Standard Sizes: The Government's Role in Diffusing Mass Production Techniques in the United States, 1917–1960s

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Abstract

By the mid-twentieth century, the United States was widely considered to be the world's preeminent manufacturing nation. Its prominence is often attributed to the accomplishments of entrepreneurs such as Henry Ford, who provided models of mass production that, in an evolutionary learning process, were quickly emulated by other American manufacturers.

However, a quite different dynamic emerges in this study of "standard sizes" and the US government's role in pushing manufacturers toward mass production from the Great War through the 1960s. It shows that formidable market forces—above all, intense competition among middling manufacturers producing in modest volumes and offering their customers a diversity of products—blocked the diffusion of mass production techniques. A concerted government-aided pushback against market forces became a pivotal force initially during the Great War and then, in sustained fashion in the 1920s, when Secretary of Commerce Herbert Hoover stepped in to offer the Department of Commerce as an agency to organize and publicize industrywide agreements on standard sizes. This achievement enabled middling manufacturers to shift to mass production methods and sparked interest around the world.

Keywords: Mass production, technological diffusion, product diversity, economies of scale, political economy, government promotion

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Contents

Introduction

"Standard sizes"— for example, of beds, printer paper, and electrical outlets—are a familiar feature of modern production and consumption that is often taken for granted. What makes a nation's standard sizes "standard" is that dozens, if not hundreds, of its firms manufacture everyday products in the same, limited set of sizes or shapes. Firms that would otherwise be fierce competitors, in other words, adopt specific sizes or shapes as collective, industrywide standards. By the mid-twentieth century, the United States, once a developing nation itself (Link and Maggor 2020), had achieved worldwide industrial leadership, and industrywide agreements on standard sizes were a lynchpin of its manufacturing prowess.

But collective agreements on a national scale do not arise spontaneously or naturally; they must be forged (Offe and Wiesenthal 1980; Olson 1965). An individual manufacturer might limit its own production to a handful of products in order to produce them in large volumes, but its "standard" products were unlikely to be identical to those of its competitors. Indeed, they were quite likely to be different in the early twentieth century, when the dominant strategy among middling manufacturers—established companies accustomed to manufacturing a diversity of everyday commodities in modest volumes—was to differentiate their products in size or style from their competitors, both to capture consumers' attention and to avoid price competition with their competitors. To the extent that American manufacturers were shifting toward mass production, the National Industrial Conference Board observed in the 1920s, standard sizes were "confined almost entirely within the...individual establishment" (National Industrial Conference Board 1925, 180). As a bed manufacturer reported in 1922: "Individual bed manufacturers did not lack standards for themselves. That wasn't the trouble at all. But they were all individual standards, perfectly useless so far as other bed manufacturers were concerned" (Powers 1922, 276). Reducing product variety across firms required a collective agreement among many competing firms. And collective action posed formidable challenges in fragmented industries, marked by many buyers and many sellers, all the more so if their suppliers and customers also had to be brought on board. How, then, did direct competitors—companies all producing or selling the same line of goods—set aside often intense competitive pressure (not to mention legal constraints) and forge collective agreements on standard sizes?

The speed with which standard sizes emerged in the United States deepens the mystery. In 1919–21, American manufacturers made mattresses and beds, for example, in 78 sizes; within a decade, 90 percent of the industry's output conformed to four standard sizes that had been adopted industrywide in 1922 (USDC 1924, 6; USDC-BS 1931b, 246). By 1930, standard sizes had been established for more than 100 commodities—from sterling silver flatware, writing paper, jelly jars, shovels, grocery bags, and milk bottles to bank checks, warehouse forms, restaurant checks, and a variety of tools and building materials (USDC-BS 1931a, Appendix C). How did this nationwide transformation—the simplification of everyday goods that we now take for granted—come about so swiftly and thoroughly?

In the United States, this paper shows, the diffusion of mass production techniques was not a natural, evolutionary economic process, as historians have portrayed it (Hounshell 1984, 260–61; Abramovitz and David 2000, 48; Gordon 2017, 557; Freeman 2018, 144). Manufacturers did not simply learn to mass produce, once Henry Ford and his assembly line had shown the way and provided the model. A multitude of middling manufacturers surely pondered the risks of emulating Ford's model. The basic question was whether they, individually, should radically reduce the variety of products they made in order to scale up for mass production, as Ford had in the first decade of the twentieth century, and risk losing customers to competitors who continued to offer just what the customer wanted.

The key to the puzzle of standard sizes lies elsewhere—in the interplay of economics and politics. As a wealth of commentary in trade journals and the like makes clear, formidable market forces—above all, intense competition for the consumer's dollar—blocked the diffusion of mass production techniques among smaller manufacturers. A concerted pushback against market forces came initially as a government conservation measure during the Great War and then in sustained fashion in the 1920s, when Secretary of Commerce Herbert Hoover stepped in to offer the Department of Commerce as an agency to organize and publicize industrywide agreements on standard sizes—an achievement that sparked interest worldwide.

The starting point of this paper is the diversity of everyday commodities in the United States on the eve of the Great War and the strategic dilemma in which middling manufacturers found themselves. This dilemma was resolved abruptly, if temporarily, by the United States' entry into the war. In a forceful campaign, wartime officials, led by Arch Wilkinson Shaw of the Conservation Division of the War Industries Board (WIB), pushed manufacturers of diverse products to simplify their product lines so that they could shift to mass production methods and thus conserve materials, labor, and transportation for war uses. The pivotal moment came when the war ended—a brief interlude that exposed the unnaturalness of the wartime push for mass production. With wartime controls lifted and manufacturers facing consumer resistance in a "buyer's strike," followed by the sharp depression of 1920–21, many wartime mass producers set aside what they had learned in the war and reverted to their old ways, rediversifying their product lines as a tried-and-true competitive strategy to capture the reluctant consumer's dollar. It was this reversal that prompted Secretary of Commerce Herbert Hoover to revive the wartime program in a form tailored for peace. Under the protective umbrella of government-sanctioned collective agreements among competitors to limit product diversity, mass production techniques diffused rapidly and broadly across the US economy from the 1920s through the 1950s.

Had the federal government not enabled American business to push back against market forces, the story of standard sizes suggests, mass production techniques would not naturally have diffused as far and as fast as they did in the United States. Absent, in the words of a British admirer, "Hoover's fostering hand" (Chisholm 1925), the twentieth-century American variety of capitalism would have looked markedly less "Fordist."

Product Diversity before World War I

Conveying a sense of the diversity of products available to American consumers on the eve of World War I is challenging, largely because the diversity of everyday goods attracted widespread comment only after the Great War brought widespread attention to it.[1] "Certainly the public was never aware," a postwar report observed, "of the extent to which duplication of common varieties of manufactured goods had been carried" (Crowell and Wilson 1921, 66). With the benefit of hindsight, however, observers who had their eyes opened in wartime testified to the pervasive product diversity of the prewar years, roundly condemning it in colorful terms. Both government officials and business leaders deemed the variety of products available before the war to have been wasteful and "uneconomic," both for individual firms and for the economy as a whole. Initiatives by some trades to reduce diversity collectively on their own, though with little success, also signaled business disgruntlement with product diversity (Dunlavy 2024, 13–15). Writing shortly after the end of World War I, a government economist, Homer Hoyt, described in vivid terms the "profusion of styles and brands of goods" that seemed endemic to the United States before the Great War. "From the cradle to the grave, from the many varieties of cribs and baby carriages to the profusion of styles in burial shrouds and coffins," he concluded, "the American consumer has been unrestricted in his choice" (Hoyt 1919a, 95). The magnitude of product diversity come through in a report from the Union Bed and Spring Company that it had been making 62 varieties of "full width" bed springs, 41 of them in two widths, for a total of 103 "styles," all of which it produced in two lengths, making a grand total of 206 styles—of full width springs alone (Powers 1922, 275).

Why did product sizes and shapes proliferate with abandon in the United States in the prewar years? An obvious source of product diversity lay in the strategies of manufacturers themselves. Specialty manufacturers, by definition, produced a variety of products in smaller lots, and, as Philip Scranton shows, they persisted well into the era of mass production, accounting in 1923 for "the same one-third of value added" as in 1909 (Scranton 1997, 340). And, as noted earlier, even when producers moved toward mass production, they usually made their core products distinctive in some way to avoid direct (price) competition. Also integral to product diversity was the business practice of "hand-to-mouth" or "current" buying—that is, placing small, frequent orders for quick delivery, rather than placing large orders seasonally for future delivery ("forward ordering"). While forward ordering provided a pillar of support for the mass production and distribution of a narrow, stable line of core products, hand-to-mouth buying created incentives for manufacturers to offer their customers an enticing, ever-changing array of novel products (Lyon 1929; Scranton 1989, 329–47). A third factor encouraging product diversity was the fragmented American political structure. Despite the much-lauded growth of a national market by the turn of the twentieth century, the division of economic policymaking powers among the federal government, the states, and municipalities persistently fragmented markets and business practice well into the twentieth century (Dunlavy and Welskopp 2007). A 1912 compendium of state and national laws governing weights and measures totaled 564 pages (USDC-BS 1912), while food regulation and building codes differed from the national through the state to the municipal level (Gephart 1919, 265; Whitehorne 1923, 40). Some observers, meanwhile, attributed product diversity to a fourth factor, American "individualism," expressed in distinctive product preferences (Dunlavy 2024, 18–19).

The root cause of product diversity, however, was seen in a fifth factor—competition for the consumer's dollar. In the hot competition for customers before the war, offering an enticing diversity of products—"a multiplicity of styles, sizes, shapes and finishes"—had become entrenched as the dominant business strategy among middling manufacturers (Matherly 1922, 383). Even the Ford Motor Company, initially a small-scale assembler of automobiles, adhered to the prevailing strategy, until it took the truly radical step of abruptly cutting its product line to a single model and ramping up production. "What the Ford company really did—although not in so many words—was to reverse the process," the company's former business manager explained. Instead of catering to consumer demand, "[w]e worked out a car and at a price which would meet the largest average need. In effect, we standardized the customer" (Couzens 1921, 263–64). As the principal vector of competitive pressures, observers pointed to salesmen and jobbers, who pressed the factory for a diverse array of products to offer their customers (refer, for example, to Copeland 1921, 57; Maddock 1921, 612; Thomas 1921b).

To be sure, the extraordinary success of the titans of mass production—Andrew Carnegie in late nineteenth-century steel manufacturing, for example, and Henry Ford in early twentieth-century automobile manufacturing—demonstrated the economic bounty that economies of scale *could* bring. For products that lent themselves to mass production, increasing the scale of production reduced production costs per unit, lowered the amount of labor needed, and increased output per worker. But producing commodities in massive volumes required sharply restricting a company's stable of products. In many lines of business, as commentary in trade journals attested, this was simply not feasible for individual producers, who felt relentless competitive pressure to entice and retain customers by offering a *diversity* of products. "[A]s any manufacturer will corroborate," a writer in *Industrial*

Management observed in 1925, "this production of numerous varieties of a single commodity, is almost a necessity so long as competition is the 'life of the trade.' Each manufacturer is after business, and the more styles he shows the more business he gets. One is always fearful lest the next one will display the 'latest' style, and this is a direct cause for a large variety of styles" (Chass 1925). The majority of manufacturers, as another observer explained, "were practically helpless. If the trade could not get what it wanted from one manufacturer, there was someone else who could fill the order" ("Trend toward Simplification" 1922, 41; refer also to Hemenway 1975, 21–22).

As enthusiasm for standardization, efficiency, and the elimination of "waste" in American life grew by leaps and bounds (Alexander 2008, 78–79), manufacturers on the eve of American entry into the Great War found themselves in a perplexing situation, caught in the crossfire between their tried-and-true strategy of product diversity and Ford-inspired enthusiasm for efficiency ("Sales Rise" 1916, 28). Ford's advice to "the little man" in manufacturing and retailing—"get big"—was simply untenable (Ford 1923, 792), and reaching a consensus on collective action to limit product variety proved a daunting challenge for those industries that tried (Dunlavy 2024, 13–15).

If competition for the consumer's dollar may serve as a proxy for "market forces," then the proliferation of products in the United States in the years before World War I seemed to be a consequence of market forces, which pushed middling manufacturers deeper into product diversity, not toward mass production. If the results of market forces are understood as "natural," then the diffusion of mass production techniques was decidedly unnatural and required a concerted, collective pushback against market forces. That pushback came when the United States began to mobilize for the Great War, abruptly tipping the balance from consumer sovereignty to industrial efficiency—at least temporarily.

Reducing Product Diversity in World War I

Efficiency became paramount when the U.S. Congress declared war on Germany in April 1917. Although war had broken out in Europe nearly three years earlier, deep divisions over US neutrality had hobbled military preparedness. American participation would prove to be brief, but no one knew beforehand when the war would end. For 19 months from the US declaration of war to armistice in November 1918, wartime officials scrambled to retool and ramp up the American economy in support of its expanding military forces.[2]

What ultimately became a concerted push to simplify American commodities grew out of a decidedly pragmatic approach to conserving resources for the war effort. Under the leadership of marketing expert and business publisher Arch Wilkinson Shaw (Copeland 1958; Witzel 2005), wartime officials adopted a variety of measures aimed at encouraging producers and distributors of civilian goods to conserve resources—labor, raw materials, transportation—for the war effort. As head of the conservation unit of the Council of National Defense, the Commercial Economy Board (CEB), Shaw focused initially on distribution (such as bread sales and retail deliveries). With a crisis-driven reorganization of mobilization agencies in March 1918, the CEB became the War Industries Board's Conservation Division, also headed by Shaw. This was when a comprehensive drive to push manufacturers of civilian goods toward mass production got under way.

Under Shaw's leadership, conservation officials took a pragmatic stance, simply seeking maximum output using less skilled labor and a minimum of materials—all as soon as possible, please. They did not expect manufacturers to emulate Henry Ford's model of ultra-efficient mass production; there were, as an engineer noted after the war, "many grades of mass production" (Allingham 1920, 478).

The critical first step was getting manufacturers to limit the variety of products they made so that, with minimal changes to their equipment, they could produce that limited set of products in much larger volumes. “[W]e did not go to Washington with a definite program of standardization,” Shaw explained after the war, “but . . . simplification seemed to be the only way . . . we could release from the resources of the nation those resources necessary for the conduct of the war” (“Standardization of Products” 1921, 65). By eliminating “every non-essential motion, and all unnecessary use of material, equipment or working capital,” and limiting production to a small set of standard products, Shaw later explained, manufacturing operations could be streamlined and production runs could be lengthened, increasing output and reducing the relative amount of labor needed; manufacturers as well as their suppliers and dealers or retailers would need to carry less inventory; and transportation costs could be minimized. The aim, in Shaw’s words, was “for the bulk of the industry of the country, even its smaller concerns, to take full advantage of the economies of mass production technique, and to achieve the efficiency of the repetitive process, resulting in continuity and speed of operation” (Shaw 1943, 6–7).

The conservation program was truly breathtaking in its sweep. “All down the line of American industry,” a journalist reported, “one could find some reorganization effected or about to be effected through ‘agreement’ with the Conservation Division of the War Industries Board” (Wood 1918, 63). The affected lines of business ran the gamut from agricultural implements to office appliances, plumbing supplies, and women’s clothing (Baruch 1921, 65-69; Crowell and Wilson 1921, 67–70; Garrett 1920, 231–32; Stewart 1941, Appendix I). As a postwar analysis put it, conservation measures “invaded all of America’s manufacturing life” (Crowell and Wilson 1921, 69).

Initially lacking enforcement powers, the Conservation Division, building on the work of the Commercial Economy Board, forged a collaborative process for reaching industrywide agreements on conservation measures. It first gathered information on needs and requirements from government and industry sources. Then it held a series of conferences with industry representatives to explain the government’s needs. “This is what you can do,” Arch Shaw would tell the industry representatives. “You can go carefully over your practice and tell me what you can eliminate without absolutely crippling your industry and working actual hardship to the public. Disregard what people want merely because they want it. Tell me what they have to have and what they can get along without” (Crowell and Wilson 1921, 67). Industry representatives then formulated recommendations for economies, which Division officials refined, circulated widely, discussed with critics, and finally issued as detailed conservation “schedules.” The schedules were published in the *Official U.S. Bulletin* and in trade journals and set an effective date to reduce the competitive risk to those who complied. The Division’s objective in this collaborative procedure, as the War Industries Board’s chairman Bernard Baruch later explained, was “to get as complete unanimity as possible” (Baruch 1921, 63).

In negotiations between the trades and conservation officials, trade associations served as the lynchpin, as they did for most aspects of World War I mobilization (Cuff 1973, 274; Eisner 2000). By 1913, the United States had some 230 commercial organizations of international, national, or interstate scope, including a “peak association” or national association of associations, the Chamber of Commerce of the United States (USDCL-BFDC 1913). Formed in 1912 at the behest of President William Howard Taft’s administration to serve as a communications channel with American business (Werking 1978), the U.S. Chamber of Commerce, an early advocate of war mobilization, worked with existing trade associations to appoint “war service committees” to represent their trade in negotiations with government officials; if a trade was unorganized, the Chamber worked with it to organize a national association and appoint a war service committee. By the war’s end, the U.S. Chamber had certified hundreds of war service committees, which worked closely with the WIB’s 57 commodity sections (Paxson 1920, 68; Baruch 1921, 23–24; McCullough 1928; Koistinen 1967, 380). The commodity sections, devoted to products as diverse as steel and woolen goods, supported the Conservation Division by collecting industry data, organizing consultations with industry, and administering the conservation schedules (Baruch 1921, 103, 108).

To enforce the conservation schedules, the Conservation Division initially relied on social sanctions—appeals to patriotism and public pledges that compliant firms would only do business with firms that also complied with the schedules. Then, after the WIB's powers were strengthened in early 1918, the Division gained the leverage it needed to enforce cooperation if it could not be elicited by social means. This was the WIB's power to establish priorities for access to economic resources, which entailed assigning individual purchase orders a priority ranking that suppliers were obliged to observe in filling orders (Baruch 1921, 63; Cuff 1973, 191–219). The WIB's priorities commissioner not only controlled the allocation of critical raw materials but, working with other agencies, Baruch explained, "could also withhold, for the purpose of bringing recalcitrants into line," access to fuel and transportation (Baruch 1921, 65, 127). Companies that declined to cooperate with conservation measures, in other words, faced the very real threat that they would be denied the resources they needed to continue in business during the war.

All told, from mid-1917 to the end of the war in November 1918, the Conservation Division and its predecessor, the Commercial Economy Board, working through trade associations, drew up conservation "schedules" for some 250 lines of business.[3] Indeed, the Division became one of the most visible agencies of the WIB (Clarkson 1924, 210), its work to streamline American business amplified by other wartime agencies such as the U.S. Food Administration and the General Medical Board's Committee on Standardization. The thrust of wartime simplification, in short, extended well beyond Arch Wilkinson Shaw's Conservation Division.

What concrete results did this forceful and sweeping, albeit brief, push to reduce product diversity and to diffuse mass production techniques yield? No comprehensive account has been published, but scattered reports convey a sense of its impact. A table prepared by the U.S. Chamber of Commerce, for example, listed varieties of a series of commodities before and after simplification and calculated the percentage reduction in variety ("Steps in Simplification" 1922, 146; "Current Editorial Comment" 1923, 33). The table included two major clusters of commodities simplified during the war—farm implements (nine types plus Total) and paper (seven types)—together with a wide range of other articles, from hammers and hatchets to pencils, piano stools, and wheelbarrows. The reductions achieved in farm-implement varieties averaged 87 percent overall, while reductions of the other articles in the table ranged from 43 percent (Book Papers) to 97 percent (Linen Papers). Other examples may help to convey the breadth and depth of reductions: horse collars, reduced from 60 to 15 styles, and riding saddles, from 200 to 36; shoe leather colors, from 81 to 3; metal bed styles, from 600 to 24; automobile tires, from 287 to 32 (to be reduced to 9 within 2 years); ready-mixed house paint colors, from as many as 100 to 32; and typewriter ribbon colors, from 150 to 5 (Dunlavy 2024, 42–45). As Baruch noted in his postwar report on the War Industries Board, "It would be wearisome to catalogue at length all the schedules which were issued and all the savings effected" (Baruch 1921, 68).

Taken together, the reductions in product diversity negotiated during the war reshaped the landscape of American manufacturing. "That period of war's white-heat," the editor of Shaw's *Factory* magazine observed, "when all that was unessential melted away until the underlying, surprisingly simple, skeleton of industrial necessity was revealed, has left its impress everywhere in manufacture" (Thomas 1921a, 451). WIB chairman Bernard Baruch deemed the economies achieved by reducing product diversity "one of the great lessons learned from the war" ("Permanent Government Organization" 1918, 3). The Council of National Defense's former director, Grosvenor Clarkson, likewise believed that manufacturers had "learned a lesson under the tutelage of the Conservation Division" and had gained "the knowledge and experience" to thrive in the perilous postwar years (Clarkson 1924, 225). But lessons learned during the war would prove no match for the forces of competition that resurged when the American economy abruptly demobilized.

The Postwar Resurgence of Product Diversity

With the signing of the armistice on November 11, 1918, the question whether American manufacturers would retain in peacetime the "lessons" in mass production that they had learned in war took on sudden urgency. Key government officials certainly thought that, in some form, the wartime lessons *should* be translated to peacetime (Baruch 1921, 69; Cuff 1973, 256 n219; "Permanent Government Organization" 1918, 3). Broad swaths of the business world shared officials' enthusiasm for continuing the conservation measures in peacetime. In the estimation of a *Printers' Ink* writer, "regret" that the conservation measures were ending was, "if anything, more widespread in business circles than in the Government environment." The writer reported that "business men are making appeals to Washington by mail, telegraph and personal visit, not to be over hasty in abolishing the conservation schedules." Even those not directly involved "in formulating the schedules . . . would regard it as a positive catastrophe if Uncle Sam, in his haste to give business a free hand, should allow business to slip back into all the old, wasteful, illogical habits from which it has so recently been lifted" ("Manufacturers May Retain" 1918, 89). The Conservation Division's collaborative process of crafting conservation schedules surely heightened business enthusiasm to retain wartime economies, often ones that businesses themselves had suggested.

But demobilization came quickly. Baruch resigned as WIB chair within weeks of the armistice, and all WIB restrictions lapsed at the end of the year. The Conservation Division was initially transferred to the Department of Commerce, the transition overseen by Arch Shaw. But, within six months, it was dissolved for lack of Congressional funding (Dunlavy 2024, 58–59). Asked about "the continuance of the conservation programmes that have brought about temporarily the simplification of styles," a WIB official responded bluntly: "It is squarely up to the trades—more specifically to the trade associations" ("Manufacturers May Retain" 1918, 89–90).

Would American trade associations be able to sustain the initiative in peacetime? Their numbers having nearly tripled between 1913 and 1919 (USDCL-BFDC 1913, 4-10; USDC-BFDC 1920, 5-16), many were young organizations forged during the war, and they faced fierce economic and political headwinds in the immediate postwar years—war-induced overcapacity, rapid demobilization, consumer resistance to high prices, depression in 1920–21, and intensification of hand-to-mouth buying. Individual firms might be able to hold the line, particularly if they dominated their line of business, but industrywide retention of the wartime conservation measures, as business leaders were well aware, depended on concerted action ("W. H. Phillips" 1919, 11; Copeland 1921, 58; Maddock 1921, 613). In peacetime, moreover, concerted action in pursuit of economies in production and distribution faced legal hurdles. As government support for collective action lapsed, American firms found themselves, in economist Homer Hoyt's words, caught "between the whirlpool of ruinous competition and the sharp rocks of the Sherman [Antitrust] Act" (Hoyt 1919b, 275).

Some lines of business were partially successful in holding the line. The paint industry retained its limits on the number of house paint colors, but brought back the smallest can sizes (Trigg 1922, 489). But the reduction in pneumatic automobile tire sizes from 287 to 9 by 1919 was rendered moot by technological innovation, as sizes of the new ballon tire quickly proliferated ("Tire Making" 1928, 136).

Most industries succumbed to competitive pressures, however, abandoning simplified product lines and reverting to product diversity as the strategy of choice. Like a one-two punch, consumer resistance to high prices and the sharp depression of 1920–21 brought the prewar tensions between producer-oriented industrial efficiency and consumer-oriented product diversity back to the surface. As a later report summed it up, "A hungry sales force and a factory running on part time combine to influence [company] policy in favor of producing anything that anyone can be induced to buy" (Report 1931, 3). Anecdotal evidence suggests that product diversity did indeed resurge after the war (Dunlavy 2024, 63–64).

Widespread appreciation of wartime achievements in streamlining American business, growing alarm that wartime economies were being abandoned, economic depression, nationwide labor strife—this was the context in which a disturbing study of American business practice appeared in 1921. Entitled *Waste in Industry*, it came from a new umbrella organization of engineers, the Federated American Engineering Societies (FAES), formed in 1920 in an intellectual milieu that envisioned a unified public role for engineers—and engineering methods—in what was widely anticipated to be the postwar "reconstruction" of American society. The FAES's first president was Herbert Hoover, who would soon become the U.S. Secretary of Commerce. The FAES's first action was to approve a proposal by Hoover to appoint a committee of engineers to study waste in production (Alchon 1985; Clements 2010, 44–47; Haber 1964, 155–59; 63–67; Layton 1986, 179–95).

The study's overarching goal, as Hoover summarized it for the FAES board, was "to visualize the nation as a single industrial organism and to examine its efficiency toward its only real objective—the maximum production." He thought of the American economy as one big "industrial machine." "The primary duty of organized society," he believed, "is to enlarge the lives and increase the standards of living of all the people—not of any special class whatever." And raising the national standard of living hinged on enhancing "national productivity" (Hoover 1921, 77; FAES 1921, ix). Focused on six industries[4] and completed in five months' time, the study highlighted four sources of waste in American industry, all centered on production: *lost production*, due to poor worker health and industrial accidents; *restricted production*, caused by industrial conflict; *interrupted production*, resulting from business cycles and seasonal operations; and *low production*, caused by "faulty management." Among other things, Hoover faulted management for allowing unchecked product diversity—or, as he put it, "a too high degree of individualism in certain basic products and tools"—to shorten production runs and raise unit costs. (Hoover 1921, ix, 8, 78–79). Quantifying waste of resources to two decimal points, the FAES report estimated that it ranged from 28.66 percent in the metal trades to 63.78 percent in men's clothing manufacture. The study attracted widespread notice, not least for its controversial conclusion that the bulk of the responsibility for waste ("over 50%") lay with management rather than labor (FAES 1921, 9).

The FAES committee's study, in highlighting product diversity as a major source of waste in American industry, echoed rising concern in the business world as product varieties proliferated again in the slump of 1920–21. This set the stage for Herbert Hoover, as Secretary of Commerce, to revive and reinvigorate World War I–era efforts to suppress the market forces that spawned product diversity and blocked the diffusion of mass production techniques.

Hoover's "Fostering Hand"

When Herbert Hoover took office as President Warren G. Harding's Secretary of Commerce at the age of 46, he had already acquired a string of distinguished sobriquets—"The Great Engineer," "The Great Humanitarian," "Master of Emergencies" (Nash et al. 1983–2010; Jeansonne 2016). Orphaned in rural Iowa, raised by Quaker relatives in Oregon, a member of Stanford's first class in 1891, he had achieved an international reputation—and considerable wealth—first, as a manager (later, partner) in a British mining company with global interests and, from 1908, as an independent consultant, work that took him to Australia, China, Burma, and Russia. Hoover retired from mining in 1914 (while retaining mine investments), and then, as war broke out in Europe, turned his formidable energies to humanitarian work. From 1914 through the war, he organized private food relief for German-occupied Belgium, an extraordinary feat that won him international acclaim. When the United States entered the war, he put his expertise to work as head of President Woodrow Wilson's U.S. Food Administration, while continuing to chair the Commission for Relief in Belgium. After the war he focused again on humanitarian work, this time organizing economic relief for war-ravaged Europe as head of the American Relief Administration. Barely into his forties, Hoover had already demonstrated, in the words of a biographer, "inexorable energy and the drive of a locomotive" (Jeansonne 2016, 83), qualities that he would bring to bear in his efforts as U.S. Secretary of Commerce to revive the wartime push for mass production.

In the global competition for hearts and minds after the Bolshevik revolution and war, Hoover believed, the United States' essential weapons were equality of opportunity and a rising standard of living, the latter resting, in Kendrick A. Clements's words, on two pillars: "increasing productivity and the broadest possible distribution of its fruits throughout society" (Clements 2010, 41). To broaden the distribution of wealth, Hoover favored high wages, a progressive federal income tax, and the federal estate tax. Increasing productivity, for Hoover, meant working closely with trade associations and labor unions to eliminate waste in all its forms, which he also saw as essential to the ability of US firms to compete in postwar foreign markets (Hoover 1919, 4; Clements 2010, 229).

Hoover thus came to the Department of Commerce armed with a comprehensive agenda to eliminate waste in the American economy (Clements 2010; Hawley 1974, 116–40; Jeansonne 2016, 152–85; Wilson 1975, 79–121). In doing so, his guiding premise was that government should serve, in a Hoover scholar's words, "primarily as a coordinator, mediator, and information-dispenser, not as a coercive or restrictive force" (Clements 2010, 42). In its pursuit of increased productivity, the Commerce Department would support business, as Hoover put it, "on a basis of cooperation," which he portrayed as "an entirely new departure" in American government–business relations (USDC 1922, 2). Given the extensive government–business collaboration that had marked the recent war effort, he might better have said "an entirely new departure *in peacetime*."

Viewed against the backdrop of the war experience, Hoover's reorganization and expansion of the Commerce Department in the 1920s (Clements 2010, 109–13; Eisner 2000, 114–21; Hawley 1974, 120–39) clearly built upon and expanded wartime practice. That he saw the War Industries Board—and, more specifically, the WIB's Conservation Division—as the template for his campaign against waste in American business is suggested by the fact that his first choice to serve as his assistant in reorganizing the department was Arch Wilkinson Shaw, the World War I conservation czar (Clements 2010, 110). Although Shaw would provide critical background support, he declined Hoover's offer. Instead, Hoover recruited Shaw's colleague Frederick Feiker, an electrical engineer by training who, like Shaw, worked in business publishing, among other things, as editor of Shaw's magazines *System* and *Factory* before the war ("F. M. Feiker" 1920, 90; *New York Times*, "Frederick Feiker" 1967, 84; Tanner 1984, 5–6; Clements 2010, 110).

In strengthening the Commerce Department, Hoover took two steps to restructure it in the image of wartime agencies (Eisner 2000, 115–21), though not in so many words. First, he created commodity divisions in the Bureau of Foreign and Domestic Commerce. Fifteen in number by 1922, these were headed, like the WIB's commodity sections, by individuals drawn mainly from the relevant industry. The commodity divisions worked closely with private sector committees whose members, like those of the war service committees, were generally nominated by the relevant trade association and were able to speak for their industry. Hoover's commodity divisions sought principally to gather and disseminate information on business practice and conditions for their respective commodities, with special emphasis on export markets in the early years (USDC 1922, 96–98; Herring 1936, 298–89; Hawley 1974, 123; Eisner 2000, 116–19). Their resemblance to the WIB's commodity sections was crystal clear to a contemporary observer (Clarkson 1924, 486).

Hoover's second step—the key structural change for his campaign to eliminate industrial waste—was to create a new division that mirrored the WIB's Conservation Division. This was the Division of Simplified Practice (DSP), housed in the Commerce Department's Bureau of Standards. Like the Conservation Division during the war, the DSP's mandate was to aid in streamlining American business and pushing it toward mass production and distribution, the key in peacetime to achieving a higher standard of living. In a 1924 publication showcasing the new Division, Hoover laid out the idea succinctly: eliminating "these endless variations" in manufactured products would reduce costs all along the line from manufacturing through distribution, lower costs would "eventually" be reflected in lower prices for consumers (including farmers), and lower prices would increase real wages, thus raising the standard of living (USDC 1924, ii). Candidates for simplification included industrial as well as consumer products—virtually anything that might profitably be mass produced. To head the new division, Hoover recruited another electrical expert, William A. Durgin, whom he borrowed from Commonwealth Edison in Chicago ("William A. Durgin" 1921; Tanner 1984, 6). Durgin was succeeded as Division head in 1924 by Ray M. Hudson, whose background was in mechanical engineering; Hudson, in turn, was succeeded by engineering and marketing specialist Edwin W. Ely, who headed the Division for some thirty years (Heckel 1931, 592–93).

The specific charge of the Division of Simplified Practice, spelled out in its name, was to enable American industries to engage—in peacetime—in collective reductions of product diversity. Such action was referred to variously as "simplification" or "simplified practice," the usage shifting somewhat over time. In his welcoming remarks to the first simplified practice conference, Hoover highlighted the problem the division would address: the collective inefficiency of American manufacturing revealed by the Great War. Individual manufacturers showed "remarkable efficiency," he noted. What concerned him was the economy as a whole—the United States' "industrial machine"—and what he saw as "the very considerable inefficiency of collective industry." "If we had the same native efficiency collectively in this country that we have individually," he believed, "we would have no difficulty in maintaining our own in foreign or international commerce, of maintaining the high wage levels and the high standards of living." Manufacturers had been persuaded by their war experience "that there was something of permanent value" in reducing product diversity, but they were hamstrung, he maintained, by antitrust strictures and the challenges of reaching industrywide consensus. Thus, he offered "the friendly help of the Government" in surmounting both obstacles (Feiker 1922, 156). Agreements with the DSP, rather than among competitors, to limit product variety would provide some protection against antitrust prosecution, he suggested, while the DSP would serve as an "unbiased third party" in negotiating collective agreements up and down the chain of production and distribution as well as across the trades (Feiker 1922, 156; Hoover 1922, 10; Priest 1926, 32).

As articulated time and again by the Division of Simplified Practice, the advantages of simplification in peacetime were essentially the same as in war, although the overall goal was quite different. Early summaries of the benefits appeared in Shaw's publications (Parsonage 1921, 756–57; Thomas 1921b, 717) and then routinely in DSP publications from the 1920s through the 1960s, highlighting productivity gains, lower costs, and inventory reductions and outlining distinctive benefits for three groups: manufacturers; distributors (jobbers, wholesalers, retailers); and consumers. But simplification in war and in peace served fundamentally different purposes, which Arch Shaw summed up this way: "The philosophy of simplification in war time is to cut down demand . . . . In peace time the philosophy of simplification is practically reversed, because in peace time the purpose of simplification is to lower costs, so that demand can be increased" ("Official Proceedings" 1930, 3).

Even before Hoover had recruited a chief for the new division, Commerce staff convened a national conference to simplify paving bricks. Held at the Department of Commerce in late 1921 and led by Hoover's assistant (and Shaw's colleague) Frederick Feiker (*SPR No. 1 1922, 5;* Feiker 1922, 156–58), this first peacetime simplification process could be organized so expeditiously, one suspects, because Commerce staff did not need to work out a process from scratch: they, like American firms, were already quite familiar with Shaw's wartime model of collaboration. The first of more than 100 simplified practice conferences in the 1920s, the paving-brick conference established Hoover's peacetime template for the simplification process (refer to box 1).

Box 1. Nomenclature for Simplified Practice Recommendations

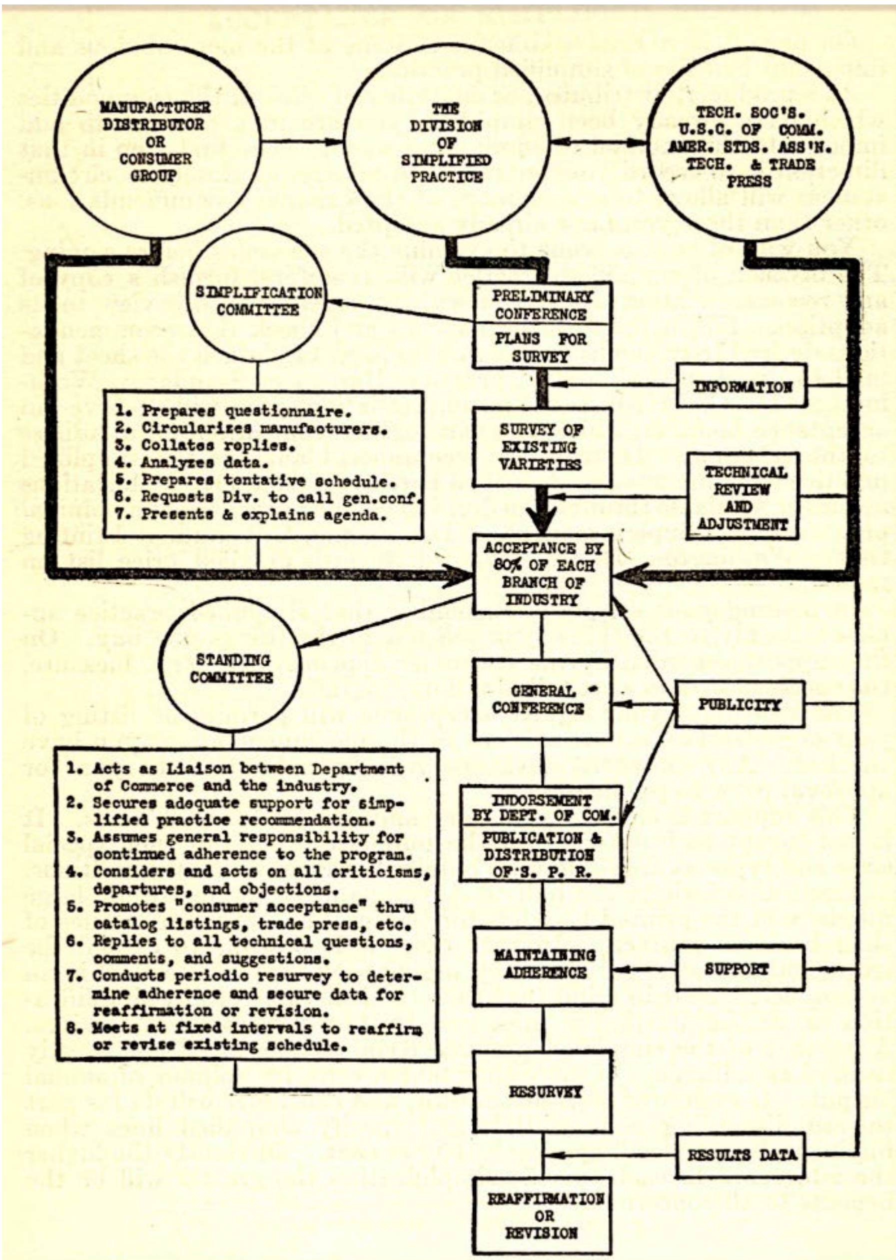
Citations to Simplified Practice Recommendations (SPRs) appear in shortened form in the text. The full citation of the first Simplified Practice Recommendation, for example, would be: U.S. Department of Commerce, *Simplified Practice Recommendation No. 1: Paving Bricks, Issued by the Bureau of Standards, Fourth Revision, May 1, 1925* (Washington, DC: U.S. Government Printing Office, 1925). In the text, it appears as *SPR No. 1: Paving Bricks* 1925.

Beginning in 1928, a new numbering convention was introduced, applicable to existing recommendations when they were revised. When it was revised in 1929, *SPR No. 1* became *SPR R1-29*. The year in the notes is the year of publication. When the product line is identified in the accompanying text, only the SPR number and year are cited. As official government publications, the printed standards were sent to federal depository libraries, but they have not necessarily been retained. Fortunately, many are available online. The most complete collection, to the author's knowledge, is on HathiTrust (https://catalog.hathitrust.org/Record/003924287).

Parallels in War and Peace

In multiple ways, Hoover's process (refer to figure 1) mirrored that of the Conservation Division during the war.[5] First and foremost, *collaboration* was at the core of both. The Division of Simplified Practice sought to involve in the postwar deliberations all economic actors with a stake in a particular commodity (apart from retail consumers and labor). Trade associations, which tripled again in number between 1919 and 1931 (USDC-BFDC 1920; USDC-BFDC 1931), were key partners. The national paving brick conference, for example, was initiated by the National Paving Brick Manufacturers Association (*SPR No. 1* 1922, 5). At conferences to simplify bank checks in 1925, a total of nine trade associations represented banks, lithographers and printers, and major users such as manufacturers, purchasing agents, and railroad accountants and treasurers (*SPR No. 50* 1926, 4–5). What has come to be called "associationalism" was in the air before, during, and after World War I, and Hoover's collaborative process served to amplify the importance of trade associations in the 1920s.

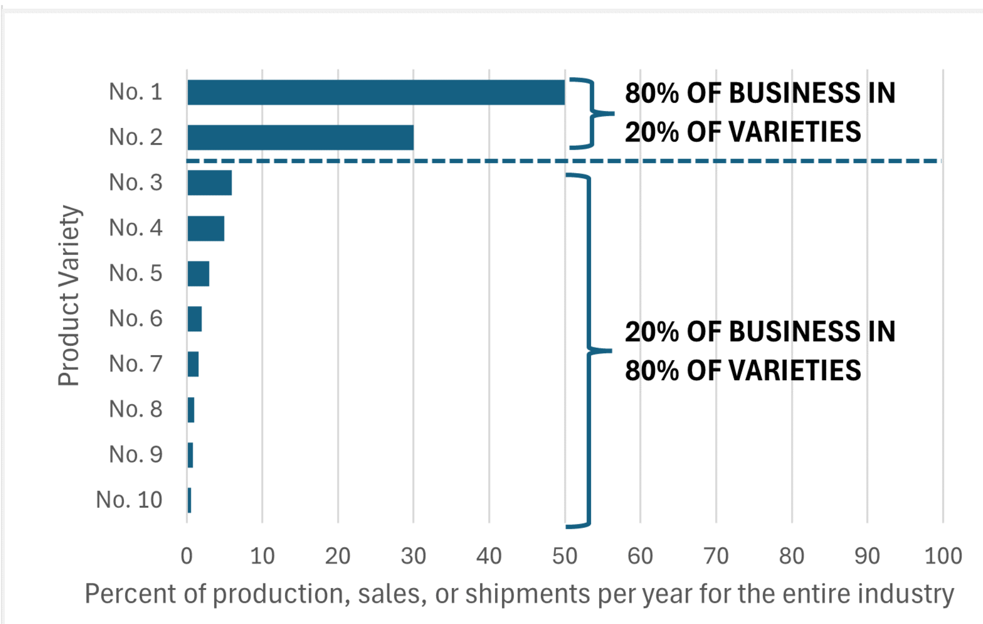
Figure 1. Secretary Hoover's Simplification Process



Source: SPR R109-29: Refrigerator Ice Compartments 1930, 9.

Second, in peace as in war, the simplification process was *data-driven*. Proposals to eliminate specific product varieties were invariably grounded not in technical data but in a survey of recent production or sales. Once a preliminary conference had decided to go ahead with a product survey, it was carried out by industry representatives, one of whom was designated "Secretary Hoover's representative" to encourage firms to furnish proprietary data and probably to allay concerns about the legality of doing so (USDC 1924, 3). Very quickly, an empirical rule emerged, which DSP staff regarded as "axiomatic" by the mid-1920s (Hudson 1925b, 195): viewed industrywide, 20 percent of product varieties usually accounted for some 80 percent of that industry's sales (refer to figure 2). As a management textbook explained, in terms reminiscent of Ford's success in "standardizing the customer," firms that simplified their products were "catering to the tastes and needs of the *average* buyer, leaving those who fall outside their field of specialization to the special-order manufacturer" (Bangs 1930, 234, original italics; refer also to Jerome 1934, 341: "stereotyped clientele"). If the production or sales of the largest firms dominated the data, this procedure meant that the selected standards would be those of the largest producers. Analyzing the survey data and preparing the supplementary materials necessary to garner industrywide support for a recommendation was occasionally a huge task, as it was, for example, with the simplification of paper bags for groceries and pocket knives (*SPR No. 42* 1926, 6, 10-11; *SPR 99-30* 1929, 1, 3).

Figure 2. The 80–20 Axiom: Simplification Concentrates Production on the Varieties in Greatest Demand



Source: Based on a figure in Priest 1926, 14.

Third, a solid foundation of data provided critical support for Hoover's efforts, like Shaw's, to *maximize consensus* as a means of enhancing adherence. The preliminary committee's recommended standard sizes, based on the survey results, were presented to a "general conference," usually held at the Department of Commerce. Time and again, attendees at the general conferences were reminded that unanimity was crucial (refer, for example, to *SPR No. 10: Milk and Cream Bottles* 1924, 2; *SPR No. 25: Hot Water Storage Tanks* 1925, 7). In some cases, such as milk bottles and paper sizes, this limited the scope of the eliminations initially adopted (*SPR No. 10* 1924, 2-3; *SPR No. 22* 1924, 6). It was a testament to the solid groundwork laid by trade associations and DSP staff that a single general conference was usually sufficient to achieve unanimity on Simplified Practice Recommendations (SPRs).

In a few cases, however, consensus was achieved only after herculean efforts. The most challenging, second only perhaps to garment sizes (Ashdown 2007), was the simplification of lumber sizes, grades, and practice. Since the early twentieth century, the lumber industry—highly fragmented, riven by regional differences, and touching a wide array of economic interests—had been pursuing nationwide standardization, and in the 1920s competition from substitute building materials heightened the urgency (Compton 1916, 126–29; Smith and Wood 1964, 5-13). As an industry report explained, "sane standardization offered promise of increased economy, more profitable and stable business, and markedly better service" (*SPR No. 16: Lumber* 1924, 17). The DSP-led process entailed multiple preliminary conferences, four general conferences, and Hoover's personal intervention to arrive at a double standard for the dimensions of a surfaced 1"-thick board: a "standard size" of 25/32" and an "extra standard size" of 26/32" (*SPR No. 16* 1924, 18–30). The dual standards were not replaced by a single standard until 1970 (American Softwood Lumber Standard [1970], 6). Nonetheless, Secretary Hoover touted lumber simplification, the National Lumber Manufacturers Association (NMLA) later reported, as "'Exhibit A' of what an industry, with able leaders and sincerity of purpose can achieve for itself, without governmental interference or restraint" (Blodgett and Ritter 1929, 5, 48–49). What the NLMA could also have noted is that the lumber industry, after decades of futile efforts, was only able to move toward consensus because of the critical assistance lent by Hoover and the DSP.

Once unanimity had been achieved in a general conference, Commerce Department staff circulated the recommendations to the industry for acceptance. In the acceptance process, the DSP defined consensus as acceptance by 80 percent (by volume) of each of the interested groups—manufacturers, distributors, and consumers (Priest 1926, 13, 16; *SPR No. 48: Shovels* [*etc.*] 1926, 5; USDC-BS 1931a, 7). As DSP Chief Edwin W. Ely later explained, 80 percent was "merely an arbitrary figure," "just … something positive to talk about," a number that seemed "a fair basis" for judging industry acceptance ("Official Proceedings" 1930, 11–12).

Fourth, once a recommendation had achieved the required acceptance levels, the Commerce Department published it as an official Simplified Practice Recommendation (SPR), the equivalent of the War Industries Board's *conservation schedule*. The imprimatur of the federal government was clearly expressed in the words "United States Department of Commerce" emblazoned across the title page, which also included a graphic of the department's seal and the words "issued by the Bureau of Standards." Invariably, the text described the SPR as the official recommendation not of the industry or trade associations but of the Commerce Department itself. Published and distributed by the U.S. Government Printing Office, each SPR bore the explicit approval of the Secretary of Commerce as well as the director of the Bureau of Standards.

Like the World War I schedules, the SPRs included measures to dampen competitive pressures. They almost always took effect industrywide on a specific future date, which reduced the risk that the first firms to comply would lose customers to their competitors while waiting for lower costs and advertising to stimulate sales (Johnson 1921, 88). The general conference also appointed a standing committee to meet annually and consider revisions of the standards, based on the latest sales data. This opened up opportunities for new standards when sales data warranted. The standing committee also conducted periodic resurveys of sales to estimate adherence to the SPRs, which enabled individual firms to gauge the extent to which their competitors were abiding by the recommendations (Priest 1926, 17–18).

Fifth, as with World War I conservation measures, getting American consumers to accept the new standard sizes took sustained *persuasion*. Individual manufacturers who simplified their product lines testified frequently in the pages of Shaw's magazines that simplification—dropping products that they had long supplied to their customers—posed daunting merchandising challenges (refer, for example, to Patch 1924, 33–34). Consumers had to be educated about the value of standard products, as did a company's sales force or jobbers (Coonley 1921, 319; McClure 1922, 123–24, 127–28; Patch 1924, 33–34; Schlink and Brady 1928, 232). Even a dominant manufacturer like the General Electric Company tread carefully, trying to nudge its customers toward the new "staple" items without losing those who preferred specialized products (1924 General Electric catalog, quoted in Agenda 1932, 4). The DSP, too, recognized that Simplified Practice Recommendations would have to be actively "sold." Those who signed the standard SPR acceptance form, like manufacturers in World War I, pledged to "use our best effort in securing general adoption of the simplified list" (Priest 1926, 16). In general, the DSP's chief noted in 1924, "[p]roducts, however meritorious, do not 'sell' themselves." Once adopted, standard products had to "be thoroughly and persistently advertised and demonstrated" (Hudson 1924, 1034). As a result, advertising took on new importance, used to quash demand for the eliminated products and redirect it to simplified lines (Barnes 1923, 23, 103).

In two ways, however, Hoover's peacetime process diverged from Shaw's wartime practice, though these were differences in degree, not kind. The *voluntary nature* of the simplification process, as one would expect, was more pronounced in peacetime. As DSP publications and staff repeatedly emphasized, the initiative for simplification projects had to come from business itself (refer, for example, to USDC 1923a, 44; Shaw 1923, 425; USDC 1924, 32; Hoover 1925, 536; Priest 1926, 32). Division staff were instructed to "lean backward when it came to making suggestions about simplification" to individual firms ("Official Proceedings" 1930, 9). However, American business had recent experience with Shaw's simplification process, Hoover's personal mission to reduce waste and his enthusiasm for simplification were widely known, and he expected the new division to move aggressively. DSP staff undertook a massive campaign to sell simplified practice to trade associations and whip up demand for its services. In its first year, DSP staff reached out to more than 100 business groups, sought to enlist the business press's support, and placed a flurry of articles in trade journals (Quarterly Report 1923a, 8–14; Durgin 1922; "Bibliography" 1924, 318–20).

The DSP also differed in the *enforcement powers* it could marshal. Like Shaw's Conservation Division, it employed social sanctions to encourage acceptance of and adherence to SPRs—pledges, as noted, as well as appeals to modernity or far-sightedness. But it did not command the leverage of the WIB's priorities power. Still, it was able to wield considerable power by working closely with the Federal Specifications Board (FSB). Created in October 1921 as another pillar of Hoover's waste-elimination efforts, the FSB set parameters that products had to meet if businesses wanted to sell them to the federal government, the nation's (if not the world's) largest consumer. Federal specifications were often adopted by state and local governments as well as industrial buyers, thus shaping American markets up, down, and across the economy (USDC 1923b, 17–18). Because federal specifications generally "called for the simplified or standardized articles," Hoover later explained, "they reinforced that whole program" (Hoover 1952, 68). The DSP could not deny access to resources, in other words, but only those firms whose products met federal specifications—and their associated Simplified Practice Recommendations—gained entry to federal markets.

However, what truly set the Division of Simplified Practice apart from its World War I predecessor—a difference in kind, not merely degree—was the durability of its accomplishments. While traces of the Conservation Division's work began to fade once the war ended, the DSP's promotion of simplified practice shaped American manufacturing for decades to come.

Diffusing Mass Production

From Arch Wilkinson Shaw's achievements during the Great War to the persistence of standard sizes today, simplified practice has traced a long arc through American history. Its elements, outlined in this section, included impressive growth in the number of standards, expansion of the mission of the Division of Simplified Practice in the late 1920s, its unlikely persistence through the Great Depression, yet another boost to simplified practice in World War II, and a sustained push to diffuse mass production techniques both at home and abroad in the 1950s. Although the federal government's role in orchestrating "voluntary standards," as they came to be called, virtually ended in the 1970s, standard sizes and the collective agreements that underlay them have proven to be amazingly durable. Which is why the American consumer today can comfortably buy queen-sized sheets for a queen-sized bed, letter-sized paper that fits in a letter-sized folder, and rolls of toilet paper of a width that fits in a toilet paper holder—all without thinking about it.

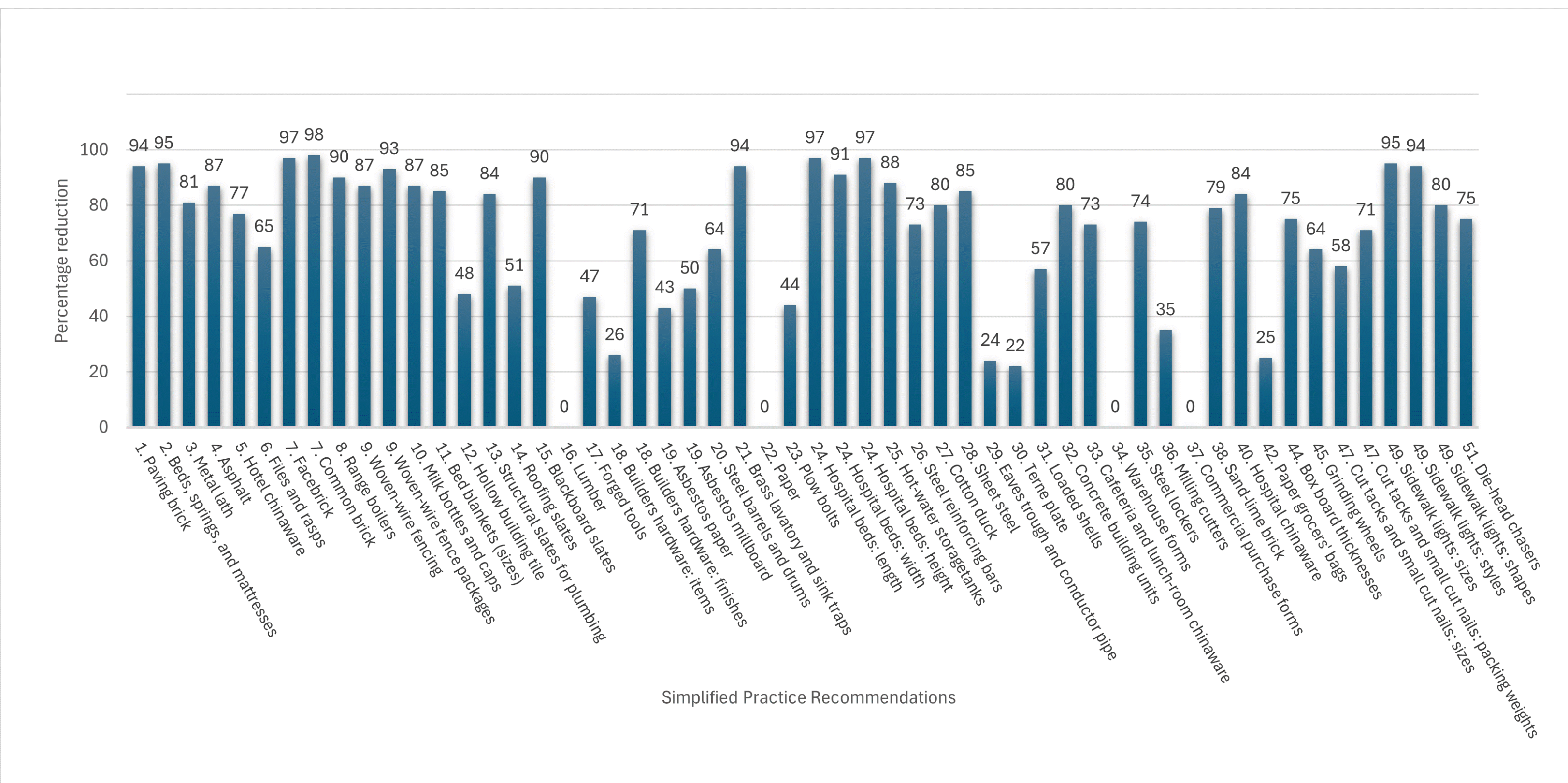
Although concrete results were initially slow in coming, word of the work of the Division of Simplified Practice almost immediately began to spread abroad because of its implications for competition in foreign markets. In a small flurry of news articles in 1922, the editor of the British edition of Shaw's *System*, Cecil Chisholm, brought the DSP's work to the attention of British business interests, lauding it as "America's new industrial policy" (refer, for example, to Chisholm 1922a). The Great War had stimulated a push for technical standardization not only in the United States but also in Europe, especially in Germany (Karabasz 1928; Klautke 2003; Wölker 1992; Yates and Murphy 2019, 78–80, 110–13), which had potentially widespread ramifications as competition in international markets ramped up after the war. Hoover and others believed that simplified practice was "of profound value in maintenance of our export trade" (Hoover 1925, 536). Chisholm warned British manufacturers to pay careful attention, as their Swedish counterparts were doing: "It is an industrial policy of first-rate importance and one which can scarcely be ignored" (Chisholm 1922b). "One thing is certain," he warned: "The work of the Department of Commerce is bearing practical fruit" (Chisholm 1922c).

Yes, despite what seemed like impressive achievements to outside observers, William Durgin, head of the DSP, was dissatisfied with its progress (Durgin 1922; Durgin 1923, 1; Quarterly Report 1923b, 7). By mid-1923, *SPR No. 1* for paving bricks and *SPR No.* 2 for beds and mattresses were in print. Another seven SPRs—born of preliminary conferences, grounded in product surveys, approved in general conferences—were awaiting industry acceptance; 24 new surveys of existing practice were under way; and the Division had created a separate committee to pursue simplification in shipbuilding (Quarterly Report 1923a, 2–3, 5). But the Division was running into resistance in several large industries (lumber, automotive, farm implements), and Durgin was not certain that all the pending SPRs would reach the threshold for industry acceptance (Durgin 1923, 1).[6]

Notwithstanding widespread enthusiasm in some quarters, skepticism about the Commerce Department's simplified practice initiative slowed its progress. One source of resistance came, of course, from firms whose primary competitive strategy was product diversity, the opposite of mass production (Priest 1926, 43). Skepticism also arose from a general fear of government intervention, as Hoover and DSP staff were fully aware (USDC 1924, 9; Hudson 1925a; Tanner 1984, 12). A third, persistent obstacle was fear of antitrust prosecution (Clements 2010, 202–06; Hudson 1925a, 537; Tanner 1984). As contemporaries well knew, the American antitrust tradition created legal obstacles to collective standardization in peacetime (refer, for example, to Hoyt 1919b, 274–75; Jones 1922, 101–12). For clarification of Justice Department policy, Secretary Hoover solicited from the U.S. Attorney General a declaration, widely publicized at the time, that as long as activities such as statistics-gathering and standardization were not used to fix prices or to limit production, they would withstand legal scrutiny ("International Industrial Digest" 1922; Jones 1922, 324–35; Heckel 1931, 588–89; Hawley 1989, 1073–74; Russell 2014, 83; Sawyer 2019, 180–82). In the mid-1920s, two court decisions put simplified practice on steadier legal ground, but uncertainty lingered through World War II and well beyond (Timberlake 1944; Rawie 1979).

Nonetheless, by mid-1926, the Division's first successes—*SPR No. 1* for paving bricks and *SPR No. 2* for beds, springs, and mattresses, both of which reduced the number of varieties by more than 90 percent, and its intensive promotional work with an array of industries began to yield results. Forty-five SPRs had been published, reducing product varieties by an average of 72.5 percent (refer to figure 3), and another 12 recommendations were circulating for industry acceptance. U.S. Government Printing Office sales of SPRs were brisk, totaling some 238,000 copies.[7] Altogether, DSP staff had hosted 273 conferences, addressed 289 meetings, and attended another 436 (Hudson 1926; USDC-BS 1926, 37). Consumer advocates and the academic world began to take notice, while foreign interest surged (Dunlavy 2024, 113–14). By the end of the decade, the number of SPRs in effect would reach more than 100 (refer to table 1), with another dozen or so in the acceptance process (USDC-BFDC 1930, 45).

Figure 3. Simplified Practice Recommendations, 1922-1926, Led to an Average Reduction of 72 Percent in the Number of Product Varieties



Source: USDC-BS 1926, 37.
Note: A few SPRs lack reductions data because the number of prior varieties was "indeterminable." SPR = Simplified Practice Recommendations

Table 1. More than 100 Simplified Practice Recommendations Were Approved between 1922 and 1930

No.	Item
1–29.	Vitrified paving bricks (seventh edition).
2.	Beds, springs, and mattresses.
3–28.	Metal lath (second edition).
4.	Asphalt (first revision).
5.	Hotel chinaware.
6.	Files and rasps.
7.	Rough and smooth face brick; common brick.
8–29.	Range boilers and expansion tanks (second edition).
9–28.	Woven-wire fencing; woven-wire fence packages (second edition).
10.	Milk bottles and caps (first revision).
11.	Bed blankets.
12.	Hollow building tile (first revision).
13–28.	Structural slate (second edition).
14–28.	Roofing slate (second edition).
15.	Blackboard slate.
16–29.	Softwood lumber (fourth edition).
17–29.	Forged tools (third edition).
18.	Builders' hardware (first revision).
19–28.	Asbestos paper and asbestos millboard (third edition).
20–28.	Steel barrels and drums (second edition).
21.	Brass lavatory and sink traps.
22.	Paper.
23.	Plow bolts.
24.	Hospital beds.
25.	Hot-water storage tanks.
26.	Steel reinforcing bars.
27.	Cotton duck (first revision).
28–29.	Sheet steel (second edition).
29.	Eaves trough and conductor pipe.
30–28.	Roofing ternes (first revision).
31.	Loaded paper shot shells (second revision).
32.	Concrete building units.
33.	Cafeteria and restaurant chinaware.
34.	Warehouse forms.
35–28.	Steel lockers (first revision).
36.	Milling cutters.
37–28.	Invoice, purchase order, and inquiry forms (second edition).
38.	Sand-lime brick.
39.	Dining-car chinaware.
40.	Hospital chinaware.
41.	Insecticides and fungicides (package sizes).
42.	Paper grocers' bags.
43–28.	Paint and varnish brushes (first revision).
44.	Box board thicknesses.
45–29.	Grinding wheels (third edition).
46.	Tissue paper.
47–28.	Cut tacks and small cut nails (second edition).
48.	Shovels, spades, and scoops (first revision).
49.	Sidewalk, floor, and roof lights.
50.	Bank checks, notes, drafts, and similar instruments.
51–29.	Chasers for self-opening and adjustable die heads (third edition).
52.	Staple vitreous china plumbing fixtures.
53.	Steel reinforcing spirals.
54.	Sterling silver flatware.
55.	Tinware, galvanized and japanned ware.
56–28.	Carbon brushes and brush shunts (first revision).
57.	Wrought-iron and wrought-steel pipe, valves, and fittings.
58–28.	Classification of iron and steel scrap (first revision).
59.	Rotary-cut lumber stock for wire bound boxes.
60.	Packing of carriage, machine, and lag bolts.
61.	White glazed tile and unglazed ceramic mosaic.
62.	Metallic cartridges.
63.	Metal spools (for annealing, handling, and shipping wire).
64.	Package sizes for vegetable shortening.
65–28.	Lead pencils.
66.	Automobile brake lining.
67.	Roller bearings.
68.	Metal and fiber flash-light cases.
69.	Packaging of razor blades.
70.	Salt packages.
71–28.	Turnbuckles.
72.	Solid section steel windows.
73.	One-piece porcelain insulators.
74.	Hospital and institutional cotton textiles.
75–29.	Composition blackboard (second edition).
76.	Ash handles.
77.	Hickory handles.
78–28.	Iron and steel roofing.
79–28.	Malleable foundry refractories.
80–28.	Folding and portable wooden chairs.
81–28.	Binders' board.
82–28.	Hollow metal doors.
83–28.	Kalamein doors.
84–28.	Composition books.
85–28.	Adhesive plaster.
86–28.	Surgical gauze.
87–29.	Form dimensions for concrete ribbed floor construction.
88–29.	Floor sweeps.
89–28.	Coated abrasive products.
90–29.	Hack-saw blades (second edition).
91–29.	Glass containers for preserves, jellies, and apple butter.
92–28.	Hard fiber twines (ply and yarn goods).
93–29.	Paper shipping tags.
94.	Fire engine pumping capacities.
95–28.	Skid platforms.
96–28.	Ice cake sizes.
97.	(To be assigned.)
98–29.	Photographic paper.
99–30.	Pocket knives.
100–29.	Welded chain.
101–29.	Metal partitions for toilets and showers.
102–29.	Granite curbstone.
103–29.	Industrial truck tires.
104.	(To be assigned.)
105–29.	Wheelbarrows.
106–30.	Hospital plumbing fixtures.
107–30.	Tight cooperage and tight cooperage stock.
108–29.	Dental hypodermic needles.
109–29.	Refrigerator ice compartments.
110–29.	Soft fiber (jute) twines.
111–30.	Color for school furniture.
112–29.	Elastic shoe goring.
113–30.	Restaurant guest checks.
114–30.	No. 1 kraft sealing tape.

Source: SPR R109-30: Refrigerator Ice Compartments 1930, 14.

The Division's progress in attracting industries to its simplification service reflected, in part, its outreach strategy, which produced clusters of SPRs in related product lines. One of its technical assistants targeted, for example, the simplification of containers, which yielded at least three SPRs—for paper bags for groceries; packages for salt; and glass containers for preserves, jellies, and apple butter (Durgin 1922; *SPR No. 42* 1926; *SPR No. 70* 1928; *SPR R91-29* 1929). Similar initiatives produced clusters of SPRs for slate products (*SPR Nos. 13–15*) and hardware (*SPR Nos. 28–31*). In 1926 the DSP formalized its cluster approach by creating the National Committee on Metals Utilization to encourage simplified practice in "the metals-using field" (USDC-BS 1927, 361).

A snowball dynamic also accelerated simplification across the economy as industry approval of a Simplified Practice Recommendation for one product line inspired simplification of competing or related product lines. Simplification of paving bricks (*SPR No. 1*) was followed quickly by simplification of a competing product, asphalt for paving purposes (*SPR No. 4*), and of other kinds of brick (*SPR No. 7*). The simplification of household beds and mattresses spurred simplification of blankets, hospital beds, and hospital and institutional bedding (*SPR Nos. 2, 11, 24, 74*). A snowball dynamic also characterized the simplification of steel products (*SPR Nos. 26, 35, 53*), ammunition (*SPR Nos. 31*, *R62-37*), and chinaware (*SPR Nos. 5, 33, 39, 40*). Simplification begot simplification.

Meanwhile, the DSP's mission expanded noticeably during the 1920s. Its focus broadened to encompass not only production but distribution, as warehouse forms (*SPR No. 34*) and other commercial forms (*SPR No. 37*) were simplified—the latter action garnering Secretary Hoover and the DSP a standing ovation at the general conference (*SPR No. 37* 1925, 11). These were followed by the simplification of warehouse pallets (*SPR R95-28*) and retail packages (*SPR R126–R129*). The Division also turned its attention more fully to questions of product quality, establishing in 1927 a "commercial standards unit." This unit aimed to simplify purchase specifications, whose proliferation was on full display in the Federal Specifications Board's 1925 directory of some 27,000 federal, state, municipal, and private specifications. The Commercial Standards Unit aided industries in choosing widely used specifications to be designated collectively as nationwide standard specifications (USDC-DSP 1927; USDC-BS 1928, 124).

As had happened during the Great War, other agencies amplified the DSP's drive to push American business toward mass production. The Federal Specifications Board worked directly with manufacturers to craft purchase specifications that reduced product variety (USDC-BS 1924b; USDC-BS 1925, 87–88), for example, while the Bureau of Standards' annual Weights and Measures Conference pushed along the simplification of milk bottles (USDC-BS 1922, 249). The Commerce Department's Bureau of Foreign and Domestic Commerce also reinforced simplified practice in its studies of the cost of distribution ("Official Proceedings" 1930, 4).

Two private associations, meanwhile, proved to be critical allies in support of the DSP's initiative. One was the Chamber of Commerce of the United States, whose representative sat on the DSP's Advisory Committee. Even before Hoover took office as Commerce Secretary, the Chamber had expressed its enthusiasm for simplification, and a Chamber representative attended many early simplified practice conferences. In its division of labor with the DSP, its role was primarily to promote simplified practice to American business, which it did with great energy, lending, in the words of a DSP pamphlet, "a powerful impetus to the work" (USDC 1924, 1 [quotation]; McCullough 1928, 9–12).

The Division's other ally was the American Engineering Standards Committee (AESC), forerunner of the American Standards Association (ASA) and also a member of the Advisory Committee. Formed as a federation of five engineering societies during World War I and broadened in 1919 to include trade associations and representatives of the U.S. Commerce, War, and Navy departments (Agnew 1943, 32; Le Page 1943, 320–22), the AESC sought to reduce—under its umbrella—the extreme fragmentation that plagued American standards. This goal, as Andrew L. Russell notes, created “a certain tension” with Hoover’s whirl of standards-setting activities (Russell 2014, 84). Like the DSP, the AESC emphasized collaboration and consensus in standards-setting, and, like the DSP, it did not set standards itself but offered a framework for some 100 American standards-setting organizations to reach agreement on nationwide standards (Russell 2014, 60–61).

The AESC and DSP differed in two ways, however. They based their standards on different criteria: where Simplified Practice Recommendations were based on sales data, the AESC “American Standards” were based on technical data. Also, they differed on the government’s proper role in setting industrial standards. When DSP expanded its purview to encompass commercial standards in 1927, tensions with the AESC burst to the surface. Until then, the AESC’s standards, based on technical data, and the SPRs, based on commercial data, had operated in largely separate domains, but now the new “commercial standards,” focused on quality specifications, threatened to overlap with the AESC’s technical standards. During what Bureau historian Rexford C. Cochrane termed “a period of estrangement” in 1928, “the AESC formally requested Bureau withdrawal from all commercial standardization activities,” it reconstituted itself as the American Standards Association (now the American National Standards Institute or ANSI), and Bureau staff no longer attended ASA meetings. “The conflict of interests was not to be entirely resolved,” Cochrane concluded, “for another two decades” (Cochrane 1966, 304). On the broader value of simplification in American business, however, the two were united.

For a decade and longer, World War I conservation expert Arch Shaw, the fourth member of the DSP’s Advisory Committee, promoted simplification with unalloyed enthusiasm. In early 1921, before Hoover took office as Commerce Secretary, *Factory*’s editor announced that the magazine would run a series of articles on “Simplification in Industry—The Next Big Step in Management” (Thomas 1921a, 451–53 [quotation on the issue cover]). By mid-1923, his magazines *System* and *Factory* together had carried 38 articles on simplification, publicity “of unlimited value to the Division,” DSP Chief Durgin reported to Hoover (Quarterly Report 1923a, 7). Shaw also sent letters “expounding the gospel of Simplification” to contacts at 125 companies (Durgin 1922), lent a hand with DSP publications (Tanner 1984, 6), and published an article in the *Harvard Business Review* that showcased the Division’s work (Shaw 1923). As he later put it, the Division’s energetic work was cultivating “a state of mind in American business” that abhorred complexity (“Official Proceedings” 1930, 3).

By the early 1930s, it seems fair to say, simplified practice was becoming embedded in American business. By mid-1932, 135 Simplified Practice Recommendations were in effect, alongside 41 commercial standards (USDC 1932, xxiii, xxv). The reductions achieved in the product variety were striking. To be sure, they ranged widely from 98 percent in some lines (common brick, height of hospital beds, binder’s board for making books) to 4 percent (sizes of valves and fittings for wrought iron and wrought steel pipes). In a few cases, reductions defied calculation because the number of varieties before simplification—for example, of warehouse forms and automobile brake linings—was unknown. But, overall, where numbers were available, the reductions averaged 65 percent (calculation based on USDC-BS 1931a, Appendix C).

Data collected in periodic audits of industry adherence to SPRs, moreover, showed that most manufacturers in most product lines were concentrating their production on standard sizes by the end of the 1920s. Adherence rates were affected by a variety of factors, of course. While the number of products in a simplified line might remain stable, the specific products included in the simplified line might change in response to consumer demand, causing fluctuations in adherence rates (USDC-BS

1930, 7). Nonetheless, measured by volume of production, the Division's surveys indicated that adherence rates averaged 80 percent or more (USDC-BFDC 1930, 46-47; USDC-BS 1931a, Appendix B).

What impact did simplified lines have on productivity and industrial structure? These questions are beyond the scope of this paper but clearly deserve the attention of scholars. We do know that the 1920s saw "a surge of industrial productivity growth" (both labor productivity and total factor productivity), centered in manufacturing (David and Wright 1999, 4, 9).[8] This was apparent by the end of the decade, as Secretary Hoover's *Commerce Yearbook 1930* noted. Between 1923 (when the postwar economic disturbances had subsided) and 1927 (the year of the most recent data at that time), factory employment fell by 5 percent while output increased by 5 percent, yielding a net rise in labor productivity of about 10 percent, which the *Yearbook* attributed, in part, to recent efforts to eliminate waste in American industry (USDC-BFDC 1930, 30, 33). As David and Wright observe, the decade of the 1920s also saw a "sharp increase in the real hourly wage in manufacturing"—just what Secretary Hoover had hoped for (David and Wright 1999, 32, 35). In the paving brick business, the secretary of the National Paving Brick Manufacturers Association reported, manufacturers' data for 1923 and 1925 showed labor productivity to be 26 percent higher among those manufacturers that had accepted *SPR No. 1* than among those who had not, while average wages were 36 percent higher for acceptors. The average selling prices of acceptors were also 9.7 percent lower than those of non-acceptors (Beller 1928, 72). What effects simplified practice had on the structure of the participating industries also deserves attention. Unfortunately, the biennial manufacturing censuses are less than helpful because of changes over time in the way that the Census Bureau counted "establishments" (for instance, in mattress manufacturing), and because of the effects of the Great Depression on industrial structure.

In any case, the broader impact of simplified practice was manifest, the DSP's Planning Committee (formerly the Advisory Committee) maintained in 1931. Some 10,000 association and individual companies had accepted the recommendations, and federal government purchases were being "based on simplified recommendations wherever possible." The National Association of Purchasing Agents had thrown its weight behind them, and two state-level chambers of commerce had initiated simplification programs (Report 1931, 11). "[T]he philosophy of simplified practice has permeated the industrial structure," the *Commerce Yearbook 1930* declared (USDC-BFDC 1930, 47).

Whether the imprint of simplified practice on American business would endure, once Hoover assumed the U.S. presidency in 1929, the stock market crashed, and depression set in, was an open question. As it had in 1920–21, economic depression again spurred a scramble for the consumer's dollar that threated to revive product diversity ("Official Proceedings" 1930, 3, 7). But, despite deep budget cuts and threats of privatization in the depths of the depression, the Division's simplified practice initiative survived, as it worked with the New Deal's short-lived National Recovery Administration and its staff levels gradually recovered (Agenda 1932, 8, 11–22; National Academy of Sciences 1960, 108). The Great Depression slowed the rate of adoption of Commerce Department standards after 1932, but the overall gains between 1930 and 1939 were impressive: the number of SPRs in effect increased by half to 173, while commercial standards tripled to 74 (*SPR R62-39 1939*, 16–17; USDC-NBS 1939, 23).

Then came another "Great War" and another boost to simplified practice. World War II enhanced and ultimately assured the place of simplified practice in American business at home and abroad. President Franklin D. Roosevelt endorsed nationwide simplification and standardization of American production and distribution in his 1943 budget message (Shaw 1943, 3). Like the War Industries Board of World War I, the War Production Board of World War II included a conservation division, headed by the then-chief of the Division of Simplified Practice. The use of SPRs and commercial standards effectively multiplied as war-related orders either incorporated existing standards or set out new ones (USDC

1942, 122; Briggs 1942, 149–50; Coonley 1942; USDC-NBS 1942, 1; Briggs 1949, 172–74; Cochrane 1966, 424–25). Foreign interest in the Bureau's simplification work again surged during the war (USDC 1942, 123). By 1950, the number of Simplified Practice Recommendations had increased to 240, while commercial standards totaled 163. (USDC 1950; USDC-NBS 1950).

After World War II, the United States' achievements in simplifying product lines and boosting mass production were broadcast far and wide under the auspices of the Marshall Plan's Productivity Program (Schlombs 2019, chapters 3–5). Its Anglo-American Council on Productivity brought British observers to the United States to study simplified practice in 1949 (Anglo-American Council 1949). The council's reports, in turn, were published in German in 1951 by the West German National Productivity Board (Vereinfachung 1951). Federal agencies, meanwhile, produced a series of pamphlets on "standardization, simplification, specialization" for Marshall Plan countries, while the U.S. Bureau of Labor Statistics compiled reports for Marshall Plan use on "productivity and factory performance" in more than 100 product lines. Through 1952, Marshall Plan aid brought thousands of European to the United States to study American production methods ("Achievements" 1952, 45; Schlombs 2019, 136–37, 163–64; Wasser and Dolfman 2005, 50).

As a federal government initiative to prod American manufacturers toward mass production, propelled by the exigencies of war, the Department of Commerce's simplified practice program had largely achieved Secretary Hoover's goal by the 1960s. In enabling voluntary, nationwide agreements on standard sizes, it had laid a foundation for mass production of a wide array of everyday commodities. In all, between 1922 and 1971, the Commerce Department issued 267 Simplified Practice Recommendations along with 274 commercial standards. In addition, it had launched a single, unified series called "product standards" in 1965 (from 1969, known as "voluntary product standards") as distinctions between the two kinds of standards—size or style vs. quality—became increasingly untenable. At least 30 new product standards with PS numbers had been issued by 1971, bringing the total number of government-sanctioned voluntary product standards to well above 500 (USDC-NBS 1972, 12–16).

But cumulative totals are misleading. Provisions for the withdrawal of standards were in place by 1955 ("Department of Commerce" 1955), and by the early 1970s large numbers of standards had been withdrawn. According to an official National Bureau of Standards (NBS) list of "existing" voluntary standards published in 1972, only 190 remained in effect (42 SPRs, 93 commercial standards, and 55 in the newer PS series) (USDC-NBS 1972). Even as the PS series continued to grow in the 1970s (USDC-NBS 1977, 8–9), the NBS officially withdrew Simplified Practice Recommendations and commercial standards in droves—some because they were regarded as obsolete, were unused, or were "not in the public interest," and others because alternative standards issued by private standards-setting organizations or set out in federal specifications were regarded as equivalent (refer, for example, to "Notices" 1966).

Finally, amidst the economic and political turmoil of the 1970s, the Commerce Department effectively ended its half-century-long effort to encourage and support simplified practice. The increasing importance of standards as non-tariff barriers to trade in a globalizing world economy sparked rising concern that the persistent fragmentation of voluntary standards in the United States would disadvantage American business in world markets, and political leaders were unwilling to centralize (and fund) standards-setting in government hands. At the same time, the Bureau was busy with new responsibilities relating to a variety of mandatory federal standards growing out of the "new social regulation" of the 1960s and 1970s (Congressional Research Service 1974, 1, 4; Schooley 2000, 469–71; Vogel 1981). In 1979, the Bureau of Standards announced that it would exit the voluntary standards business and leave the matter to private organizations such as the American Standards Association (Hemenway 1975, 89-90; Passaglia 1999, 687). Today, the Commerce Department's Voluntary Product Standards Program remains nominally in place, described on the website of the National Institute of Standards and Technology (NIST, successor to the National Bureau of Standards) in language that could have been written in the 1920s:

> *Producers, distributors, users, consumers, and other interested groups contribute to the establishment of Voluntary Product Standards by initiating and participating in their development. . . . The use of DOC [Department of Commerce] Voluntary Product Standards is voluntary. NIST has no regulatory power in the enforcement of their provisions; however, since the standards represents a consensus of all interested groups, their provisions are likely to become established as trade customs (NIST 2023).*

But only three voluntary standards remain in effect, all concerning lumber products. One of those, *PS 20-20, American Softwood Lumber Standard*, is the present-day incarnation of *SPR No. 16*, Hoover's "Exhibit A" on behalf of government–industry cooperation, now a century old.

Introduced in World War I, revived and amplified by Hoover's Commerce Department, and normalized during World War II, simplified practice—industrywide reductions in product variety that made industrywide mass production possible—had become embedded across the American economy by the 1950s. "[S]implified practice has become habitual in the United States," Commodity Standards Division Chief Edwin W. Ely observed in 1951, "like locking one's office door at the end of a working day, without publicity or fanfare" (Economic Cooperation Administration 1951, 11). Despite the Commerce Department's withdrawal, the habit persisted.

Conclusion

The story of standard sizes requires us to think differently about the United States' status as a manufacturing powerhouse in the twentieth century. The diffusion of mass production techniques across the American economy was not, as conventional wisdom would have it, a natural, evolutionary process of entrepreneurial emulation and learning. Neither the models of large-scale production offered by Carnegie and Ford, nor wartime lessons in simplification, were enough to diffuse mass production methods throughout the economy. In many lines of business, relentless competitive pressures to offer consumers a diversity of products stymied the diffusion process. Only when the federal government stepped back in again after the war, encouraging and enabling American manufacturers to push back collectively against market forces, did mass production techniques diffuse quickly and broadly across the economy, positioning the United States to become a global manufacturing powerhouse by the mid-twentieth century.

Should we be surprised that the prominence of mass production and consumption in the mid-twentieth-century American economy, captured in the term "Fordism," can be laid at the feet of the federal government rather than entrepreneurs? Yes—but only if one gauges the government's role in the economy through a restricted conceptual lens that focuses solely on "regulation." Widen the conceptual lens, however, and regulation's counterpart, government "promotion," suddenly springs into view. Where government regulation seeks in some way to constrain business activity, government promotion does the opposite: it encourages and supports business activity. In its *constitutive* guise, government promotion provides the institutional framework that makes capitalist enterprise possible by lowering risk (for example, by specifying property rights—both who can own property and what can be owned—and enforcing contracts) (Deakin et al. 2017; Hodgson 2015). In what one might call its *fostering* form (Chisholm's "industrial policy"), government promotion encourages and supports particular sectors, industries, firms, or activities by offering direct investment, interest guarantees, tariff protection, and so on (Chisholm 1925; Dunlavy 1991; Juhász and Steinwender 2023; Robertson 2000).

In its fostering form, American promotion of enterprise has a long history that extends back to 1789 and has continued without interruption through more than two centuries in an ever-changing mosaic of federal, state, and local government policies—a panoply of policies that would be tedious to enumerate here. Like Hoover's pursuit of simplified practice, the overarching goal of fostering policies has been to enhance Americans' standard of living. Notwithstanding persistent mythmaking about laissez-faire in American history, and regardless what role one thinks government *should* play in economic change, the reality is that all levels of the US government have promoted business enterprise throughout the nation's history.

As a premier example of federal efforts to foster business enterprise, the story of standard sizes fits comfortably within—and enlarges—this rich and fulsome history. In all, a full century of government promotion elevated mass production to its dominant position in the American economy: a half-century of Army Ordnance Department support for nascent mass production before the Civil War (Schakenbach Regele 2019; Smith 1977, 1985;), plus a second half-century in which the War Industries Board of World War I, Hoover's "fostering hand," and the War Production Board of World War II pushed energetically to diffuse mass production techniques across the economy. To this, one can add an intervening half-century of federal policies between the Civil War and the Great War that created the mass markets on which mass production was premised (think of removal of Native Americans from their ancestral lands, land grants to settlers, transcontinental railroads, nationally chartered banks, protective tariffs). Without sustained government promotion over one and a half centuries, it seems fair to conclude, mass production would not have become so quintessentially "American" by the mid-twentieth century.

The history of standard sizes in the United States raises a host of intriguing questions that I hope others will explore. How did individual firms negotiate, in Hartmut Berghoff's words, that "fundamental dilemma of industrial capitalism"—the tension between the factory, prioritizing volume production, and sales department or consumer demands for product diversity (Berghoff 2016, 313)? How did simplified practice agreements affect the structure of industry? Did they work to the advantage of already dominant firms, or did they, as Herbert Hoover hoped, provide a framework to support small and medium-sized manufacturers in an age of big business? Did standard sizes actually limit consumer choice in the vaunted age of consumerism? To what extent was mass advertising used not merely to ramp up consumer demand but more specifically to quash demand for non-standard products? If collective agreements on standard sizes drove the diffusion of mass production techniques in the 1920s, does this help explain the puzzling surge in productivity in that decade? Did the diffusion of mass production techniques enhance a growing mismatch between production and consumption, deepening the Great Depression? To what extent do early twentieth-century worries about "waste" resonate with present-day environmental concerns? If the era of simplified practice recommendations (1920s–60s) was somehow an "unnatural" development under Hoover's "fostering hand," did the break-up of mass markets in the 1980s (Piore and Sabel 1984) represent a reversion to a normal pattern of development? And, finally, absent simplified practice, would the American "variety of capitalism" have more closely resembled the German or British form by the 1950s?

Notes

[1] "Product diversity" here is different from product "diversification." Following Chandler, the strategy of diversification entailed adding new product lines that were technologically related to existing lines or could be handled by the existing sales organization (refer to Chandler 1977, 473–76). As used here, "product diversity" means that styles and sizes proliferated *within* product lines and that commodities were modified *physically* to differentiate them from competitors' products—in other words, a form of product differentiation that necessitated alterations in the manufacturing process. When manufacturers of sterling silver flatware, for example, agreed to limit new patterns of flatware collectively, they defined a "new pattern" as one "requiring for its manufacture a set of front dies or the use of tools which change the character of an already existing pattern" (*SPR No. 54* 1926, 2–3).

[2] On the complex politics of mobilizing the American economy in World War I and the postwar consequences, refer to Koistinen (1967); Cuff (1973); Kennedy (1982, 93–143); Eisner (2000); and Rockoff (2012, 99–154).

[3] Refer to Copeland (1921, 55); Clarkson (1924, 220); Shaw (1943, 8); Cochrane (1966, 177). For details on specific wartime restrictions by commodity, refer to USWIB (1918, 39–42) and Stewart (1942). Stewart's study was part of a comprehensive set of mimeographed reports on World War I policies produced during World War II by the U.S. Department of Labor's Bureau of Labor Statistics, many concerning conservation. Refer to Historical Studies of Wartime Problems Nos. 1–54, available at https://catalog.hathitrust.org/Record/102565939.

[4] The six industries were the building trades, men's clothing manufacturing, shoe manufacturing, printing, the metal trades, and textile manufacturing.

[5] The description that follows is based largely on the published simplified practice recommendations, which included not only the recommendation itself but also a brief history of the process, conference minutes, and lists of attendees and of the entities (trade associations, firms, government agencies) that had accepted the recommendation.

[6] Two of the pending SPRs would not be accepted as proposed. *SPR No. 22* for paper was scaled back to paper sizes only, while a proposed SPR for paints and varnishes initially failed because of opposition from manufacturers. Refer to *SPR No. 22: Paper, 6*; USDC-BS 1924a, 6–7.

[7] The DSP sent free copies of the printed SPRs to those who had formally accepted an SPR or wished to consider doing so, while the Government Printing Office sold copies to others. By the mid-1960s, the relevant industry covered the cost of the initial printing of SPRs (Lonie 1966, 23).

[8] David and Wright (1999) argue that the 1920s surge in productivity was due largely to the increasing use of electrical power in manufacturing ("the Dynamo Revolution") and changes in the labor market. They note that "other technological and organizational innovations" (40) may have contributed to the productivity surge, but they were apparently unaware of the World War I-era simplified practice initiative and its revival in the 1920s.

References

Note: All U.S. Department of Commerce publications are listed separately following the reference list.

Abramovitz, Moses, and Paul A. David. 2000. "American Macroeconomic Growth in the Era of Knowledge-Based Progress: The Long-Run Perspective." In *Cambridge Economic History of the United States*, vol. III *"*The Twentieth Century," edited by Stanley L. Engerman and Robert E. Gallman, 1–92. Cambridge, United Kingdom, and New York: Cambridge University Press.

"Achievements of the Marshall Plan: ECA Summarizes European Recovery." *Department of State Bulletin* 26 (655, January 14): 43–45.

Agenda for Meeting of the Planning Committee of the Division of Simplified Practice . . . [to be held] December 16, 1932. 1932. In RG 40, Department of Commerce, General Correspondence, 1923–1927, File 67009/80, National Archives II.

Agnew, P. G. 1943. "Twenty-Five Years—the American Standards Association: 2. Development of the ASA." *Industrial Standardization* 14 (12, December): 322–29.

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

Alexander, Jennifer Karns. 2008. *The Mantra of Efficiency: From Waterwheel to Social Control.* Baltimore: Johns Hopkins University Press.

Allingham, H. W. 1920. "Mass Production." *The Electrician* 84 no. 18 [N. 2, 189] (April 30): 478–79.

American Softwood Lumber Standard: A Voluntary Standard Developed by the National Bureau of Standards in Cooperation with Producers, Distributors, and Users. 1970. Washington, DC: U.S. Government Printing Office.

Anglo-American Council on Productivity. 1949. *Simplification in Industry: Report of an Inquiry in Britain by a Group Appointed by the Council.* London and New York: Anglo-American Council on Productivity, October 1949.

Ashdown, S. P., editor. 2007. *Sizing in Clothing: Developing Effective Sizing Systems for Ready-to-Wear Clothing*. Cambridge, United Kingdom, and Boca Raton, FL: Woodhead Publishing Limited and CRC Press.

Bangs, John R., Jr., in collaboration with C. D. Hart. 1930. *Factory Management.* New York: Alexander Hamilton Institute.

Barnes, Julius H., based on an interview by Roy Dickinson. 1923. "Standardization as a Creator of New Advertising." *Printers' Ink Monthly* 6 (3, March): 23–24, 100, 103.

Baruch, Bernard. 1921. *American Industry in the War: A Report of the War Industries Board*. Washington, DC: U.S. Government Printing Office.

Beller, E. L. 1928. "Economic Effect of Simplification in the Paving Brick Industry." *Annals of the American Academy of Political and Social Science,* Stabilization of Commodity Prices, (139, 1, September): 71–73.

Berghoff, Hartmut. 2016. *Moderne Unternehmensgeschichte: Eine Themen–und Theorieorientierte Einführung,* 2nd ed. Berlin/Munich/Boston: Walter de Gruyter GmbH.

"Bibliography of Articles on Simplification." 1924. *Factory* 32 (3, March): 318–20.

Blodgett, John W., and W. M. Ritter. 1929. High Lights of a Decade of Achievement of the National Lumber Manufacturers Association. Columbus, OH: Hann & Adair Printing Co.

Briggs, Lyman J. 1942. "National Bureau of Standards in War Simplification and Standardization Work." *Industrial Standardization* 13 (6, June): 149–51.

Briggs, Lyman. 1949. *NBS War Research: The National Bureau of Standards in World War II.* Washington, DC: U.S. Department of Commerce, National Bureau of Standards. September 1949.

Chandler, Alfred D., Jr. 1977. *The Visible Hand: The Managerial Revolution in American Business.* Cambridge, MA, and London: Belknap Press of Harvard University Press.

Chass, Benjamin P. 1925. "Inefficiency and Waste in American Industry." *Industrial Management* 70 (4, October): 239–41.

Chisholm, Cecil. 1922a. "'Simplification' in United States: America's New Industrial Policy: I.—Genesis of the Movement." *The Times Imperial and Foreign Trade and Engineering Supplement* (London), April 29, 1922, 131.

Chisholm, Cecil. 1922b. "'Simplification' in United States: Is It Applicable in Great Britain? III.—What Some Firms Are Doing." *The Times Imperial and Foreign Trade and Engineering Supplement* (London), May 13, 1922, 171.

Chisholm, Cecil. 1922c. "'Simplification' in the United States: Progress of New Industrial Policy: Groups Using Commerce Department's Service." *The Times Imperial and Foreign Trade and Engineering Supplement* (London), December 9, 1922, 301.

Chisholm, Cecil. 1925. "Simplification in British Industry: I.—Progress at Home and Abroad." *The Times Imperial and Foreign Trade and Engineering Supplement* (London), August 8, 1925, 513.

Clarkson, Grosvenor B. 1924. *Industrial America in the World War: The Strategy Behind the Line, 1917–1918,* revised edition. Boston and New York: Houghton Mifflin Company.

Clements, Kendrick A. 2010. *The Life of Herbert Hoover: Imperfect Visionary, 1918–1928*. New York: Palgrave Macmillan.

Cochrane, Rexmond C. 1966. *Measures for Progress: A History of the National Bureau of Standards.* Miscellaneous Publications 275. Washington, DC: U.S Department of Commerce, National Bureau of Standards.

Compton, Wilson. 1916. The Organization of the Lumber Industry, with Special Reference to the Influences Determining the Prices of Lumber in the United States. Chicago: American Lumberman.

Congressional Research Service, Science Policy Research Division. 1974. *Voluntary Industrial Standards in the United States: An Overview of Their Evolution and Significance for the Congress*. Washington, DC: U.S. Government Printing Office.

Coonley, Howard. 1921. "Simplification in Industry, VII: We Reduced Our Line from 17,000 to 610 Items." *Factory* 27 (3, September): 317–19.

Coonley, Howard. 1942. "WPB Drives for Simplified Lines and Standards." *Industrial Standardization and Commercial Standards Monthly* 13 (6, June): 137–41.

Copeland, Melvin T. 1921. "Standardization of Products: I. As a National Economy." *Bulletin of the Taylor Society* 6 (2, April): 55–59.

Copeland, Melvin T. 1958. "Arch W. Shaw," *Journal of Marketing* 22 (3): 313–15.

Couzens, James. 1921. "What I Learned about Business from Ford." *System* 40 (3, September): 261–64, 360–62, 368.

Crowell, Benedict, and Robert Forrest Wilson. 1921. *The Giant Hand: Our Mobilization and Control of Industry and Natural Resources, 1917–1918*. New Haven, CT: Yale University Press.

Cuff, Robert D. 1973. The War Industries Board: Business–Government Relations during World War I. Baltimore: Johns Hopkins University Press.

"Current Editorial Comment: Sidelights on Standardization." 1923. *Industrial Management* 65 (1, January): 32–34.

David, Paul A., and Gavin Wright. 1999. "Early Twentieth Century Productivity Growth Dynamics: An Inquiry into the Economic History of 'Our Ignorance.'" University of Oxford, Discussion Papers in Economic and Social History No. 33, October 1999.

Deakin, Simon, David Gindis, Geoffrey M. Hodgson, Kainan Huang, and Katharina Pistor. 2017. "Legal Institutionalism: Capitalism and the Constitutive Role of Law." *Journal of Comparative Economics* 45 (1, February): 188–200."Department of Commerce, Business and Defense Services Administration, Office of Technical Service, Commodity Standards Division, Statement of Organization." 1955. *Federal Register* 20, no. 34 (February 17): 1028.

Dunlavy, Colleen A. 1991. "Mirror Images: Political Structure and Early Railroad Policy in the United States and Prussia." *Studies in American Political Development* 5 (Spring): 1–35.

Dunlavy, Colleen A. 2024. *Small, Medium, Large: How Government Made the U.S. Into a Manufacturing Powerhouse*. Cambridge, United Kingdom and Hoboken, NJ: Polity Press.

Dunlavy, Colleen A., and Thomas Welskopp. 2007. "Myths and Peculiarities: Comparing U.S. And German Capitalism." *German Historical Institute Bulletin* 41 (Fall): 33–64.

Durgin, William A. 1922. "Memorandum to Mr. Hoover. November 1." In RG 40, Department of Commerce, General Correspondence, 1918–1922, File 82341, National Archives II.

Durgin, William A. 1923. "Memorandum to Mr. Hoover and Present Status of Definite Simplification Projects. September 17." In RG 40, Department of Commerce, General Correspondence, 1923–1927, File 67009/80, National Archives II.

Economic Cooperation Administration, Technical Assistance Division, Special Project Branch. 1951. *Increasing Productivity Thru Simplification, Standardization, Specialization.* Washington, DC. March 1, 1951.

Eisner, Marc Allen. 2000. From Warfare State to Welfare State: World War I, Compensatory State-Building, and the Limits of the Modern Order. University Park, PA: Pennsylvania State University Press.

FAES (Federated American Engineering Societies), Committee on Elimination of Waste in Industry. 1921. *Waste in Industry*. Washington, DC: Federated American Engineering Societies.

"F. M. Feiker Vice-President of McGraw-Hill Company." 1920. *Electrical World* 75 (2, January 10): 90.

Feiker, F. M. 1922. "The Trend of 'Simplification': How the Movement Is Growing, and What the Paving Brick Action Signifies." *Factory* 28 (2, February): 156–58.

Ford, Henry. 1923. "'If My Business Were Small.'" *System* 43 (6, June): 735–39, 786, 788, 790, 792.

Freeman, Joshua Benjamin. 2018. Behemoth: A History of the Factory and the Making of the Modern World. New York: W. W. Norton.

Garrett, Paul Willard, with Isador Lubin and Stella Stewart. 1920. *Government Control over Prices*. W. I. B. Price Bulletin No. 3. Washington, DC: U.S. Government Printing Office.

Gephart, W. F. 1919. "Grading and Standardization in Marketing Foods." *Annals of the American Academy of Political and Social Science,* Industries in Readjustment 82 (March): 263–70.

Gordon, Robert J. 2017. The Rise and Fall of American Growth: The U.S. Standard of Living since the Civil War. Princeton, NJ: Princeton University Press.

Haber, Samuel. 1964. Efficiency and Uplift: Scientific Management in the Progressive Era, 1890–1920. Chicago: University of Chicago Press.

Hawley, Ellis W. 1974. "Herbert Hoover, the Commerce Secretariat, and the Vision of an 'Associative State,' 1921–1928." *Journal of American History* 61 (1, June): 116–40.

Hawley, Ellis W. 1989. "Herbert Hoover and the Sherman Act, 1921–1933: An Early Phase of a Continuing Issue." *Iowa Law Review,* Symposium: The Sherman Act's First Century: A Historical Perspective, 74 (5, July): 1067–104.

Heckel, George B. 1931. *The Paint Industry: Reminiscences and Comments.* St. Louis: American Paint Journal Company.

Hemenway, David. 1975. *Industrywide Voluntary Product Standards*. Cambridge, MA: Ballinger Publishing Co.

Herring, E. Pendleton. 1936. *Public Administration and the Public Interest.* New York and London: McGraw-Hill Book Company, Inc.

Hodgson, Geoffrey M. 2015. *Conceptualizing Capitalism: Institutions, Evolution, Future.* Chicago and London: University of Chicago Press.
Hoover, Herbert. 1919. “Some Notes on Industrial Readjustment.” *Saturday Evening Post*, December 27, 1919, 3–4, 145–46.
Hoover, Herbert. 1921. “Industrial Waste.” *Bulletin of the Taylor Society* 6 (2, April): 77–79.
Hoover, Herbert, as interviewed by Theodore M. Knappen. 1922. “Making Profits by Cutting Waste.” *Magazine of Wall Street* 30 (1, May 13): 9–10.
Hoover, Herbert. 1925. “No Imposition of Government in Business.” *Factory* 35 (4, October): 536.
Hoover, Herbert. 1952. The Memoirs of Herbert Hoover, Vol. II: The Cabinet and the Presidency, 1920–1933. New York: MacMillan Company.
Hounshell, David A. 1984. From the American System to Mass Production, 1800–1932: The Development of Manufacturing Technology in the United States. Baltimore: Johns Hopkins University Press.
Hoyt, Homer. 1919a. “Industrial Combination and the Standardization of Production.” *Journal of Political Economy* 27 (2, February): 95–104.
Hoyt, Homer. 1919b. “Standardization and Its Relation to Industrial Concentration.” *Annals of the American Academy of Political and Social Science,* Industries in Readjustment, 82 (March),: 271–77.
Hudson, Ray M. 1924. “Simplification and Standardization.” In *Management's Handbook: By a Staff of Specialists*, edited by L. P. Alford, 987–1034. New York: Ronald Press Company.
Hudson, Ray M. 1925a. “Are There Any Real Obstacles to Simplification?” *Factory* 35 (4, October): 537–38, 384, 386, 388, 390.
Hudson, Ray M. 1925b. “Group Simplification Gains Momentum.” *Factory* 35 (2, August): 193–96, 286.
Hudson, Ray M. 1926. “R. M. Hudson, Chief, Division of Simplified Practice, to Secretary Hoover, July 1, 1926, Progress in Simplified Practice—Second Quarter, 1926.” In RG 40, Department of Commerce, General Correspondence, 1923–1927, File 67009/80, National Archives II.
“International Industrial Digest: Associations: Helping to Clear up the Trade Association Muddle.” 1922. *Factory* 28 (4, April): 408.
Jeansonne, Glen, with David Luhrssen. 2016. *Herbert Hoover: A Life.* New York: New American Library.
Jerome, Harry. 1934. “Mechanization in Industry.” NBER Working Paper 27 (January), National Bureau of Economic Research, New York, NY.
Johnson, Roy W. 1921. “How Advertising Affects Standardization.” *Printers' Ink* 115 (11, June 16): 81–82, 84, 88.
Jones, Franklin D. 1922. Trade Association Activities and the Law: A Discussion of the Legal and Economic Aspects of Collective Action through Trade Organizations. New York: McGraw-Hill.
Juhász, Réka, and Claudia Steinwender. 2024. "Industrial Policy and the Great Divergence." *Annual Review of Economics* 16: 27–54.
Karabasz, Victor S. 1928. “Simplification and Standardization in Europe.” *Annals of the American Academy of Political and Social Science,* Standards in Industry, 137 (May): 25–31.
Kennedy, David M. 1982. *Over Here: The First World War and American Society*. Oxford: Oxford University Press.
Klautke, Egbert. 2003. Unbegrenzte Möglichkeiten: ‘Amerikanisierung‘ in Deutschland und Frankreich (1900–1933). Stuttgart: Franz Steiner.
Koistinen, Paul A. C. 1967. “The ‘Military-Industrial Complex’ in Historical Perspective: World War I.” *Business History Review* 41 (4, Winter): 378–403.
Layton, Edwin T. 1986. The Revolt of the Engineers: Social Responsibility and the American Engineering Profession. 1971; Baltimore: Johns Hopkins University Press.
Le Page, Clifford B. 1943. “Twenty-Five Years—the American Standards Association: 1. Origins.” *Industrial Standardization* 14 (12, December): 317–22.

Link, Stefan, and Noam Maggor. 2020. “The United States as a Developing Nation: Revisiting the Peculiarities of American History.” *Past and Present* 246 (1, February): 269–306.

Lonie, Mansfield. 1966. “Voluntary Product Standards: What They Mean to the Consumer.” *Journal of Home Economics* 58 (1, January): 22–26.

Lyon, Leverett S. 1929. Hand-to-Mouth Buying: A Study in the Organization, Planning, and Stabilization of Trade. Washington, DC: Brookings Institution.

Maddock, A. M. 1921. “How Simplification Removed Production Difficulties: Ninth Article in the Simplification in Industry Series.” *Factory* 27 (5, November): 612–14.

“Manufacturers May Retain Some War Restrictions.” 1918. *Printers' Ink* 105 (9, November 28): 89–90.

Matherly, Walter J. 1922. “Financial Economies of Simplified Industrial Practice.” *The Annalist* 20 (509, October 16): 382, 384.

McClure, Arthur, with James G. Lamb, Secretary, Scott Paper Company, Chester, PA. 1922. “Two Thousand Brands Reduced to Three.” *Printers' Ink* 118 (5, February 2): 123–24, 27–28.

McCullough, E. W. 1928. “The Relation of the Chamber of Commerce of the United States of America to the Growth of the Simplification Program in American Industry.” *Annals of the American Academy of Political and Social Science*, Standards in Industry, 137 (May): 9–12.

Nash, George H., et al. (eds.). 1983–2010. *The Life of Herbert Hoover*. Vols. 1–6. New York: W. W. Norton and Palgrave Macmillan.

National Academy of Sciences, Special Advisory Committee. 1960. *The Role of the Department of Commerce in Science and Technology: A Report to the Secretary of Commerce*. Washington, DC: National Academy of Sciences.

National Industrial Conference Board. 1925. *Trade Associations: Their Economic Significance and Legal Status*. New York: National Industrial Conference Board.

NIST (National Institute of Standards and Technology), Standards Coordination Office. 2023. “Voluntary Product Standards Program.” Updated May 1. https://www.nist.gov/standardsgov/voluntary-product-standards-program.

New York Times. 1967."Frederick Feiker, Hoover Aide, Dead." *New York Times,* January 15, 1967, 84. (ProQuest Historical Newspapers).

“Notices, Department of Commerce, National Bureau of Standards, Voluntary Product Standards: Notice of Action on Proposed Withdrawal.” 1966. *Federal Register* 31, no. 178 (September 14): 12027.

Offe, Claus, and Helmut Wiesenthal. 1980. “Two Logics of Collective Action: Theoretical Notes on Social Class and Organization Form.” *Political Power and Social Theory,* vol. I: 67–115.

"Official Proceedings: Conference on Simplified Practice in Industry: Meeting of Officials of the Federal Government with Chairmen of Standing Committees in Charge of Recommendations for Simplified Practice, Washington, DC, November 24 and 25, 1930, Complete Stenographic Record." 1930. *Supplement to The United States Daily* 5, no. 241, Section II (December 13): 3–12.

Olson, Mancur. 1965. The Logic of Collective Action: Public Goods and the Theory of Groups. Cambridge, MA: Harvard University Press.

Parsonage, E. E. 1921. “What Simplification Saves Us.” *System* 40 (6, December): 709–12, 756–57.

Passaglia, Elio, with Karma A. Beal. 1999. *A Unique Institution: The National Bureau of Standards, 1950–1969.* Special Publication 925. Washington, DC: U.S. Dept. of Commerce, Technology Administration, National Institute of Standards and Technology.

Patch, Ralph R. 1924. “Lower Prices, Doubled Volume—through Simplification.” *System* 46 (1, July): 31–34, 76, 78–79.

Paxson, Frederic L. 1920. “The American War Government, 1917–1918.” *American Historical Review* 26 1 (1, October): 54–76.

"Permanent Government Organization to Standardize American Industries Is Advocated by Chairman Baruch." 1918. *Official U.S. Bulletin* 2 (464, November 15): 3.
Piore, Michael J., and Charles F. Sabel. 1984. *The Second Industrial Divide: Possibilities for Prosperity.* New York: Basic Books.
Powers, George G. 1922. "We Cut Factory Overhead Despite Smaller Volume." *Factory* 28 (3, March): 275–79, 310, 312, 314.
Priest, Ernest L. 1926. A Primer of Simplified Practice, Issued by the Bureau of Standards, November 1, 1926. Washington, DC: U.S. Government Printing Office.
Quarterly Report on the Activities of the Division of Simplified Practice. 1923a. June 30, 1923. In RG 40, Department of Commerce, General Correspondence, 1923–1927, File 67009/80, National Archives II, Washington, DC.
Quarterly Report on the Activities of the Division of Simplified Practice. 1923b. September 30, 1923. In RG 40, Department of Commerce, General Correspondence, 1923–1927, File 67009/80, National Archives II, Washington, DC.
Rationalisierungs-Kuratorium der Deutschen Wirtschaft (West German National Productivity Board). 1951. Vereinfachung der industriellen Produktion: Berichte einer englischen Studienkommission über ihre Erfahrungen in USA und in England. Schriftenreihe des RKW-Auslandsdienst No. 4. Munich: Carl Hanser Verlag.
Rawie, Carol Chapman. 1979. "A Guide to Papers Citing Antitrust Cases Involving Standards or Certification." U.S. Department of Commerce, National Bureau of Standards, NBSIR 79-1921, December, Washington, DC.
Report of the Planning Committee of the Division of Simplified Practice, Bureau of Standards, to the Secretary of Commerce . . . 1921 to 1931. 1931. In RG 40, Department of Commerce, General Correspondence, 1923–1927, File 67009/80, National Archives II, Washington, DC.
Robertson, David Brian. 2000. Capital, Labor, and State: The Battle for American Labor Markets from the Civil War to the New Deal. Lanham, MD: Rowman & Littlefield Publishers.
Rockoff, Hugh. 2012. America's Economic Way of War: War and the US Economy from the Spanish–American War to the Persian Gulf War. Cambridge, United Kingdom: Cambridge University Press.
Russell, Andrew L. 2014. *Open Standards and the Digital Age: History, Ideology, and Networks.* Kindle edition. New York: Cambridge University Press.
"Sales Rise as Different Models Are Merged into One Line." 1916. *Printers' Ink* 96 (10, September 7): 28, 31–32.
Sawyer, Laura Phillips. 2019. American Fair Trade: Proprietary Capitalism, Corporatism, and the 'New Competition,' 1890–1940. New York: Cambridge University Press.
Schakenbach Regele, Lindsay. 2019. Manufacturing Advantage: War, the State, and the Origins of American Industry, 1776–1848. Baltimore: Johns Hopkins University Press.
Schlink, F. J., and Robert A. Brady. 1928. "Standards and Specifications from the Standpoint of the Ultimate Consumer." *Annals of the American Academy of Political and Social Science,* Standards in Industry, 137 (May): 231–39.
Schlombs, Corinna. 2019. Productivity Machines: German Appropriations of American Technology from Mass Production to Computer Automation. Cambridge, MA: MIT Press.
Schooley, James F. 2000. Responding to National Needs: The National Bureau of Standards Become the National Institute of Standards and Technology, 1969–1993. Special Publication 955. Washington, DC: U.S. Dept. of Commerce, Technology Administration, National Institute of Standards and Technology.
Scranton, Philip. 1997. Endless Novelty: Specialty Production and American Industrialization, 1865–1925. Princeton, NJ: Princeton University Press.

Scranton, Philip. 1989. Figured Tapestry: Production, Markets, and Power in Philadelphia Textiles, 1885–1941. Cambridge, United Kingdom: Cambridge University Press.

Shaw, A. W. 1923. “Simplification: A Philosophy of Business Management.” *Harvard Business Review* 1 (4, July): 417–27.

Shaw, Arch Wilkinson. 1943. *Enlarging the War Effort through Simplification*. Chicago: Arch W. Shaw.

Smith, L. W., and L. W. Wood. 1964. *History of Yard Lumber Size Standards*. Madison, WI: Forest Products Laboratory, Forest Service, U.S. Department of Agriculture. September 1964.

Smith, Merritt Roe. 1977. Harpers Ferry Armory and the New Technology: The Challenge of Change. Ithaca, NY: Cornell University Press.

Smith, Merritt Roe. 1985. “Army Ordnance and the ‘American System’ of Manufacturing, 1815–1861.” In *Military Enterprise and Technological Change: Perspectives on the American Experience,* edited by Merritt Roe Smith, 39–86. Cambridge, MA: MIT Press.

“Standardization of Products: Discussion.” 1921. *Bulletin of the Taylor Society* 6 (2, April): 64–76.

“Steps in Simplification.” 1922. *Factory* 29 (2, August): 146.

Stewart, Stella. 1941. *Industrial Conservation: Evolution of Policies and Procedures, 1917–1918*. U.S. Department of Labor, Bureau of Labor Statistics, Historical Studies of Wartime Problems No. 24. November 1941.

Stewart, Stella. 1942. *Consumer Goods (Other Than Food): Government Controls in 1918.* U.S. Department of Labor, Bureau of Labor Statistics, Historical Studies of Wartime Problems No. 40. April 1942.

Tanner, William R. 1984. “Secretary Hoover's War on Waste, 1921–1928.” In *Herbert Hoover and the Republican Era*, edited by Carl I. Krog and William R. Tanner, 1–35. Lanham, MD: University Press of America.

Thomas, Leon I. 1921a. “Simplification in Industry.” *Factory* 26 (4, February 15): 451–53.

Thomas, Leon I. 1921b. “Simplification in Industry, II: The Source of This Movement in War-Time Conservation.” *Factory* 26 (6, March 15): 715–18, 752, 754.

Timberlake, E. Compton. 1944. “Standardization and Simplification under the Anti-Trust Laws.” *Cornell Law Review* 29 (3, March): 301–29.

“Tire Making and Size Simplification.” 1928. *Society of Automotive Engineers Journal* 22 (1, January): 135–36.

“Trend toward Simplification: A Review of the Simplification of Industry in War Times and Its Present Status.” 1922. *Printers' Ink* 119 (5, May 4): 41–42, 44, 48.

Trigg, Ernest T. 1922. “We Increased Volume When We Cut Our Line 60%.” *System* 42 (4, October): 425–27, 486–89.

USWIB (U.S. War Industries Board). 1918. An Outline of the Board's Origin, Functions, and Organization, Compiled as of November 10, 1918. Washington: U.S. Government Printing Office, 1918.

Vogel, David. 1981. “The ‘New’ Social Regulation in Historical and Comparative Perspective.” In *Regulation in Perspective: Historical Essays*, edited by Thomas K. McCraw, 155–85. Boston: Division of Research, Graduate School of Business Administration, Harvard University; distributed by Harvard University Press.

“W. H. Phillips Feels Confident of the Future.” 1919. *Painters Magazine and Paint and Wall Paper Dealer* 46 (2, February): 10–13.

Wasser, Solidelle F., and Michael L. Dolfman. 2005. “BLS and the Marshall Plan: The Forgotten Story.” *Monthly Labor Review* 128 (6, June): 44–52.

Werking, Richard Hume. 1978. “Bureaucrats, Businessmen, and Foreign Trade: The Origins of the United States Chamber of Commerce.” *Business History Review* 52 (3, Autumn): 321–41.

Whitehorne, Earl E. 1923. “Practical Economies the Keynote.” *Electrical World* 81 (1, January 6): 39–40.

“William A. Durgin Leaves Company Temporarily for Government Service in Washington.” 1921. *The Edison Round Table Weekly* 6 (16): 1, 3.

Wilson, Joan Hoff. 1975. *Herbert Hoover, Forgotten Progressive.* Boston: Little, Brown.
Witzel, Morgen. 2005. "Shaw, Arch Wilkinson." In *Encyclopedia of History of American Management,* edited by Morgen Witzel, 465–66. London: Bloomsbury Publishing PLC.
Wölker, Thomas. 1992. Entstehung und Entwicklung des Deutschen Normenausschusses 1917 bis 1925. DIN-Normungskunde, vol. 30. Berlin: Beuth.
Wood, Charles W. 1918. The Great Change: New America as Seen by Leaders in American Government, Industry and Education Who Are Remaking Our Civilization. New York: Boni and Liveright.
Yates, JoAnne, and Craig N. Murphy. 2019. *Engineering Rules: Global Standard Setting since 1880.* Baltimore: Johns Hopkins University Press.

U.S. Department of Commerce Publications:

Note: Citations to Department of Commerce publications use letter codes (for example, USDC-BS for U.S. Department of Commerce, Bureau of Standards).

USDC (U.S. Department of Commerce). 1922. *Tenth Annual Report of the Secretary of Commerce.* Washington: U.S. Government Printing Office.
USDC (U.S. Department of Commerce). 1923a. *Commerce Yearbook 1922 (Including Early Part of 1923)*. Washington, DC: U.S. Government Printing Office.
USDC (U.S. Department of Commerce). 1923b. *Eleventh Annual Report of the Secretary of Commerce.* Washington: U.S. Government Printing Office.
USDC (U.S. Department of Commerce). 1924. Simplified Practice: What It Is and What It Offers: Summary of Activities of the Division of Simplified Practice and Description of Services Offered to American Industries, Issued by the Bureau of Standards, November 26, 1924. Washington, DC: U.S. Government Printing Office.
USDC (U.S. Department of Commerce). 1932. *Twentieth Annual Report of the Secretary of Commerce.* Washington, DC: U.S. Government Printing Office.
USDC (U.S. Department of Commerce). 1942. *Thirtieth Annual Report of the Secretary of Commerce: 1942*. Washington, DC: U.S. Government Printing Office.
USDC (U.S. Department of Commerce). 1950. "Simplified Practice Recommendations: Alphabetical List Revised to February 1." Letter Circular LC979 (Supersedes LC958).
USDC-BFDC (U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce). 1920. *Commercial and Industrial Organizations of the United States*, Revised to November 1. Misc. Series No. 99. Washington, DC: U.S. Government Printing Office.
USDC-BFDC (U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce). 1930. *Commerce Yearbook 1930 (Eighth Number)*. Vol. 1, *United States*. Washington, DC: U.S. Government Printing Office.
USDC-BFDC (U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce). 1931. *Commercial and Industrial Organizations of the U.S.*, 8th ed. Domestic Commerce Series No. 5. Washington, DC: U.S. Government Printing Office, September.
USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1912. *State and National Laws Concerning Weights and Measures of the United States,* revised by William Parry, 2d ed. Washington, DC: U.S. Government Printing Office.
USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1922. *Annual Report of the Director of the Bureau of Standards to the Secretary of Commerce for the Fiscal Year Ended June 30, 1922.* Misc. Publication No. 50. Washington, DC: U.S. Government Printing Office.

USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1924a. Limitation of Variety Recommendation No. 1: Paints and Varnishes, Issued by the Bureau of Standards, Original Draft; September 1, 1924. Washington: U.S. Government Printing Office.

USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1924b. "Standardization of Dry Cells." *Technical News Bulletin* 85 (May 10): 2.

USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1925. *National Bureau of Standards: Its Functions and Activities.* Circular No. 1, 2d ed. Washington: U.S. Government Printing Office. October 29.

USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1926. *Annual Report of the Director of the Bureau of Standards to the Secretary of Commerce for the Fiscal Year Ended June 30, 1926*. Misc. Publ. No. 75. Washington, DC: U.S. Government Printing Office.

USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1927. *Standards Yearbook 1927*. Misc. Publ. No. 77. Washington: U.S. Government Printing Office.

USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1928. *Standards Yearbook 1928*. Misc. Publ. No. 83. Washington: U.S. Government Printing Office.

USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1930. *Standards Yearbook 1930*. Misc. Publ. No. 106. Washington: U.S. Government Printing Office.

USDC-BS (U.S. Bureau of Standards). 1931a. "The Purpose and Application of Simplified Practice." July 1, 1931. Washington, DC.

USDC-BS (U.S. Department of Commerce, Bureau of Standards). 1931b. *Standards Yearbook 1931*. Misc. Publ. No. 119. Washington: U.S. Government Printing Office.

USDC-DSP (U.S. Department of Commerce, Division of Simplified Practice). 1927. "1. Commercial Standards." *Monthly News Bulletin*, no. 31 (October 15): 1–2.

USDC-NBS (U.S. Department of Commerce, National Bureau of Standards). 1939. "Commercial Standards and Their Value to Business (Second Edition), Commercial Standard CS0-39 (Supersedes CS0-30), Recorded Standards of the Industry." Washington, DC: U.S. Government Printing Office.

USDC-NBS (U.S. Department of Commerce, National Bureau of Standards). 1942. "Variety Reduction Effected by the Application of Simplified Practice." June 4, 1942. Letter Circular LC-693 (Supersedes LC-651).

USDC-NBS (U.S. Department of Commerce, National Bureau of Standards). 1950. "List of Commercial Standards, Revised to January 1." Letter Circular LC978 (Supersedes LC956).

USDC-NBS (U.S. Department of Commerce, National Bureau of Standards). 1972. *List of Voluntary Product Standards, Commercial Standards, and Simplified Practice Recommendations.* NBS List of Publications 53, revised September 1972.

USDC-NBS (U.S. Department of Commerce, National Bureau of Standards). 1977. *List of Voluntary Product Standards, Commercial Standards, and Simplified Practice Recommendations.* NBS List of Publications 53, revised February 1977.

USDCL-BFDC (U.S. Department of Commerce and Labor, Bureau of Foreign and Domestic Commerce). 1913. *Commercial and Agricultural Organizations of the United States*. Misc. Series No. 8. Washington, DC: U.S. Government Printing Office.