programs. The authorities might also manage patents pooled by all their members. Gilfillan claimed his ideas "would substitute intelligent trade and national planning for haphazard development of inventions, prevent duplication of effort, pour as much funds as seem fit into each research deemed hopeful and desirable...[and suppress wasteful spending on patent litigation]." To other associationalists, however, technological innovation was seen to be an

aspect of "chiseling," a term applied to all practices that drove down prices and destroyed industrial order. They recognized that associative forms of governance, like patent pools, could be used to prevent the introduction of new technology that caused installed capital to become obsolete. [23]

The mechanics of NRA code-writing were unclear in law and chaotic in practice. Self-organized industry was supposed to take the lead, but its efforts were to be overseen by the NRA in Washington, including Consumer, Labor and Industrial Advisory Boards, which were authorized to represent these constituencies at all code hearings. To this array of institutionalized interests, Karl Compton, the president of MIT, and Isaiah Bowman, the president of the NRC, hoped to add a Science Advisory Board (SAB) to serve as a comparable voice on behalf of technological innovation in the codes. They sensibly proposed that the SAB focus on older industries, like textiles and steel, that were likely to be tempted to use the NRA for protection from new technologies. On this score, Compton and Bowman were frustrated. While they ultimately succeeded in establishing an entity called the SAB, chaired by Compton, it had no voice in the NRA and its name was a relic of unfulfilled hopes.[24]

In addition to attempting to gain a seat at the table in code negotiations, Hoover=s heirs tried to lead by example through the writing of model codes. The earliest model industrial codes predated the NIRA, emanating from the Commerce Department=s Bureau of Foreign and Domestic Commerce in 1932; they called for cooperation in product and process research as well as in simplification and standardization. In 1933, Maurice Holland of the NRC DEIR drafted a paragraph on industrial research for inclusion in the model code being prepared by NRA headquarters and made extensive efforts to interest trade association executives in the subject.

Like Compton and Bowman, Holland was rebuffed by industry executives on the one hand and reformers in the government on the other. Both model and actual NRA codes were more likely to ignore research or even to authorize controls on modernization than to promote it.[25]

These failures presaged the realization of pessimistic expectations that, as the New York Times editorialized, the NRA would "throttle invention." The code authorities could barely distinguish between beneficial price rises and gouging, much less determine when worn-out equipment ought to be replaced and with what sort of new equipment. Consequently, only simple controls that regulated an industry's overall production capacity could feasibly be implemented by the industrial Aself-governments,@ and these tended to be adopted by those industries that wanted to avoid further expansion. About 15-20% of the codes ultimately imposed some regulations that directly affected the pace at which plants were modernized, including capacity controls, machine hour limitations, and production quotas. As the most authoritative contemporary assessment of the NRA, carried out by the Brookings Institution, put it, "By admitting capacity control provisions into codes, the NRA in effect certified it to be in the public interest that the present amount and ownership of productive equipment be frozen in its existing pattern..." [26]

The accuracy of the claim that the NRA was a drag on technological innovation is probably impossible to assess for certain. The short tenure of the agency and its dubious effectiveness in enforcing any of its regulations suggest that the critics overstated their case. Nonetheless, after its demise, the notion that the "meaning of the NRA" was a "showdown with progress" took hold among observers of all persuasions.[27]

The Politics of Railroad Innovation

The triumph of associationalism in the governance of the railroad industry also resulted in protectionist, rather than progressive, economic policy. Like other sick industries, railroads faced new technological competitors with which they were ill-prepared to cope. The Emergency Railroad Transportation Act (ERTA), which passed on the same day as the NIRA in June, 1933, provided for voluntary reorganization under the auspices of industry committees, to be guided by a Federal Coordinator of Transportation. The Coordinator, Joseph Eastman, lacked the power to force railroad firms to comply with his orders. In practice, the railroads operated under an arrangement much like the NRA, in which strong entities for self-government were overseen by a central state organization armed with little more than the power of persuasion.[28]

In August, 1933, SAB chairman Compton approached Eastman, following up on efforts to stimulate railroad R&D made by the DEIR=s Dugald Jackson the previous year. Compton proposed that a committee of prominent industrial research directors plan and oversee the establishment of a laboratory that would conduct fundamental research for the benefit of the entire railroad industry at an initial cost of $500,000 per year. Eastman agreed, with the caveat that he appoint railroad men and his own staff to the committee. On October 11, 1933, the two men announced the establishment of the Committee on National Railway Research Organization. The SAB members of the committee included many of the men who had worked with Hoover on the NRE, including the research directors of AT&T, General Motors, Dupont, U.S. Steel, and Alcoa; Eastman's appointees were led by General W.W. Atterbury, the president of the Pennsylvania Railroad.[29]

The committee commissioned a five-volume report on existing railroad technical

activities, and its non-railroad members quickly reached a consensus that these activities were inadequate. The railroads needed "an improved mutual organization for stimulating, directing, and planning the utilization of the results of the research." The committee's report proposed that a new research organization, which might be a subsidiary of the existing trade association or a separate research corporation (like Bell Telephone Laboratories), be created. The proposed course of action was to select a director of good "character," who was well connected to academic and industrial research networks, and then to let him identify key problems (in conjunction with industry experts) and put in place the new mechanisms of cooperation. The construction of new facilities could follow as needed. The program was to be supported by "equitable annual levy;" the report stressed the importance of patient steady funding, but provided no figure.[30]

Eastman, who had earlier reported to Congress that the railroad industry had failed to take full advantage of "innumerable opportunities" to enhance its competitive position by developing and using new technology, received the report with open arms. The SAB's leadership began prospecting for a director, with the notion that they would participate in his selection. Yet, nobody got the job, because the railroads did not create it. The new Association of American Railroads (AAR) engaged Compton to advise them on the matter, but, as an Eastman aide reported in April, 1935, the proposed Department of Planning and Research was "in a state of suspended animation." In December of that year, Eastman himself conceded he was at a loss to understand why the report had been shelved. The AAR did not establish a technical research department until 1943, and then only in response to antitrust proceedings alleging that it was impeding the adoption of new technology.[31]

The SAB initiative on railroad research, like related associative initiatives within the NRA, failed because the managers of the sick industries had a different understanding of their interests than did Compton and Eastman. Faced with losses that continued to mount, immediate damage control was the order of the day. Management=s idea of damage control was to use the powers granted to trade associations as vehicles for protection from change, rather than to mount the best competitive counterattack they could. If the experience of the 1920s suggested that voluntary cooperation in science and technology would not arise spontaneously just because managers were informed that it was in their interest, the NRA experience indicated that associations vested withe power to punish recalcitrant minorities might use that power to defend collective stagnation, rather than push the state of the art.

The Apparent Demise of the Associative State

The grand coalition that had passed the landmark legislation of 1933 dissolved well before the NIRA was declared unconstitutional in 1935, polarized over the interpretation of the failures in practice of early New Deal associationalism. Reformers who had hoped that the NRA would represent an autonomous public interest rather than merely facilitate self-government called for more aggressive administrative measures. The social commentator Stuart Chase, for instance, idealized the Tennessee Valley Authority: AThe patents are held by the government, and the development will be non-profit government business - unless the Liberty League lawyers contrive to get hold of it and lock it up in their economy of judicial scarcity. Dams, yes. But perhaps here is something more important.@ Associationalists, like Compton, who had followed Swope=s lead and moved beyond Hooverian voluntarism in the crisis atmosphere of the

Depression, saw the state being used in ways that they could not countenance and recoiled. They often adopted a Manichean perspective, assailing the emerging administrative state as antithetical to the Aenterprise system.@ Such a state would soon be compelled to dominate every aspect of a market society, including science and technology, which formed, as the Conference Board=s Virgil Jordan put it in 1935, Athe essence of the enterprise system.@ Only a few lamented, with Federal Trade Commissioner Nelson Burr Gaskill, that the ANRA almost discovered the true public interest in this matter of regulation of competition and then turned back.@[32]

One manifestation of the apocalyptic turn among associationalists was the joint scientific research committee of the American Institute of Physics (AIP) and the National Association of Manufacturers (NAM). A descendant of Compton=s "Put Science To Work@ campaign of 1934-35, the joint committee=s most visible activity was the sponsorship of major speeches to the NAM's annual Congress of American Industry. In this context in December, 1937, Compton attacked government-funded research for its inefficiency and susceptibility to "political domination.@ Lammot Dupont, whose family bankrolled the viciously anti-Roosevelt American Liberty League, echoed Compton=s complaints about Aoppressive@ government policies from the same platform, claiming that Federal labor, regulatory, and tax policies inhibited new product development. A "Modern Pioneers" dinner mounted by the committee to celebrate the 150th anniversary of the patent law in 1940 fingered "certain sinister, subversive groups" in the Administration as opponents of private property and economic liberty.[33]

Despite the dire rhetoric, pockets of associative governance persisted, as Congress transformed some emergency measures into permanent specialized regulatory authorities,

particularly in the natural resource and transportation industries. The railroad industry, for instance, freed itself from the Coordinator in 1936, with the support of its unions. Trainmen who had ridden the rails their entire lives feared technological unemployment as deeply as the executives feared technological disinvestment. Sheltered from competition by the Interstate Commerce Commission, the industry had neither the incentive nor the funds to invest in new technologies over the next few decades. But regulation did not necessarily have to induce technological stagnation. The electric utility industry, for instance, was given ample incentive by regulators (typically at the state level) to invest in advanced equipment; indeed, such investments were often the only way that they could make more money. Although utilities did little R&D themselves, their purchasing power, the steady growth of the market until the 1970s, and the engineering esprit of some particularly aggressive firms, which served as Alead users,@ motivated competing electrical equipment manufacturers to offer a steady stream of bigger and better products, which many utilities quickly adopted.[34]

The trenchant public statements of former advocates of Aself-government@ under the NRA also concealed a continued fondness for the associative vision of the state. Some admired from afar the salutary effect of the German cartel system on research, even though they despised the Nazi system as a whole. German firms pooled technical resources, while their American competitors had to go it alone. The opening of the Mellon Institute=s new building in 1937 provided an occasion for these sentiments to surface. At Pittsburgh=s Mellon, associationalists hoped, scientists supported by industry would work together on agendas set through voluntary cooperation in the manner that Hoover had extolled. The "Parthenon of granite and limestone" would be, the New York Times reported, the "salvation" of small manufacturers who would be

able to match the research resources of large firms. Edward Weidlein, the Institute=s director, emphasized the importance of constructive cooperation for industrial success, supplanting destructive price competition. The Institute's flagship program, the Industrial Fellowship System, served 142 fellows on the newly expanded campus, about half again as many as the Bureau of Standards' research associates program had involved at its peak in 1930. When war overtook economic recovery as the primary concern of the President and Congress in 1940, the associative vision surfaced once again as a guide to technological mobilization.[35]

Wartime Associationalism and Its Postwar Legacy

Although President Roosevelt=s domestic economic policies alienated associationalists, his foreign policy cleaved the policy elite differently. Many Hooverians were early believers in military preparedness. Vannevar Bush, for instance, who was a top administrator at Compton=s MIT, moved to Washington in 1939 and orchestrated a behind-the-scenes campaign for a new and more aggressive approach to military technology. In May, 1940, Bush brought a proposal for a new science agency to the President=s right-hand man, Harry Hopkins. Hopkins recognized Bush's capacity to bring the impressive capabilities of the nation=s high-technology corporations and top research universities to bear on urgent problems to which the military seemed blind. Bush wrote of Hopkins in his memoirs, AHe was a New Dealer and I was far from it. Yet something meshed, and we found we spoke the same language.@ As Congress delegated emergency war authority to the President after the fall of France, he in turn delegated science and technology matters to Bush.[36]

Following the precepts of Hoover, whom he thought of as the Achief,@ and the example of

NACA, which he had chaired, Bush organized his Office of Scientific Research and Development (OSRD) around committees composed of civilian and industrial scientists and military officers. Like Bush, most scientists and engineers working on OSRD contracts remained on the payrolls of private institutions. Non-government experts were thus placed in charge of allocating resources and setting agendas for Federally-financed research and development (R&D). Bush did his best to maintain the autonomy of OSRD=s contractors by offering generous and flexible terms, utilizing existing facilities, and decentralizing technical decision-making. OSRD committees thus bore a strong resemblance to the research committees of industrial associations envisaged by Hoover in the 1920s, able to see across organizational boundaries to identify new opportunities and to pool knowledge to realize them. The state, however, bore the cost and reaped the benefits. Voluntary cooperation (albeit impelled by patriotism) under OSRD auspices contributed immensely to such breakthroughs as radar and the proximity fuze.[37]

OSRD=s approach to technological mobilization was shared to some extent by the Army Air Forces (AAF), the most technologically sophisticated of the armed services. Like OSRD, the AAF negotiated flexible contracts that could accommodate unexpected technological advances of uncertain cost. Technological networks involving contractors, academics, and military officers emerged as a result of these contracts, with the procurement officials at Dayton=s Wright Field at their hubs. These networks were formalized in coordination committees that built sufficient trust so that designs and technical information could be freely shared. An industry-wide production council ultimately emerged as a trade association of Hooverian dimensions and infiltrated the AAF=s long-range planning process. The capabilities of U.S. military aircraft, particularly long-range bombers, were augmented substantially thanks to these associative

institutions. [38]

Although OSRD was confined to weapons and instrumentalities of war, Bush=s influence extended into civilian fields that supported the war effort. With Bush pulling the levers, the War Production Board (WPB), which oversaw the home front, rejected initiatives of New Dealers like Vice President Henry Wallace, Senator Harley Kilgore and former Representative Maury Maverick, who wanted to create a Federal capacity for industrial technological innovation that could nurture postwar civilian growth industries. Instead, influenced by former SAB member C.K. Leith of the University of Wisconsin, the WPB addressed problems in areas like metallurgy and chemical engineering through consultative committees of the NRC.[39]

The most exemplary associative scheme on the civilian side of the wartime economy governed the development of synthetic rubber, a critical priority in the early years of the war. Following the advice of the Rubber Survey Committee, which was instigated by Bush and composed of Baruch, Compton and Harvard president James Conant, the President appointed a "rubber czar" in September, 1942. The czar's R&D program built upon prewar patents held by Standard Oil of New Jersey, which were exploited under industry-wide cross-licensing and technical information-sharing agreements worked out under pressure from the Justice Department. In 1944, the government built a laboratory in Akron, Ohio, run by rubber industry research executives, to support the program. In fact, in the immediate postwar period, the big four rubber companies established a system in which their research directors rotated through the directorship of the government program. The Aguidance and the bringing about of voluntary research exchange,@ of which Bush had written to the President=s uncle, Frederic Delano of the National Resources Planning Board in July, 1942, led in the case of synthetic rubber to a large

and dynamic postwar industry.[40]

At the end of the war, the patriotic incentives for voluntary cooperation diminished, many of the most avid associationalists returned to private life, and alternative visions of the state regained their appeal. Many associative governance structures were disbanded. OSRD was shut down, and proposals by Bush and others that would have placed the management of military research permanently in the hands of civilian committees were defeated. Similarly, inter-firm and government-industry cooperation in synthetic rubber could not be sustained without the spur of a hot war. Yet, just as Hooverian associationalism shaped the Bureau of Standards and the Department of Commerce and New Deal associationalism=s influence was felt long after in the regulatory commissions, so too did wartime associationalism leave a hidden legacy. Defense procurement regulations, for instance, nominally provided for competition in military R&D, but the military services and their suppliers evolved cooperative means of diffusing new technology. Federal programs for funding academic science, too, relied heavily on self-government and voluntary cooperation.[41]

New Paths from Dead Ends: Science and Technology "Partnerships," 1980-1996

The vision of the associative state in science, technology, and industrial policy faded after its efflorescence during the mid-century crises of depression and war. But it was not entirely gone, much less gone for good. President Dwight D. Eisenhower was fond of speaking of the Amiddle way,@ utilizing private expertise and power to build consensus and shape expectations. The Business Advisory Council, which Eisenhower revived, and the President=s Science Advisory Council, created in the wake of Sputnik, can be interpreted as manifestations

of the associative vision. In the 1960s, the Kennedy Admininstration=s concern about slow growth sparked an interest in government-facilitated cooperation in such industries as textiles and construction. In the 1970s, the Carter Administration advanced new R&D programs for "generic technology" to support industry as well as plans for a government-industry-labor Economic Revitalization Board to combat the slowdown in productivity growth. Most of Carter=s initiatives were soon swept away by the vigorous conservatism of the Reagan Administration. Ironically, it was the vigor with which President Ronald Reagan acted that indirectly gave associationalism new life. The Administration=s inability to make spending cuts commensurate with its tax cuts led to large budget deficits, which in turn made the enactment of new civilian spending programs very difficult. Its huge military programs revitalized the technological capacities of the defense agencies. These two features of Reagan-era policy shaped the highly-publicized search for "new ideas@ upon which Reagan=s critics embarked, a search which ultimately led back to the associative vision.[42]

As unemployment shot past 10% for the first time in decades and the budget and trade deficits soared in the early years of the Reagan Presidency, the Anew idea@ of Aindustrial policy@ captured the fancy of Senator Gary Hart of Colorado, a Democratic Presidential hopeful for 1984, and the "Atari Democrats" in Congress. The vision of the state=s role in technological innovation that lay behind industrial policy went beyond associationalism. Its advocates, such as MIT=s Lester Thurow and Harvard=s Robert Reich, called for the Federal government not merely to catalyze cooperative private relationships and to harmonize public and private objectives, but to invest public funds in promising new industries and to take an active and indepedent role in bargaining over economic policy with business and labor. They pointed to New Deal agencies

like the Reconstruction Finance Corporation and the Tennessee Valley Authority as well as the Japanese Ministry of International Trade and Industry (MITI) and even the U.S. Department of Defense as evidence that their approach was plausible. Industrial policy came under harsh attack, however, not only from conservatives in the Administration, but also from Keynesians like Charles Schultze, who had chaired the Council of Economic Advisors (CEA) under Carter. Schultze argued that the nation's problems had macroeconomic solutions and that government channelling of investment would distort the market rather than enhance it. The 1984 Democratic presidential nominee, former Vice President Walter Mondale, perceived industrial policy to be out of temper with the conservative times and unappealing to key constituencies, particularly in business. Mondale stressed deficit reduction in his campaign.[43]

In the wake of Mondale=s devastating defeat, the Anew idea@ of "competitiveness" supplanted industrial policy in many influential Democratic circles. Competitiveness policy entrepreneurs such as John Young, the chief executive officer of Hewlett-Packard, called for new "partnerships" between business and the Federal government to replace the adversarial relationships that they thought placed American firms at a disadvantage in the world economy. While MITI aided Japanese firms by promoting exports, facilitating labor harmony, and supporting technological innovation, Federal agencies spent their time squabbling with U.S. manufacturers over environmental and labor regulations. Rather than pulling the state out of the economy altogether, as the conservatives had hoped to do, or subordinating economic development to a modicum of state direction, as advocates of Aindustrial policy@ desired, the new associationalists sought to build institutions within which business and government could communicate and cooperate, with business defining many of the policy objectives and

instruments.[44]

Associative ideas, which had the additional advantage that they required few government outlays that would increase the budget deficit, appealed especially to the Democratic Leadership Council (DLC), which hoped to broaden the party's appeal among ideological moderates. The DLC's membership included a number of governors like Arkansas=s Bill Clinton (the organization's chair for several years) who saw public-private technology partnerships working already at the state level. With the waning of the Cold War in the late 1980s, partnerships also proved appealing to politicians like Senators Jeff Bingaman of New Mexico and Ernest Hollings of South Carolina, whose states faced the loss of economically significant defense industrial facilities. Military technologies and the laboratories and organizations that developed them were put on the table as government contributions to partnerships for competitiveness.

The new associative vision made its first prominent appearance on the national agenda in the 1985 report of the Reagan Administration=s Commission on Industrial Competitiveness, chaired by Young. The report was ignored, and a piqued Young formed a non-profit organization to continue to press the case from the outside. Congress, led by Bingaman, Hollings, and others, then took the initiative, broadening the scope of Cooperative Research and Development Agreements (CRADAs) between government laboratories and private firms, expanding the mission of the National Bureau of Standards (changing its name in the process to the National Institute of Standards and Technology), and giving it a new Advanced Technology Program (ATP). The Pentagon also took steps to establish partnerships, notably SEMATECH, a consortium for the development of semiconductor manufacturing equipment. Under President

George Bush, partnerships gained a stronger foothold in the executive branch, despite resistance from those who equated any government-business cooperation with industrial policy. D. Allan Bromley, the President=s science advisor, was able to win more funds for Sematech, ATP, and related programs. The Clinton Administration made "stimulate partnerships" a central tenet of its science, technology, and industrial policy dramatically expanding funding for NIST and defense technology conversion in its first two years and defending these programs vigorously in the face of the Congressional Republican majority in 1995-96. Bill Clinton, in an important sense, is Herbert Hoover=s heir.[45]

Conclusion: He Who Laughs Last...

Efforts to remake the self-interests of private economic actors by facilitating cooperation among them and between them and government agencies have had mixed results as a strategy for economic growth. Neither the Bureau of Standards in the 1920s, the code authorities of the National Recovery Administration, nor the Coordinator of Transportation, according to the evidence I have assembled, was able to stimulate old industries or generate new ones. Wartime associative arrangements performed better, producing the booming synthetic rubber industry, but they typically did not impress the corporate participants enough for those participants to maintain them permanently. The present Administration's experiments with associationalism, however, do not reflect a careful evaluation of prior experience with similar policies in practice. Indeed, this history has essentially been forgotten.[46]

Yet despite this lapse of memory, the associative vision has proven remarkably durable, and the revival of the 1980s and 1990s is not merely coincidental. Its durability stems in part

from the limits that the liberal tradition places on policy discourse in the U.S. If APlanning@ is unthinkable and AFreedom@ is unworkable, the terrain that can be explored in any search for new ideas is not so large; much of it will have been explored before. Moreover, in the contemporary era, the Keynesian welfare state, which appeared to many policy-makers in the past to have resolved the tension between APlanning@ and AFreedom@ once and for all, is widely seen as an untenable, obsolete model. Beyond the social critique of the welfare state, economic globalization is perceived to have narrowed the margin for macroeconomic flexibility, upon which the Keynesian vision depends. In this context, the turn to microeconomic approaches, particularly the inexpensive voluntary cooperation and information-sharing that characterizes associationalism, makes eminent sense.

Institutions add another element to the explanation. Earlier associative policy entrepreneurs were successful enough to have institutionalized their vision of the state in a modest way. The Bureau of Standards and the Commerce Department, for instance, have continued ever since Hoover to articulate the gospel of business-government cooperation. In the shadow of the welfare state and the warfare state, the associative state has survived. The experience of working with or within its agencies has inspired advocacy on its behalf in virtually every Administration. The public-private relationships forged by these agencies provided examples for associative policy entrepreneurs to point to and suggested a logical home for the new partnerships. The designation by Congress and the President of the newly named National Institute of Standards and Technology and the new Technology Administration in the Department of Commerce as the lead agencies to administer the associative-tinged policies of the 1990s breathed new life into this Hooverian legacy.

The institutional diversity of the American state, then, bolsters the supply of policy entrepreneurs bearing Anew ideas.@ It also underlies the demand for them. The vague and changing boundaries of institutional authority among branches, levels, and agencies of government (as well as the steady diet of electoral opportunities) generate incentives for policy activism. Crises of war and depression, as in the 1930s and 1940s, and perceived crises of Cold War and economic decline, as in the 1980s, are the most opportune times to remake the balance of power among the separated institutions, but efforts to do so are not absent in periods of relative domestic and international tranquility, such as the 1920s and 1990s, are Policy initiatives are disposed of in a decentralized, piecemeal fashion, leaving open the possibility that vestiges of bygone eras can be sustained almost indefinitely.

The policies examined in this paper are far from being the only ones that display this pattern. By looking again at the histories of labor policy, agricultural policy, trade policy, and others, we will probably find more legacies and reinventions of the associative state. Herbert Hoover, having been rescued from infamy, may yet be honored as a state-builder, albeit indirectly. Even Hoover, not a man much given to irony, might have gotten a chuckle from that.

Notes

1. Ellis W. Hawley, "Herbert Hoover, the Commerce Secretariat, and the Vision of an 'Associative State,' 1921-1928," Journal of American History 61:116-140 (1974).

2. Robert J. A. Skidelsky, John Maynard Keynes: A Biography, first American edition (New York: Viking, 1986); Gary Gerstle, "The Protean Quality of American Liberalism," American Historical Review 99:1043-1073 (1994); J. David Greenstone, The Lincoln Persuasion: Remaking American Liberalism (Princeton: Princeton University Press, 1992), 35-65.

3. Sven H. Steinmo, AAmerican Exceptionalism Reconsidered: Culture or Institutions?,@ in Lawrence Dodd and Calvin Jillson, eds., The Dynamics of American Politics: Approaches and Interpretations (Boulder: Westview, 1994), 106-131; Stephen Skowronek, Building a New American State (New York: Cambridge University Press, 1982), 290.

4. Hawley, 1974, op. cit.

5. Guy Alchon, The Invisible Hand of Planning: Capitalism, Social Science and the State in the 1920s (Princeton: Princeton University Press, 1985), 4.

6. Hoover, speech, May 7, 1924, Herbert C. Hoover papers, Herbert Hoover Presidential Library, (HHPL) (hereafter AHoover papers@), ABible@ (speech file), item 378; Hawley, 1974, op. cit., 116-120; Peri Arnold, "Ambivalent Leviathan: Herbert Hoover and the Positive State," in J. David Greenstone, ed., Public Values and Private Power in American Politics (Chicago: University of Chicago Press, 1982), 113-123.

7. Edwin T. Layton, Jr., The Revolt of the Engineers: Social Responsibility and the American Engineering Profession (Cleveland: Press of Case Western Reserve University, 1971), 179-200; Vernon Kellogg, "Herbert Hoover and Science," Science 73:197-199 (February 20, 1931); Barry D. Karl, "Presidential Planning and Social Science Research: Mr. Hoover's Experts," Perspectives in American History 3:347-409 (1969), 361-362.

8. "Hoover Disavows Policy Favoring Business Combines in Big Units," Journal of Commerce, June 5, 1925, Hoover papers, "Bible" (speech file), item 493; "On to Greater Discovery!", Industrial and Engineering Chemistry, September, 1923, Hoover papers, ABible@ (speech file), item 31A.

9. Robert D. Cuff, The War Industries Board: Business-Government Relations During World War I (Baltimore: Johns Hopkins University Press, 1973); Jordan A. Schwarz, The New Dealers: Power Politics in the Age of Roosevelt (New York: Knopf, 1993), 32-34; Hawley, 1974, op. cit., 121, 138.

10. Franklin D. Jones, Trade Association Activities and the Law (New York: McGraw-Hill, 1922), chap. 7; Department of Commerce, Trade Association Activities (Washington: GPO, 1923), chap. 11; National Industrial Conference Board, Trade Associations: Their Economic Significance and Legal Status (New York: National Industrial Conference Board, 1925), 212-215; William Spraragen, "Trade Association Research," in Malcolm Ross, ed., Profitable Practice in Industrial Research (New York: Harper and Brothers, 1932), 182-184.

11. Committee on Elimination of Waste in Industry of the FAES, Waste in Industry

(Washington: FAES, 1921); Fourteenth Annual Report of the Secretary of Commerce (Washington: Commerce Department, 1926); William R. Tanner, "Secretary Hoover's War on Waste, 1921-1928," in Carl E. Krog and Tanner, eds., Herbert Hoover and the Republican Era (Lanham, MD: University Press of America, 1984), 1-6.

12. "Wilhelm, Donald, 1919-1922 April," Hoover papers, Commerce series, Box 147; "Simplified Practice: What It Is and What It Offers," Department of Commerce pamphlet, 1924, available in Littauer Library, Harvard University, 1; R.M. Hudson to Hoover, July 15, 1927, Hoover papers, Commerce series, Box 145, ASimplified Commercial Practice;@ Sixteenth Annual Report of the Secretary of Commerce (Washington: Department of Commerce, 1929), xxxiv.

13. Eleventh Annual Report of the Secretary of Commerce (Washington: Department of Commerce, 1924), 154; U.S. House of Representatives, Committee on Appropriations, Appropriations, Department of Commerce, 1929, 70th C., 1st s., 1928, 95-96; George K. Burgess, "Bureau of Standards Cooperation in Industrial Research," in Ross, ed., op. cit., 164-167; Seventeenth Annual Report of the Secretary of Commerce (Washington: Department of Commerce, 1929), 163.

14. Edward J. Mehrens, "Concrete: Yesterday, Today, Tomorrow," American Concrete Institute pamphlet, February, 1935, available at Widener Library, Harvard University; Louis Galambos, Competition and Cooperation: The Emergence of a National Trade Association (Baltimore: Johns Hopkins University Press, 1966), 121-122; Herbert Hoover, address to National Association of Cotton Manufacturers, April 7, 1925, Hoover papers, ABible@ (speech file), item 466; Ellis W. Hawley, "Three Facets of Hooverian Associationalism: Lumber, Aviation, and

Movies," in Thomas K. McCraw, ed., Regulation in Perspective (Cambridge: Harvard University Press, 1981), 101-108; Housing Division memo, undated, 1921, Hoover papers, Commerce series, Box 63, ABuilding and Housing 1921;@ John M. Gries, AElimination of Waste in Building Industry,@ undated, James S. Taylor papers, HHPL, Box 3, ACommerce Department.@

15. Hawley, 1981, op. cit., 109-114; David D. Lee, "Herbert Hoover and the Development of Commercial Aviation, 1921-1926," in Krog and Tanner, eds., op. cit., 36-65; Alex Roland, Model Research: The National Advisory Committee for Aeronautics, 1915-1958 (Washington: NASA, 1985), 51-123; Nathan Rosenberg and Richard R. Nelson, AAmerican Universities and Technical Advance in Industry,@ Research Policy 23:323-348 (1993), 329-330.

16. Hugh G.J. Aitken, The Continuous Wave: Technology and American Radio, 1900-1932 (Princeton: Princeton University Press, 1986); Philip T. Rosen, The Modern Stentors: Radio Broadcasting and the Federal Government, 1920-1934. (Westport, CT: Greenwood Press, 1980); "Radio Patent and Copyright Questions," Journal of the Patent Office Society 12:327-330 (1930); "The RCA Consent Decree," George Washington Law Review 1:513-516 (1933).

17. Robert E. Kohler, "Science, Foundation, and American Universities in the 1920s," Osiris, second series, 3:135-164 (1987), 140; Daniel J. Kevles, The Physicists (New York: Knopf, 1978), 117-154; Herbert Hoover, "The Nation and Science," Science 65:26-28 (January 14, 1927), 26; Willard to Hoover, June 10, 1926, Hoover to Robert A. Millikan, July 2, 1926, and Maurice Holland to Hoover, August 5, 1926, all in Hoover papers, Commerce series, Box 426, ANational Academy of Sciences - National Research Endowment - Railroads and Pure Science;@ Lance E. Davis and Daniel J. Kevles, AThe National Research Fund: A Case Study in the

Industrial Support of Academic Science,@ Minerva 12:207-220 (1974).

18. Rexmond C. Cochrane, Measures for Progress (Washington: U.S. Department of Commerce, 1966), 259-262; Bureau of National Affairs, Inc., Verbatim Record of the Proceedings of the Temporary National Economic Committee (Washington: BNA, 1939), Vol. 1, 68.

19. Twenty-first Annual Report of the Secretary of Commerce, 1933 (Washington: Department of Commerce, 1933), 45; Science Advisory Board, Report, July 31, 1933 - September 1, 1934 (Washington: National Research Council, 1934), 62-63; Robert Kargon and Elizabeth Hodes, "Karl Compton, Isaiah Bowman, and the Politics of Science in the Great Depression," Isis 76:301-318 (1985), 304-305, 309-310; correspondence of Dugald C. Jackson, William Spraragen and Holland, 1932, in Dugald C. Jackson papers, MIT Archives (hereafter "Jackson papers"), Box 4, Folders 316-317; "Trade Associations Hit Hard as Depression Breeds Ill Will," Business Week, April 29, 1931, 7-8.

20. Barry D. Karl, The Uneasy State: The U.S. from 1915 to 1945 (Chicago: University of Chicago Press, 1983), 81-99; "Plan for Stabilization of Industry by the President of the General Electric Company," Monthly Labor Review, November, 1931, 45-53; "Trade Association is Keystone of Swope Stabilization Plan," Business Week, September 23, 1931, 12; "Friendly Critics of Swope Plan Want to See It Given Fair Trial," Business Week, September 30, 1931, 15; Robert F. Himmelberg, The Origins of the National Recovery Administration: Business, Government and the Trade Association Issue, 1921-1933 (New York: Fordham University Press, 1976), 88-165; Ellis W. Hawley, The New Deal and the Problem of Monopoly (Princeton:

Princeton University Pres, 1966), 42

21. "The Country Needs, the Country Demands Bold, Persistent Experimentation,@ address, May 22, 1932, in Samuel Rosenman, ed., Public Papers and Addresses of Franklin D. Roosevelt vol. 1 (New York: Random House, 1938), 639.

22. Himmelberg, op. cit., 181-218; Hawley, 1966, op. cit.; Donald Brand, Corporatism and the Rule of Law (Ithaca: Cornell University Press, 1988).

23. "Patents and the 'New Deal'," Journal of the Patent Office Society 16:92 (1934); S.C. Gilfillan, "A New System for Encouraging Invention," Journal of the Patent Office Society 17:966-970 (1935), 970.

24. Kargon and Hodes, op. cit., 308-310; Carroll W. Pursell, Jr., "The Anatomy of a Failure: The Science Advisory Board, 1933-1935," Proceedings of the American Philosophical Society 109:342-351 (1965), 342-343; Albert L. Barrows, Assistant Secretary, NRC, to R.A. Millikan, July 15, 1933 (with attachment, "Preliminary Science Approach to the Industrial Recovery Program" by Maurice Holland), in Robert A. Millikan papers, California Institute of Technology Archives, File 7.15. I retrieved the Barrows letter thanks to a citation by Kargon and Hodes.

25. NRA Division of Review, AThe So-Called Model Code: Its Development and Modification,@ 1936, Hagley Museum and Library, Imprints Collection; "Report of the Chairman to the Executive Board for the Period July, 1933 - April, 1934," April 25, 1934, 19, Jackson papers, Box 5, Folder 341; Maurice Holland, "Summary of Analysis...with Recommendations for Future Development," October 5, 1934, National Academy of Sciences (NAS) Archives, NRC,

Engineering and Industrial Research Division, 1934, "Analysis..."

26. "Research and the New Deal," New York Times, October 23, 1933, 14; "Code Provisions Restricting New Machinery," Journal of the Patent Office Society 16:476-483 (1934); Arthur R. Burns, The Decline of Competition: A Study of the Evolution of American Industry (New York: McGraw-Hill, 1936), 465-471, 508-512; Leverett S. Lyon et al., The National Recovery Administration: An Analysis and Appraisal, 2nd ed. (New York: Da Capo Press, 1972), 647.

27. Garet Garrett, "Machine Crisis," Saturday Evening Post, November 12, 1938, 61; Bernhard Stern, "Restraints Upon the Utilization of Inventions," Annals of the American Academy of Political and Social Sciences, November, 1938, 13-32; Harry Jerome, Mechanization in Industry (New York: National Bureau of Economic Research, 1934), 18-22.

28. Hawley, 1966, op. cit., 227-231; Earl Latham, The Politics of Railroad Coordination (Cambridge: Harvard University Press, 1959).

29. Compton to Holland, September 7, 1933 (Folder 336), Eastman to Holland, September 15, 1933 (Folder 336); Holland to Eastman, September 20, 1933 (Folder 336); Holland, "A Plan for Centralized and Coordinated Railroad Research Organization," September 20, 1933 (Folder 337); Holland, "Steps in Establishing a Central Scientific Laboratory for Railroad Transportation Industry," September 23, 1933 (Folder 336); Eastman to Compton, September 23, 1933 (Folder 336); Compton to Jackson, September 28, 1933 (Folder 336); press release, October 11, 1933 (Folder 338), all in Jackson papers, Box 5.

30. Frank Jewett to Jackson, October 17, 1933 (Folder 338); minutes, notes, and statements from committee meeting, December 18, 1933 (Folder 339); Jackson to Jewett, December 20, 1933 (Folder 339); Jewett to Jackson, December 29, 1933 (Folder 339); notes and minutes of committee meeting, January 16, 1934 (Folder 340); notes and minutes of subcommittee meeting, March 9, 1934 (Folder 340); Jewett to committee, June 22, 1934 (Folder 342); Jackson to Jewett, July 18, 1934 (Folder 343); Jewett to Compton, October 1, 1934 (Folder 344), all in Jackson papers, Box 5; Second Report of the Science Advisory Board, September 1, 1934 - August 31, 1935 (Washington: National Research Council, 1935), 459-477.

31. Regulation of Railroads, S. doc. 119, 73rd C., 2nd s., 1934, 11, 31-33, 50-57; Eastman to Compton, October 15, 1934; Jewett to Jackson, October 17, 1934; Jackson to Jewett, October 24, 1934, all in Jackson papers, Box 5, Folder 344; "Railroad Research," Business Week, October 3, 1936, 38; U.S. Senate, Committee on Military Affairs, Technological Mobilization (Washington: GPO, 1943), 77th C., 2nd s., 305-306.

32. Stuart Chase, "The New Deal's Greatest Asset," Nation 142:738-741 (June 10, 1936), 741; meeting minutes, National Industrial Conference Board, January 23, 1936, 37-38, and May 16, 1935, 29, Acc. 1057, Boxes 7-8, Hagley Museum and Library. Alan Brinkley, "The New Deal Order and the Idea of the State," in Steve Fraser and Gary Gerstle, eds., The Rise and Fall of the New Deal Order (Princeton: Princeton University Press, 1989), 85-121, provides a more comprehensive picture of the flight from associationalism.

33. "Proposal for Science-Industry Relationship...," April 13, 1937, NAS Archives, Institutions-

Associations-Individuals, "National Association of Manufacturers, 1937;" Karl T. Compton, "Symposium on Science and Industry," Review of Scientific Instruments, January, 1938, 6-9; Lammot Dupont, "Industry's Outlook," reprinted in Congressional Record, 75th C., 2nd s., 359-360; "Twentieth Century Pioneers," Business Week, March 2, 1940, 20.

34. AMake Technical Progress Social Progress," American Federationist 43:682-683 (1936); Latham, op. cit., 222-225, 259-265; Aaron J. Gellman, "Surface Freight Transportation," in William M. Capron, ed., Technological Change in Regulated Industries (Washington: Brookings Institution, 1970), 169-178; Richard F. Hirsh, Technology and Transformation in the American Electric Utility Industry (New York: Cambridge University Press, 1989), 36-81.

35. National Research Council, AResearch Consciousness Among Leading Industrial Nations@ (1937), reprinted in Harold Vagtborg, Research in American Industrial Development (New York: Pergamon, 1976); William L. Laurence, "Scientists Open Mellon Institute," New York Times, May 7, 1937, 15; William L. Laurence, "Mellon Institute," New York Times, May 7, 1937, 24; E.R. Weidlein, "Broad Trends in Chemical Research, Industrial and Engineering Chemistry, January 10, 1938, 10-11; W.A. Hamor, "Research at the Mellon Institute Science 87:360-363 (April 29, 1938).

36. Carroll W. Pursell, Jr., "Science Agencies in World War II: The OSRD and Its Challengers," in Nathan Reingold, ed., The Sciences in the American Context: New Perspectives (Washington: Smithsonian Institution Press, 1979), 360; Bush to Hoover, April 10, 1939, Vannevar Bush papers, Library of Congress, Box 51, File 1261; Vannevar Bush, Pieces of the Action (Cambridge: MIT Press, 1970), 35.

37. Nathan Reingold, AVannevar Bush=s New Deal for Research or the Triumph of the Old Order,@ Historical Studies in the Physical and Biological Sciences 17:299-344 (1987), 302; Larry Owens, AThe Counterproductive Management of Science in the Second World War: Vannevar Bush and the Office of Scientific Research and Development,@ Business History Review 68:515-576 (1994); David A. Mindell, A>Datum for Its Own Annihilation=: Feedback, Control, and Computing, 1916-1945,@ (Ph.D. diss., MIT, 1996).

38. Michael S. Sherry, The Rise of American Air Power (New Haven: Yale University Press, 1987), 187-190; Allen Kaufman, AIn the Procurement Officer We Trust: Constitutional Norms, Air Force Procurement and Industrial Organization, 1938-1947@ (paper presented at the Hagley Museum, October, 1995), 37-49; Roland, 1985, op. cit., 173-198; Jonathan Zeitlin, AFlexibility and Mass Production at War: Aircraft Manufacture in Britain, the U.S., and Germany, 1939-1945,@ Technology and Culture 36:46-79 (1995).

39. Bush to Roosevelt, April 8, 1942, Records of the War Production Board, National Archives Record Group 179 (hereafter ARG179"), Policy Documentation File (PDF) 027.33, "WPB - Organization - Proposed Units and Committees, 1941-1942;" Leith to Batt, April 15, 1942, RG 179, PDF 073.011; Maverick to Nelson, May 29, 1942, RG179, PDF 282M; Bush to Delano, July 22, 1942, Records of the Office of Scientific Research and Development, National Archives Record Group 227 (hereafter ARG227"), Entry 13, Box 34; Daniel J. Kevles, "The National Science Foundation and the Debate over Postwar Research Policy, 1942-1945," Isis 68:5-27 (1977).

40. Peter J.T. Morris, The American Synthetic Rubber Research Program (Philadelphia:

University of Pennsylvania Press, 1989), 9-17; Keith Chapman, The International Petrochemical Industry (Cambridge: Blackwell, 1991), 66-82; Bush to Delano, op. cit.

41. Daniel J. Kevles, "Scientists, the Military, and the Control of Postwar Defense Research: The Case of the Research Board for National Security," Technology and Culture 16:20-47 (1975); Thomas J. Misa, AMilitary Needs, Commercial Realities, and the Development of the Transistor, 1948-1958,@ in Merritt Roe Smith, ed., Military Enterprise and Technological Change (Cambridge: MIT Press, 1985), 253-287; J. Merton England, A Patron for Pure Science (Washington: National Science Foundation, 1982).

42. Robert Griffith, ADwight D. Eisenhower and the Corporate Commonwealth,@ American Historical Review 87:87-122 (1982); Grant McConnell, Private Power and American Democracy (New York: Knopf, 1966), 255-280; Dorothy Nelkin, The Politics of Housing Innovation (Ithaca: Cornell University Press, 1971); "Industrial Innovation Initiatives," Public Papers of the President, 1979, vol. 2 (Washington: GPO, 1980), 2070-2074; "Economic Renewal Program," Public Papers of the President, 1980, vol. 2 (Washington: GPO, 1982), 1585-1591; Paul Krugman, Peddling Prosperity: Economic Sense and Nonsense in the Age of Diminished Expectations (New York: Norton, 1994), 89-95; David Stockman, The Triumph of Politics: How the Reagan Revolution Failed (New York: Harper and Row, 1986), 39-44, 245-253; Bruce L.E. Smith, American Science Policy Since World War II (Washington: Brookings, 1990), 132-134.

43. James Shoch, "Party Competition, Divided Government, and the Politics of Economic Nationalism," (Ph.D. diss., MIT, 1993); Otis Graham, Losing Time: The Industrial Policy

Debate (Cambridge: Harvard University Press, 1992).

44. Shoch, op. cit. A good recent statement of the associative vision is Paul M. Romer, AImplementing a National Technology Strategy with Self-Organizing Industry Investment Boards,@ Brookings Papers: Microeconomics, 1993, No. 2, 345-399.

45. David Osborne, Laboratories of Democracy (Boston: Harvard Business School Press, 1988); Shoch, op cit., 594-603, 658-662, 679-680; John A. Alic, et al., Beyond Spinoff: Military and Commercial Technologies for a Changing World (Boston: Harvard Business School Press, 1992), 79-80; D. Allen Bromley, The President's Scientists: Reminiscences of a White House Science Advisor (New Haven: Yale University Press, 1994), 122-141; "Industrial R&D Wins Political Favor," Science 255:1500-1502 (20 March 1992); William J. Clinton and Albert Gore, Jr., Technology for America=s Economic Growth: A New Direction to Build Economic Strength,@ (Washington: Executive Office of the President, 1993); William J. Clinton and Albert Gore, Jr., Science in the National Interest (Washington: Executive Office of the President, 1994); ACommittee Clamor Illustrates Extent of Partisan Divide,@ Congressional Quarterly Weekly Report 54:1291-1292 (11 May 1996); Lewis M. Branscomb and James H. Keller, eds., Investing in Innovation (Cambridge: MIT Press, 1998).

46. For a discussion of history and its uses in the industrial policy debate, see Graham, op. cit.