The American Variety of Capitalism, 1929-1939

Richard N. Langlois
Richard.Langlois@UConn.edu
Department of Economics
The University of Connecticut
Storrs, CT 06269-1063 USA

Paper for the WINIR Symposium
on Global Capitalism and its National Varieties in an Era of Crisis
Loughborough University London
16-18 December 2019

ABSTRACT

The varieties-of-capitalism literature of the 1990s and beyond saw a fundamental difference between the liberal-market economies of the U.S. and Britain on the one hand and the coordinated-market economies of Germany and the Continent on the other. In liberal-market economies, the creation of capabilities is guided largely by market forces acting through independent firms, whereas in coordinated-market economies, firms rely far more on non-market relationships, including relational contracting and networks. Writing a couple of decades earlier, Alfred Chandler saw the matter differently: the U.S. and Germany were fundamentally similar, both creating industrial capabilities through administrative coordination; for Chandler, the outlier was Britain, with its alleged system of “personal” capitalism. Yet, as Mira Wilkins (2010, p. 639) has pointed out, “every economic historian has come to recognize that capitalism took on different forms, not only between different countries but also within individual countries. The capitalism of late-nineteenth-century America, the New Deal, the Kennedy-Johnson era, and the Reagan administration were, for instance, very different.” This paper attempts to characterize the American “variety” of capitalism during the crucial middle years of the twentieth century. It is in fact a chapter from a larger book project called The Corporation and the Twentieth Century, which chronicles and interprets the institutional and economic history – the life and times, if you will – of American business in the twentieth century. One integrating theme is that the signal calamities of the Great Depression and World War II, as well as the policy responses to those calamities, are crucial in understanding the structure of American industry in the post-war world, including the rise of the large Chandlerian corporation.

Comments solicited. Please do not cite without permission of the author.
Chapter 6
The Real Catastrophe.

“On the whole, the great stock market crash can be much more readily explained than the depression that followed it.”¹ So wrote John Kenneth Galbraith in 1955 in his snidely elegant, widely read portrayal of the events of 1929. A broadly shared professional consensus today would reverse that judgment. There is still considerable debate about the nature and causes of the downturn of 1929 and about the role of the stock market in that downturn.² But there is general agreement about what transformed the episode into a Great Depression – into a worldwide cataclysm that would alter the history of the century in the U.S. more fundamentally and profoundly than even its two brutal wars.

It is burned into the popular consciousness, and widely taught in schools (apart from university economics departments), that the crash of 1929 caused the Depression. Indeed, as one economist observed, “people who are not economists often view the Great Crash and the Great Depression as the same event.”³ Then as now, many held that the crash and the Depression represented a failure of “capitalism.” By contrast, there is a broad consensus among economists across the political spectrum today that the greatness of the Great Depression was in fact a cataclysmic failure of public policy – at the hands of the institution that had been created precisely to avoid such catastrophes: the Federal Reserve System.

In similar fashion, the popular understanding of recovery from the Depression focuses on the policies of the New Deal, especially public spending. Even among economists after World War II, the Depression and recovery were seen through Keynesian lenses: monetary policy was assumed ineffective, so the only solution was the stimulus of fiscal policy, that is, of public (deficit) spending.⁴ Modern-day research has largely stood this supposition on its head as well. Spending during the New Deal was in fact small compared to the size of the decline in GDP, and what spending there was had little – or perhaps even negative – stimulus effect. At the same time, New Deal regulatory and cartelization policies retarded recovery by attempting to maintain high pre-Depression nominal wages and prices in many important sectors. What put the economy on the road to recovery was in fact an act of monetary policy: Roosevelt’s repudiation of the gold clause, which effectively took the U.S. off the gold standard.⁵ This permitted the dollar to depreciate, and cheaper dollars began to entice gold to flow from abroad to reinflate the economy. In effect, the repudiation of the gold clause did what the Federal Reserve had failed to do.

The Depression and the policy responses to it had significant consequences for the American corporation – consequences that have been widely underappreciated. The dramatic monetary contraction, along with the failure of the Fed to act as an adequate lender of last resort, led to an amplifying cascade of bankruptcies and bank failures. Among other things, as Ben Bernanke has argued, this had the effect of destroying much of the
capacity of the banking system, and of the financial system more generally, to supply financial intermediation. Small firms, which needed to rely on external capital markets, felt the effects far more than large firms, which could rely on internal financing and had close ties to large banks. Thus the Depression initiated or accelerated shakeouts in many industries. In some industries the process was Darwinian, with the most productive firms surviving; in others, survival depended simply on access to capital. At the same time, the New Deal instituted an unprecedented regime of price supports and entry restriction in financial, labor, and product markets. The Second World War placed resource allocation even more firmly in the hands of the government and ushered in far more comprehensive non-market controls.

Between fall 1929 and the end of World War II, many prices in the United States transmitted either false information or no information at all about relative scarcities, and many of the institutions upon which market exchange depended were hampered or destroyed. It is against this background, and not against a counterfactual backdrop of thick and well-functioning markets, that we must explain and appraise the rise of the large American corporation in the middle years of the twentieth century.

**Contraction.**

The Federal Reserve was created to supply a more “elastic” currency and to manage the cyclical banking panics that had plagued a heavily agricultural economy. This job description changed radically during America’s participation in World War I, and the needs of the Treasury conferred on the Fed much greater capabilities, along with as access to a portfolio of securities with which it could influence financial markets. In effect, the organization had gained the power of a European-style central bank. Yet the Fed retained its decentralized structure, with no clear demarcation of leadership between the reserve banks and the Board in Washington. More critically, the Fed was inexperienced; it was staffed in significant part with people who understood politics far better than economics; and it was in thrall to the real-bills doctrine written into Section 13 of the enabling act. This would prove to be a disastrous mix.

The act creating the Fed had contemplated open-market operations, the buying and selling of government securities, as a way to help create markets in those securities. By the end of the war, open-market operations had grown to become a powerful tool of monetary policy. No one understood this better than Benjamin Strong, the governor of the Federal Reserve Bank of New York. In 1922, Strong spearheaded the creation of an open-market investment committee, and he made sure that the actual buying and selling of securities took place through his New York Fed. Although he very much hoped for the eventual restoration of the automatic mechanism of the pre-war gold standard, Strong believed that the chaotic international financial climate after the war dictated a more activist approach to monetary policy. This meant using open-market operations to “manage” the gold standard and more broadly to regulate economic activity. To Liaquat Ahamed, it was “Strong more than anyone else who invented the modern central banker.”
Yet Strong’s was not the only voice of the Federal Reserve, and there is some doubt that even his voice was as clear and unwavering as normally portrayed. As an institution, the system was decentralized and politicized. The Board in Washington consisted of political appointees and regional bank governors chosen for constituency not talent. During most of the twenties, the chair was one Daniel Crissinger, a childhood buddy of Warren G. Harding from Marion, Ohio. Nor was the Board completely independent of the executive branch: the Secretary of the Treasury and the Comptroller of the Currency were members ex officio. Treasury objected to Strong’s scheme for using open-market operations to conduct monetary policy and wanted the banks to liquidate all their holdings. Apart from New York and Boston, the regional banks saw open-market operations strictly from the perspective of their own balance sheets. And, despite Strong’s friendship with Montagu Norman, the eccentric governor of the Bank of England, and his habit of meeting frequently with the heads of major European central banks, the war and reparations had in fact put an end to the sort of genuine international monetary cooperation that had been the norm before 1914. In Washington, the dominant intellectual force was Adolph C. Miller, an original member of the Board and its only academic economist. A student of J. Laurence Laughlin at Chicago, Miller was also an avid proponent of the real-bills doctrine, which naturally led him to cast a jaundiced eye on the decade’s booming stock market.

In 1924, Britain was preparing to return to the gold standard at pre-war parity, implying a serious overvaluation of sterling relative to the dollar and other gold-backed currencies. Norman and Strong understood that a decline in the value of the dollar would at least help to reduce the inevitable deflationary drain of gold from London. Strong got the Fed Board to agree to $200 million in credits to the Bank of England (which, in the end, were never used), and the New York Fed began lowering interest rates. Of course, the lower rates affected domestic lending as well, and Miller quickly blamed Strong for the rise in what he considered to be purely “speculative” stock-market loans. In a practice of long standing, stocks were usually bought on margin, meaning that as much as 75 or 80 per cent of the funds for a stock purchase would be borrowed. Through subsidiaries – they were not allowed to trade directly in equities – commercial banks would extend loans to brokers, who would in turn finance the purchases of their clients. Over the first half of the decade, brokers’s loans (or “call” loans) more than tripled to some $3.5 billion.

Miller found a kindred spirit in his next-door neighbor on S Street in Washington, Commerce Secretary Herbert Hoover. So alarmed was Hoover over the rise in credit for “speculation” that he protested to Crissinger, whom he considered a “mediocrity.” To no avail. His boss Coolidge insisted that the Fed was independent and told him not to interfere. Andrew Mellon told him the same thing. So he bombarded Congress with letters instead.

By the end of 1925, however, even Strong was becoming concerned that Fed policy was too loose, and rates in New York began creeping back up. There was no stock market crash in 1925-1926, and a housing boom in Florida fizzled with few nationwide repercussions. Driven by spectacular growth in productivity and the decade’s great innovations in product, process, and organization, the stock market continued to boom. The boom
was concentrated in new and expanding industries like automobiles, radio, and utilities; the highly regulated railroad sector benefited not at all. General Motors was paying consistent dividends, and it thrived during the period when (privately held) Ford was shut down to retool for the Model A. Other high-tech companies, notably those in radio, motion pictures, and aviation, tended not to pay dividends but, like high-tech companies today, preferred to reinvest earnings and provide their investors with capital gains. RCA was a major growth stock. And utilities blossomed as Samuel Insull and others consolidated geographically dispersed providers and fortified them with capital, technology, and managerial know-how.

Economists including Irving Fisher and John Maynard Keynes had warned Britain against resumption at the pre-war parity, predicting dire consequences. Under the supervision of the Chancellor of the Exchequer, Winston Churchill, Britain did indeed reattach the pound to gold at the old rate, and dire consequences did indeed ensue. Gold began fleeing the country and, in highly unionized Britain, nominal wages and prices could not easily adjust to the deflation. The result was labor unrest and unemployment. In the summer of 1927, Montagu Norman traveled to the U. S., accompanied by Hjalmar Schacht of the German Reichsbank and Charles Rist of the Banque de France. Even before the meetings got underway, Strong knew what had to be done: another cut in U. S. rates to help stem the outflow of gold from Britain. Strong had not bothered to include the Board in these meetings, and a few days after the bankers went home – and in the absence of Miller (as well as of Hoover, who was dealing with a devastating flood of the Mississippi) – he saw to it that the Board voted to lower rates to 3.5 per cent and that it kept dissenting reserve banks in line.

The economy responded by rebounding from a mild recession, and the stock market continued to thrive. This further stoked fears of speculative excess. When the open-market committee met in January 1928, there was general agreement that it was time to raise rates again. Ill with the tuberculosis from which he had long suffered and that would soon kill him, Strong did not attend the meetings, but he nonetheless approved of the policy change; and indeed the New York Fed took the lead in raising rates to 4.5 and then five per cent by the summer. Meanwhile, the open-market committee sold $400 million in securities. U. S. monetary policy had gone from accommodating to mildly deflationary in the blink of an eye. Yet this did not stop the growth of the call-loan market, as banks borrowed more heavily and corporations and other sources stepped in. Indeed, the stock market boom was increasing the demand for money just as the Fed was restricting the supply. As the nominal interest rate rose from four to 5.5 per cent between the end of 1927 and the end of 1928, real interest rates climbed from something like 5.6 per cent to 9.5 per cent. Higher returns in the U. S. began drawing in gold from abroad, but the Fed “sterilized” the gold – kept it out of circulation – to prevent increases in the price level.

For reasons that went beyond the election season, the Federal Reserve System remained quiescent in the second half of 1928. Benjamin Strong died in October, replaced at the New York Fed by his understudy, George Harrison. At the same time, Herbert Hoover was ushered into office with a resounding election victory. Calvin Coolidge had believed in an independent Fed, and he had consistently poured cold water on any talk of speculative
excess in the stock market. With Strong out of the picture and his like-minded friend Hoover soon to be in the White House, Adolph Miller now felt emboldened. He blamed New York for the system’s inaction in the second half of 1928, during which both stock prices and the volume of call loans continued to rise. It was, he believed, a time of “optimism gone wild and cupidity gone drunk.”

Like Strong, Harrison understood that loanable funds were fungible and that the only way to dampen “speculative” investment was a general increase in rates – a blunt instrument. The open-market committee proposed raising rates in early 1929. But Miller had a different idea. At his instigation, the Board issued and then publicized a directive to member banks commanding them “to restrain the use, either directly or indirectly, of federal reserve credit facilities in aid of the growth of speculative credit.” This was the policy of “direct action,” conceived of as a real-bills free lunch: speculation would be curbed without any increase in the rates for “real” loans, including loans to politically powerful agricultural interests. Needless to say, banks found it difficult to know what the Board would count as “speculative” borrowing, so the policy disrupted lending generally. Over the protest of the reserve banks, especially New York, the policy stayed in place until the summer of 1929. It did little to stint the call-loan market, though it did shift the source of funds to non-member banks and non-bank entities. Many, including Roy Young, by then chair of the Board, considered the direct-action policy mere ineffective jawboning; others have wondered whether the policy might not have weakened banks and sowed seeds of doubt about the willingness of the Fed to support those banks in a time of crisis.

Already by the spring of 1929, the American economy had begun to slow. Economies abroad were already heading into recession. Rates around the world were rising as the gold standard amplified the deflationary effects of what was in effect the hoarding of gold by the U. S. (and, even more so, France). By the summer, rates had increased to 5.5 per cent in Britain and the Netherlands, seven per cent in Italy, and 7.5 per cent in Germany. The Federal Reserve was well aware of these developments; and, although eyes remained fixed on the stock market, in August the Board was willing to listen to a compromise proposed by Harrison: the New York Fed would raise the discount rate to six per cent in an effort to curb stock-market speculation while at the same time lowering rates on short-term commercial loans to business. Unsurprisingly, this had little effect.

It was also in August that industrial output began to contract and the American economy began a downward turn. Between July and October, industrial production fell three per cent, implying an annual rate of decline of 13 per cent. For a while, the stock market failed to notice. Over the period from 1920 to the middle of 1927, the Dow Jones Industrials Average had doubled; by the time it reached its peak of 381.17 on September 3, 1929, the Dow had almost doubled again. But suddenly the market began to wobble. On the morning of Black Thursday, October 24, panic broke out on the selling floor of the New York Stock Exchange as prices collapsed. Thomas Lamont quickly assembled many of the city’s most prominent bankers at 23 Wall Street, and they cobbled together an injection of $240 million “to keep trading on an orderly basis.” Despite a record volume of almost 13 million trades, which the tickers worked late into the night to record, the Dow ended
the day down only two per cent below its level the day before. On Black Monday, October 28, however, even the bankers could not still the panic. The market dropped 13 per cent. The next day, Black Tuesday, it fell another 12 per cent. All the days had become black. By the second week of November, the Dow had fallen to little more than half of its value on September 3.

To economists, a “bubble” occurs when the prices of assets diverge from the “fundamentals”: when people do not trade strictly in light of a careful and sober assessment of the prospects of the firms issuing the stock, including the prospects for dividends, but rather trade purely in expectation that asset prices will continue to go up and provide them with capital gains. Essentially all popular accounts take it for granted that the crash of 1929 was the result of a stock-market bubble. So too do Keynesian (and Post-Keynesian) economists, who believe that financial markets are inherently unmoored from the fundamentals and are inevitably at the mercy of “irrational exuberance.” Experimental evidence suggests that, even when trading is clearly grounded in fundamentals, adjustment is never instantaneous and bubbles are possible during the process. Yet, perhaps surprisingly, economists then and now have challenged the claim that the stock market was overvalued in the 1920s. Most famously, Irving Fisher declared days before the crash that stock prices had reached “what looks like a permanently high plateau,” a remark that has earned him ridicule in virtually every account of the episode. Writing in 1930, Fisher conceded that the market may have been a tad overvalued, but he also pointed out that on average stocks were trading at a price-to-earnings ratio of 13.5, which is not dangerously high even by the standards of the twenties let alone by modern standards. Some present-day economists agree with Fisher. As we will see again at the end of the century, an era of rapid real growth, propelled by fundamental technological and organizational transformation, poses serious challenges for stock valuation.

Economists also remain divided on what triggered the downturn and the crash. The most prominent narrative, especially in popular accounts, faults the loose-money policies of the Federal Reserve. The crucial event was Benjamin Strong’s attempt to ease pressure on the overvalued pound by lowering rates in August 1927. This poured cash into the stock market, pumping up a bubble. “The Fed’s move was the spark that lit the forest fire,” concludes Ahamed. Many contemporaries agreed. Adolph Miller called the Fed’s action “one of the most costly errors committed by it or any other banking system in the last 75 years.” In his memoirs, Herbert Hoover blamed the Depression on the “Federal Reserve Board’s pre-1928 enormous inflation of credit at the request of European bankers.” Other economists, both then and now, have seen a more subtle mechanism at work: easy-money policies by the Fed in the 1920s lowered the nominal interest rate below the true market rate, which artificially extended the time horizons of business and induced investors to put money into the wrong mix of capital projects. In this theory, the crash did not represent the departure of stock values from fundamentals but rather a sudden shift in the underlying fundamentals themselves. Having said all this, it remains the case that the dominant account among monetary historians blames the crisis not on the Fed’s inflationary policies in 1927 or earlier but on its excessively deflationary policies.
after 1928 – its attempt to curb the “orgy of mad speculation” in the stock market.47

There is far less disagreement about what happened after the crash. A couple of blocks away from the stock exchange, George Harrison and the New York Fed were also well aware of the crisis.48 As they watched banks begin borrowing more heavily from the Fed, New York petitioned the Board to reduce the discount rate from six to 5.5 per cent. No, said Washington. But as the market fell further, Harrison decided he needed to take matters into his own hands. After finally reaching two members of his bank’s board in the middle of the night, he purchased $50 million in government securities before the market opened on the 29th and another $65 million over the next few days. Washington was furious, though in the end largely because Harrison had flouted procedures not because of what he had done. Indeed, the Board okayed a reduction in the discount rate to five per cent on November 1 and a further reduction to 4.5 per cent on November 15. The Fed as a system made further net purchases $161 million in November and $131 million in December.49

This is precisely what a modern-day central banker would have done: flood the market with liquidity to counteract the deflationary effects of the crash. The Dow rebounded from a low of 231 in December 1929 to almost 300 in April 1930, roughly the same level as a year earlier. Had the Fed continued to manage the money supply appropriately, the entire episode would have been remembered as a significant recession. But that is not what happened. What happened instead was the Great Depression.

Many accounts of the Fed’s behavior in this period stress the tension between Harrison and New York on the one hand and Miller and the Board on the other. And it is certainly true that power moved increasingly toward Washington in this period. By spring the small and powerful open-market committee that Strong had created was transformed into a subcommittee of the Board on which sat every single reserve-bank governor. Yet, as Alan Meltzer, the preeminent historian of the Fed, has argued, not even Harrison had a clear long-term vision, and his calls for expansion were typically in response to short-run movements in the market.50 Once the stock market had rebounded to something like its early 1929 level, the Fed considered its job largely done, even though industrial production continued to plummet.51

Somewhat belatedly, in the summer of 1931 an agitated Irving Fisher made an appointment to see the new chair of the Fed, Eugene Meyer.52 Fisher expressed alarm that the level of demand deposits, an important component of the money supply, was declining rapidly. Meyer looked at him quizzically: this was not a category of data he was familiar with. To Fisher, Meyer “was like a chauffeur [sic] going blindfolded and running into the curb because he could not see the direction in which he was driving.” It was actually worse than that. Rather than paying attention to the stock of money, the Fed looked for guidance to the nominal interest rate and the borrowed reserve holdings of banks. Nominal interest rates had fallen below two per cent as the Depression continued, and banks held plenty of reserves. Under normal circumstances – though not in the throes of a massive deflation – these would have been propitious signs. So the Fed concluded that monetary policy was easy. In fact, because the price level was falling and borrowers would have to pay off loans with increasingly more expensive dollars, the real
interest rate was shooting through the roof; by one estimate it exceeded 20 per cent in early 1932.\textsuperscript{53} Moreover, banks were actually stockpiling reserves against the threat of runs and outright failures. The problem was not merely a blindfold: it was as if the instruments the Fed was steering by had been labeled backwards.\textsuperscript{54} Far from being alarmed by what was going on, Fed officials were smugly pleased with their performance.\textsuperscript{55}

A mild deflation like that of the late nineteenth century tends to transfer income from debtors to creditors, but it does not have significant adverse consequences on the economy. By contrast, a large and rapid deflation can seriously hurt the real economy. As Irving Fisher understood at the time, the operation of unanticipated deflation on unindexed debt contracts made the contraction worse through a cascading process of debt deflation.\textsuperscript{56} As borrowers saw the real value of their indebtedness rise with deflation, they scurried to pay off their loans, which, in a system of fractional-reserve banking, decreased the money supply; this in turn led to further price decreases, which pushed more people to pay off their loans; and so on in a vicious cycle. Many debtors became bankrupt, laying off resources. The effects of this process were real not just distributional because, far from “purging” the system of speculative excess, debt deflation actually took off the board countless valuable real transactions that would have taken place if nominal prices had been better aligned with the value of money. Ben Bernanke pointed out that debt deflation also harmed lenders by adversely affecting bank balance sheets; the destruction of financial intermediaries was another real effect of the monetary contraction.\textsuperscript{57}

Beginning in late 1930, the failures that banks had feared started coming to pass. In a continuation of the pattern since the war, many of these were among small banks that were not members of the Fed. But in December 1930, a run started on the Bank of United States, the fourth largest bank in New York measured by deposits and the largest by number of depositors (almost half a million).\textsuperscript{58} Despite its official sounding name – chosen no doubt exactly for that reason – BUS was an ordinary commercial bank and a member of the Federal Reserve. It catered to a multitude of small shopkeepers and manufacturers, most of them Jewish and only a generation removed from the \textit{shtetl}. BUS was not a member of the New York Clearinghouse, but Thomas Lamont and others, including J. Herbert Case, the chair of the board of the New York Fed, met with the clearinghouse to try to engineer a merger of BUS with two other Jewish-owned banks. Franklin Delano Roosevelt, now governor the state of New York, dispatched Lieutenant Governor Herbert Lehman to plead on behalf of the bank’s many depositors. But, for reasons that many have seen to include anti-Semitism, the deal fell apart, and the bank was closed.\textsuperscript{59} Although contagion did not spread to other New York banks, and although BUS was probably insolvent not just illiquid, the failure of an institution of such size did little to bolster the public’s increasingly shaky confidence in the banking system; and the Fed’s general inaction during the era’s many bank failures certainly exacerbated the monetary contraction.\textsuperscript{60}

\textbf{Purchasing power.}

The most prominent of the many victims of the Fed’s calamitous failure was Herbert Hoover, whose presidency was precisely coextensive with the worst
period of economic decline the country has ever seen. Already in 1932, the Progressive editor William Allen White was ready to characterize Hoover as "the greatest innocent bystander in history." Of course, Hoover was not in fact a man to stand around, and he generated much energy trying to alleviate the effects of the Depression. For a variety of reasons that went beyond the most central one – that the Depression was a monetary phenomenon and the executive branch had little control over monetary policy – Hoover’s flurry of activity came to little, and indeed some of it arguably helped make matters worse. We can sort Hoover’s policies into two categories: policies that essentially attempted to compensate for the failures of the Fed and policies that attempted to support wages and prices, the latter in the fallacious belief that higher wages and prices would generate the “purchasing power” necessary to put unemployed factors of production back to work. As many have noted, Hoover’s policies were along both dimensions precursors of the New Deal.

The centerpiece of the administration’s banking policy was actually forced upon Hoover by the chair of the Federal Reserve Board. Eugene Meyer had begun his government career as a dollar-a-year man during the war. In 1918, he was placed in charge of the War Finance Corporation, which had been created to effectively nationalize lending to war-related industries. The war ended just months later. Meyer persuaded Congress to keep the WFC in business as a way of subsidizing lending to exporters, and during the 1920 recession it was repurposed again as a lender to agriculture. By 1929, however, the organization was being wound down, and in 1930 Meyer was moved over to the Fed. Because bank failures were largely concentrated among small institutions that weren’t members of the reserve system, Meyer became convinced that the solution to the banking crisis lay not with the Fed but in a resurrection of the WFC.

Whipsawed by runs on sterling, Britain was forced off the gold standard in September 1931. The Fed raised interest rates to prevent an outflow of U. S. gold, which touched off another spate of bank failures. In accord with his voluntarist philosophy, Hoover wanted a private fund not a government corporation to help prop up the failing banks. After a secret meeting with Hoover at the Washington apartment of Andrew Mellon, Thomas Lamont and other major New York bankers agreed reluctantly to the creation of a private National Credit Corporation, capitalized at $500 million, to loan money to cooperative associations of non-Fed banks against lower collateral than the Fed would have required. At the same time, Meyer continued to work with Congress to reanimate the WFC, now to be called the Reconstruction Finance Corporation. As the private consortium sputtered, Hoover was forced to accede to the government solution, and the RFC began work in January 1932 with Meyer as its head. In the end, however, the RFC did little during the Hoover administration to stem bank failures. This was because, like the Fed, the RFC required that its loans be senior to deposits, meaning that depositors were still left holding the bag in the case of a failure. Indeed, RFC loans actually increased the riskiness of bank deposits.

At the prodding of Hoover and Mellon, Congress also passed legislation in early 1932 that allowed the Fed to use government bonds in addition to “eligible” commercial loans as collateral to back paper currency while expanding the permissible circumstances in which the Fed could help out
member banks. In July, a system similar to the RFC was set up to aid small mortgage lenders.

The second dimension of Hoover’s anti-Depression policies extended from his distinctive version of Progressivism. Like Progressives in general, he thought that markets could not be trusted to allocate resources effectively and would merely generate “haphazard development.” At the same time, he feared the politicization of economic decision-making and believed strongly that government should limit itself to supplying impartial guidance and facilitating non-collusive cooperative arrangements within industry. This was very much in keeping with the contemporary enthusiasm for scientific management and enlightened administration that Hoover himself embodied. As we saw, Hoover’s Commerce Department had understood its mission as bestowing data upon benighted producers and eliminating waste through standard setting and industrial conferences. This program also contained a significant component of what we would now call “macroeconomic” management. As Alfred Chandler taught, one of the central tasks of administrative coordination is to adjust mass-produced output to demand in industries with high fixed costs and long production runs. Administrative coordination is thus a mechanism of countercyclical planning and hedging. Hoover believed that government should help in this process by providing business with a “national conception” so that individual planning could occur from “a larger perspective than the individual business.” The goal was nothing less than “to mobilize the intelligence of the country, that the entire community may be instructed as to the part they may play in the effecting … of solutions.”

More than this, however, Hoover believed that the federal government could steer the macro economy by planning public works and other large construction projects in a countercyclical way through administrative coordination of its own. A conference he organized on unemployment in 1921 called for deferring construction during prosperous times so that projects would be shovel ready during recessions. The conference proceedings even contained diagrams demonstrating how such a fiscal stimulus would create a multiplier effect rippling through the economy. Little came of any of this, but that didn’t stop Hoover from taking credit for the prosperity after 1921. Within a month of the stock market crash, Hoover once again initiated a program of fiscal stimulus, ordering his departments to step up shipbuilding and public works – including the dam on the Colorado river that would eventually bear his name – and imploring lower levels of government to do the same. Over Hoover’s veto, Congress passed a bonus for veterans in 1931. Between 1929 and 1933, nonmilitary federal expenditures increased 259 per cent in nominal terms, a greater percentage increase than during the New Deal, albeit from a much lower base. This would have led to a budget deficit of some $3 billion had Hoover and his treasury secretary, Ogden Mills, not immediately pushed through what was essentially an undoing of the Mellon tax cuts, increasing the marginal income-tax rate to 63 per cent and slapping consumption taxes on gasoline, electricity, refrigerators, telephone calls, and other things. As a result, the fiscal stimulus in the Hoover era was tiny; but, as we will see, that was also true of the New Deal.
The most significant way in which the Progressive vision of administrative coordination entered the macroeconomic arena was via the doctrine of high-wage purchasing power. Baldly stated, this was the assertion that the true path to prosperity, and the route out of the Depression, lay in the maintenance of high wages (and in some versions high prices as well), because only high wages would assure enough purchasing power to soak up all the unsold goods piling up in inventories. The empirical touchstone of this idea was Ford’s five-dollar-a-day wage, which had increased productivity by increasing pay. Moreover, as we have seen, the immigration restrictions and tariffs of the twenties had raised wages and thus induced firms in many leading sectors to seek higher productivity through organizational innovation, greater capital intensity, and human-capital formation. Many businesspeople, intellectuals, and politicians of the era interpreted the observed relationship between wages and productivity not as a slow adaptation of capabilities to changing relative prices but as a macroeconomic principle: through a multiplier effect, higher wages create the purchasing power that drives prosperity.

Ford himself was an apostle for high wages. By paying high wages, he believed, “we increased the buying power of our own people, and they increase the buying power of other people, and so on and on. It is this thought of enlarging buying power by paying high wages and selling at low prices which is behind the prosperity of this country.” Ford was not alone. Boston department store magnate Edward A. Filene called for a national minimum wage on similar grounds. Writing in the American Economic Review in 1923, and citing both Ford and Hoover, Filene invoked the efficiency-wage theory. “One of the ways of increasing efficiency is to pay wages that will command a high enough grade of employee to make it unnecessary for the proprietor to put in most of his time directing and correcting errors of inefficient, underpaid people.” The problem, Filene argued, is that wages are inevitably driven down by mean and short-sighted employers. Only a government mandate would permit “a standard of wage high enough to give us a good consuming public.” These widely held views were intellectualized and amplified throughout the decade, notably in the popular writings of William Trufant Foster and Waddill Catchings and by the British economist John A. Hobson.

The high-wage doctrine had immediate implications for the Depression. As many vividly recalled, during the 1920-1921 recession employers quickly reduced wages in order to cut costs. Proponents of the high-wage doctrine considered this a grievous error. When wage rates fall faster than prices, the real wage of the workers – their “purchasing power” – will decline. To believers in the high-wage doctrine, such a fall in purchasing power actually hurts businesses more than cutting wages helps them.

On November 21, 1929, Hoover called together 22 of the nation’s leading industrialists. Among those seated around the cabinet table in the executive office building were Pierre du Pont, Henry Ford, Samuel Insull, Julius Rosenwald, Alfred P. Sloan, and Owen D. Young. Hoover’s secretary took notes.

The President … explained that immediate “liquidation” of labor had been the industrial policy of previous depressions; that his every instinct was opposed to both the term and the
policy, for labor was not a commodity. It represented human homes. Moreover, from an economic view-point such action would deepen the depression by suddenly reducing purchasing power and, as a still worse consequence, it would bring about industrial strife, bitterness, disorder, and fear. He put forward his own view that, in our modern economy and on account of the intensified competition from shrinkage in demand and the inevitable loss of profits due to a depression, the cost of living would fall even if wages were temporarily maintained. Hence if wages were reduced subsequently, and then no more and no faster than the cost of living had previously fallen, the burden would not fall primarily on labor, and values could be “stepped down.” Thereby great hardships and economic and social difficulties would be avoided. In any event the first shock must fall on profits and not on wages.81

Hoover secured a promise from the industrialists that they would not cut wages. Henry Ford did the president one better. At the end of the three-hour meeting, Ford burst through the phalanx of waiting reporters and, hopping into an eponymous vehicle, instructed his secretary to hand out a press release. “Wages must not come down,” it said, “they must not even stay on their present level; they must go up.”82 In the afternoon Hoover exacted a promise from labor leaders that they would not strike, and on December 5 he met with a much larger group of businesses and made the same high-wage demands.

A recession (or depression) is a monetary disequilibrium.83 We teach in introductory economics courses that whenever there is a glut of apples, the self-interest of buyers and sellers will tend to push the price of apples down until the market clears. But money is a unique good. Because money is the medium of exchange and the numéraire, the unit of account in which the prices of all other goods are expressed, its price is not as easily adjustable as the price of apples. When the quantity of money changes, the nominal prices of all other goods in the economy have to adjust, implying a much more serious problem of coordination. This is what happened in the Depression. As the money stock fell, the value of money increased dramatically relative to the nominal prices of all other goods. So all other goods, including capital and labor, experienced equally dramatic surpluses. As the contemporary economist Ralph Hawtrey observed, a “collapse of demand” is just another name for the appreciation of the value of money relative to all other goods.84

A surplus of labor is called unemployment. In order to restore full employment, either the value of money had to decline (meaning reflation) or nominal wages had to fall. Again, a modern-day central banker would not have hesitated to flood the economy with liquidity to lower the value of money. There is general agreement among monetary historians that the U. S. Federal Reserve System in 1929 could well have done this, even despite the constraints of the gold standard.85 But it did nothing of the sort. The other alternative would have been to wait for nominal prices to fall. As we saw, this is what happened in the 1920-1921 recession; and many in 1929 believed that falling prices would again be the cure. Perhaps the most ardent, or at
any rate the most famous, “liquidationist” was Treasury Secretary Mellon, who fortified his economics with Calvinism. “Liquidate labor, liquidate stocks, liquidate the farmers, liquidate real estate,” Hoover quotes him as saying. “It will purge the rottenness out of the system. High costs of living and high living will come down. People will work harder, live a more moral life. Values will be adjusted, and enterprising people will pick up the wrecks from less competent people.”

Almost certainly because the economy was in flux during the post-war conversion, prices were relatively flexible in 1920-1921. Something similar happened after World War II. But in 1929, adjustment through liquidation was an extremely costly alternative. The economy was humming along, and market participants had no reason to expect sudden changes. Many contracts were written for relatively long durations, their prices specified in nominal terms. These included not only union labor contracts but also real estate mortgages and rental agreements, bonds with fixed coupons, and many other types of contracts. As a result, prices were “sticky.” Even when prices were not locked in by contract, adjustment was not easy. Resources remained unemployed as market participants frantically searched for new prices on a radically altered landscape through trial and error. Complicating matters further, everyone had an incentive to let someone else lower prices first. The result was that prices ceased to convey valuable information about relative scarcities, leaving labor and other resources chronically in surplus.

On the matter of wages, Hoover got his wish. Nominal wages fell more slowly than prices. The result was that businesses saw their profits decline and began laying off workers. Henry Ford kept his promise, immediately raising wages to $7 a day. Almost as quickly, the Ford works went on short time.

Nominal wages stayed relatively unchanged in 1930 and 1931, beginning to fall only in 1932. Because of falling prices, however, the real wage in the United States increased by 16 per cent between 1929 and 1932, and it would remain elevated throughout the years of the Depression. As Anthony Patrick O’Brien has observed, “manufacturing workers who managed to retain their jobs during the first two years of the Great Depression experienced one of the largest increases in real income of any group in the history of the country.” Between 1930 and 1940, the real wages of the employed increased 45 per cent. At the same time, unemployment exploded from 3.2 per cent in 1929 to 24 per cent in 1932, reaching a high of 25 per cent in 1933. When the unemployed are taken into account, the average real income of workers fell by 25 per cent during the period 1930-1935.

Many have blamed the rigidity of nominal wages on the success of “Hoover’s truce,” though there is in fact no hard evidence that the firms represented at the meetings behaved differently than similar firms who weren’t represented. The high-wage doctrine was well ensconced in business thinking in the era, and Hoover was less a cause than an instance of this fact. Indeed, it seems clear that, especially in large and well-established firms, employers responded to the fall in demand for their products by doubling down on the efficiency-wage strategy. Rather than cutting wages, large firms fired their least productive workers and retained their most productive. For example, GE and Westinghouse laid off unskilled workers
and reassigned skilled workers and foremen to the factory floor. Unemployment disproportionately affected the young, who were least experienced. As smaller firms went out of business, larger firms scooped up the most productive, leaving the rest unemployed. Over the period 1930-1935, real wages increased or held steady in all relatively capital-intensive sectors, declining only in lower-tech, labor-intensive sectors like mining, farm labor, domestic service, and construction. At a time when organized labor was relatively weaker than it would soon be, labor unions had little to do with this wage structure.

Even before the crash, Hoover had also attempted to prop up agricultural incomes by pushing through the creation of a Federal Farm Board to buy, sell, and store agricultural surpluses and to loan money to farmers. As the system lacked any provision to restrict output, however, it had little effect on the decline of agricultural prices. Also before the crash, the infamous Hawley-Smoot tariff had begun wending its way through Congress. Like earlier tariffs in the decade, it was initially aimed at supporting agriculture. But once the bill opened up in the legislature, it transformed into a feeding trough for special interests of all sorts. Would Hoover sign it? The State Department was alarmed by the likely international repercussions. Thomas Lamont personally pleaded with the president not to approve the bill. On May 5, 1930, 1,028 American economists denounced the tariff in a statement carried on page one of the New York Times. Yet, unwilling to take a stand against his own party, Hoover signed on June 17. In so doing, wrote Walter Lippmann, Hoover had “accepted a wretched and mischievous product of stupidity and greed.”

There is little support for the once-popular view that the Hawley-Smoot Tariff triggered the Great Depression. But it certainly did not help. Although the measure raised average duties only about 15 per cent, its effect was amplified by deflation. Because many duties were specified in nominal terms and import prices were falling, the effective tariff rate was as high as 59 per cent in 1932. In quantity terms, U.S. imports fell 40 per cent and exports plummeted 49 percent between 1929 and 1932. Countries around the world began raising tariffs and imposing non-tariff barriers. Canada, America’s largest trading partner, responded to the Hawley-Smoot Tariff by lowering duties on goods from the Commonwealth and raising them on U.S. goods. The interdependent effects of deflation and trade barriers drove a dramatic decline in world trade, the two factors probably contributing equally to the collapse. When trade began to creep up again after 1933, it did so entirely because of increasing income. Trade barriers would remain in place.

Seeing unemployment rising, Hoover shut down all immigration by executive order in September 1930. In 1932, the U.S. would welcome little more than 35,000 immigrants; more than 100,000 people emigrated. The combination of immigration restrictions and trade barriers helped pushed the country further along its high-wage-high-unemployment trajectory.

We want beer.

In October 1931, Herbert Hoover attended the World Series between the St. Louis Cardinals and the Philadelphia Athletics at Shibe Park in Philadelphia.
It is not perhaps surprising that the president was greeted with boos and jeers. What may be more surprising is why the fans were upset. “We want beer!” they shouted. As contemporary opinion polls document, Prohibition was at the forefront of American minds in the lead up to the election of 1932 – to a far greater extent perhaps even than the Depression.  

The Eighteenth Amendment had been ratified in January 1919, and, buttressed by the draconian Volstead Act, it took effect a year later, just as a decade ill-suited to prohibition was getting underway. The war against alcohol had long featured prominently on the populist and Progressive agendas; but an alignment of forces at the end of World War I suddenly propelled the amendment through Congress and the states with breathtaking speed. As Lisa McGirr puts it, Prohibition represented “a distinctly modern fusion of twentieth-century nation-state building with an older strand of Protestant moral righteousness.” Although women would not get the vote until the Nineteenth Amendment, Prohibition was closely allied to the suffrage movement. The Women’s Christian Temperance Union and other groups stressed the toll that male drunkenness exacted upon women and the family. Prohibition also drew from reservoirs of nativism, as abstinence formed a clear divide between white Protestants and the immigrant hordes filling America’s cities, what WCTU founder Frances Willard sensitively called “the infidel foreign population of our country” and “the scum of the Old World.” The Ku Klux Klan extended its strong support while broadcasting the well-worn trope of drunken Negro rapists prowling the land. (Although Prohibition would be associated with women’s suffrage, it was also associated with increased disenfranchisement of African Americans.) Seeing drink as a capitalist plot, the International Workers of the World were on board as well. The most effective prohibitionist organization was the well-funded Anti-Saloon League, formed by Protestant clergy and headed by the crafty Wayne B. Wheeler; it constituted the first significant single-issue pressure group in American politics.

World War I provided the momentum necessary to take Prohibition over the top. Right after the war broke out, Irving Fisher, always an ardent prohibitionist, gathered together a group of American thought leaders, including Upton Sinclair, Orville Wright, and Judge Gary, and regaled them with a guns-and-beer lecture on the opportunity costs to the war of alcohol production. In the event, Food Administrator Hoover did slash the amount of grain that could be used for alcohol production during the war. Meanwhile, the Creel Committee demonized German-American brewers as supporters of the enemy. Opponents of Prohibition came to seem a sorry lot of politically toxic ethnic bosses, suspect business interests, and foreign sympathizers. They were quickly vanquished.

Immediately after the law took effect, alcohol consumption fell to 30 per cent of its previous level, but it quickly rebounded to 60 to 70 per cent as the illegal economy took shape. Because the framers of the amendment, especially Wheeler and the ASL, insisted on absolute prohibition, even less-intoxicating drinks like beer and wine were banned, so consumers predictably switched to beverages with a higher alcohol-to-volume ratio, and the quality and safety of the product declined precipitously, especially for low-income consumers. Beer almost completely disappeared. Because of the product’s illegality and the forced inefficiencies of its now-decentralized production,
prices increased; but the fraction of GDP devoted to expenditures on alcoholic beverages did not decline.\textsuperscript{112}

As mostly white Protestants and mostly non-drinkers, the leaders of American business were typically supportive of Prohibition, at least in the beginning. Temperance, after all, was essential to productivity. At the meeting of the American Economic Association in 1927, Irving Fisher read out a letter from Henry Leland testifying to the improvement in productivity he had seen after Prohibition. His workers no longer took off Blue Mondays in large numbers to sober up, and they were now saving their money and spending it on food and clothing instead of drink.\textsuperscript{113} John D. Rockefeller matched all donations to the Anti-Saloon League.\textsuperscript{114} Yet, just as the Eighteenth Amendment was interconnected with the Nineteenth, so too was it deeply intertwined with the Sixteenth Amendment. Before World War I, taxes on alcoholic beverages had been one of the largest source of federal revenue, and supporters of Prohibition understood that a replacement source of funds – an income tax – would be essential. As marginal income tax rates climbed during the war and after, however, high-income taxpayers began to look back fondly at the alcohol tax.

By the end of the twenties, of course, Americans in large numbers had come to equate Prohibition with hypocrisy, corruption, and violence, and all understood that, in effect, alcohol was still being taxed. During his visit in 1929, Winston Churchill, whose views on prohibition can easily be imagined, encapsulated the issue in characteristically epigrammatic form. “We realize over £100 million a year from our liquor taxes,” he told a reporter, “an amount I understand that you give to your bootleggers.”\textsuperscript{115} In the anti-Prohibition movement that began to spread, American business leaders were at the forefront. In 1926, Pierre du Pont and John Jakob Raskob joined the Association against the Prohibition Amendment, which was among the first of many like-minded groups. By the summer of 1932, du Pont was chair of a United Repeal Council with some 2.5 million members.\textsuperscript{116} Most astonishingly, on June 6, 1932, John D. Rockefeller, Jr., the son of the patron of the ASL, declared himself in favor of repeal.\textsuperscript{117} He was quickly joined by Alfred P. Sloan, tire manufacturer Harvey Firestone, and many others. Hoover responded to the growing discontent over Prohibition in the way he responded to most issues – he set up a commission. Under the supervision of former attorney general George Wickersham, the resulting report cataloged the failures of Prohibition but nevertheless endorsed continued enforcement. It was greeted with ridicule.\textsuperscript{118} The Prohibition plank in the 1932 Republican platform equivocated so much as to be unintelligible.\textsuperscript{119}

Throughout the 1920s, the Democratic Party had been the party of the remainder, a jury-rigged alliance of two major constituencies that disliked each other possibly more than they disliked the Republicans. In 1924, the candidate of the rural, Protestant, and dry South was William Gibbs McAdoo; the candidate of the urban, Catholic, and wet North was Al Smith, the governor of New York. After a proposed plank denouncing the Ku Klux Klan unleashed a punishing battle – it was ultimately defeated by a single vote – the convention was forced to settle on the anodyne candidate John W. Davis, who was crushed by Calvin Coolidge.\textsuperscript{120} In 1928, the urban bloc was successful in nominating Smith, who had come under the wing of Raskob, by then chair of the Democratic National Committee and a major donor.
Dry Southern voters defected to the Republicans in droves, and Smith was crushed by Hoover.

In 1932, however, the Depression and the groundswell against Prohibition had combined to realign the firmament in favor of the Democrats. Although he had long waffled on Prohibition, Franklin Delano Roosevelt came out strongly in favor of repeal at the Democratic convention in Chicago, thus brushing aside Al Smith. The patrician Roosevelt, with a presence in Warm Springs, Georgia, also appealed far more to the Southern wing of the party than did the brashly urban and Catholic Smith. Roosevelt received crucial support from Huey Long; and when he agreed to take the Southern candidate, John Nance Garner of Texas, as his running mate, the nomination was sealed. Roosevelt crushed Hoover in the general election in November. Just as significantly, Democrats won a resounding majority in Congress, which would grant the new president considerable scope to maneuver so long as he remained within the constraints of what his two constituencies demanded: the repeal of Prohibition and higher prices for agricultural commodities.

As in the case of Hoover, we can distinguish Roosevelt’s economic policies into two broad categories: monetary and banking policies that tried to respond to the inadequacies of the Federal Reserve and microeconomic policies that tinkered with relative prices in an attempt to increase “purchasing power.”

The problems of banking would make themselves loudly heard even before the inauguration, which in that era did not take place until early March. Throughout the election period, the country had continued to experience regional banking crises. In June 1932, runs began on a number of large Chicago banks, most notably including the Central Republic Trust, headed by none other than Charles Dawes, who had taken over from Meyer as president of the Reconstruction Finance Corporation. The RFC quickly advanced the bank $90 million, the largest single loan it would ever make. Regional panics continued throughout the fall until, in mid-February, crises spread to another major city. The Guardian Union Trust in Detroit was tottering on the edge of collapse, threatening to take with it not only the network of regional banks in its group but also the First National Bank of Detroit, the third-largest bank in the U.S. Guardian appealed to the RFC for help. As was its wont, the RFC insisted that depositors subordinate their interests to the RFC loan. One depositor was Henry Ford, with $7.5 million on account. The RFC asked not only that Ford agree to subordination but also that he pony up an additional $4 million in equity. Henry Ford refused, in no uncertain terms; the RFC would not relent; and on February 14 the governor of Michigan was forced to declare a bank holiday.

As the shockwave spread, depositors around the country pulled some $1.3 billion out of the banking system. Congress did not help matters by forcing the RFC to publish a list of all the shaky banks to which it had loaned money. At the same time, international currency markets were readying a run on the dollar. Farm commodities had reached a new low in January, falling to half of their pre-war “parity” level. Currency traders were well aware of the agitation for devaluation in farm states, which had begun to degenerate into riots. The pro-devaluation Committee for the Nation, bankrolled by Henry Ford and William Randolph Hearst, featured on its board of directors.
the uber-populist Henry A. Wallace, Roosevelt’s designee for secretary of agriculture. As the ghost of William Jennings Bryan stalked America’s farmlands, Congress toyed with remonetizing silver. “Sound money” had been a plank of the Democratic platform, of course, and Roosevelt had worked hard during the campaign to rebut attempts by Hoover and others to paint him as an inflationist; but all foresaw the pressure the new president would face from his agricultural constituency. By March 1, rumors of devaluation had reached the front page of the Financial Times, which predicted that the U. S. might even abrogate bond contracts written in terms of gold.

As traders converted dollars into gold between February 1 and March 4, the Federal Reserve Bank of New York lost $584 million in gold, 61 percent of its reserves. Ogden Mills reminded Hoover that the wartime Trading with the Enemy Act was still in force and that it gave the president power to embargo gold flows. Hoover attempted to get Roosevelt to buy in, but to no avail. Roosevelt’s advisors had also thought of the emergency gold powers, and indeed they had already written a draft of a declaration of a bank holiday. Roosevelt made it plain, however, that, until the inauguration, the crisis would be Hoover’s problem alone, as later would be the blame. In principle the New York Fed could have called on the gold reserves of Chicago and the system’s other banks. But, under pressure from their own member banks, the reserve banks declined to help, and the Board failed to enforce inter-district lending. George Harrison was compelled to ask New York governor Herbert Lehman for a bank holiday. Immediately after the inauguration on March 4, Roosevelt did indeed make the bank holiday a national one, though 48 states and territories had already enacted holidays or restrictions.

In special session on March 9, Congress granted the new administration unprecedented powers over the flow of gold and the reopening of the banking system. In his first fireside chat, Roosevelt calmly assured the public that banks would methodically reopen and that people could safely return their funds to the bank. By March 13, most banks had reopened. But the stock of monetary gold continued to fall. On April 7, the president issued an executive order forbidding the hoarding of gold: under penalty of a fine and even imprisonment, everyone was required to sell all monetary gold to the Federal Reserve at the official rate of $20.67 an ounce. Yet commodity prices remained stubbornly depressed, and pressure continued to build in Congress for some form of genuine inflation. Seeing the handwriting on the wall, Roosevelt agreed on April 18 to support an amendment to the Farm Relief Act, then before Congress, that would give the president power to lower the gold content of the dollar by as much as 50 per cent. The next day, April 19, 1933, Roosevelt announced that he would embargo the export of gold indefinitely. Although the official rate of exchange between gold and dollars had not (yet) changed, the U. S. was off the gold standard.

There remained a glaring problem. Many contracts, including bond contracts issued by the government itself, specified payment not in dollars but directly in gold. It would do little good to devalue the dollar if contracts could be written to bypass dollars. As contracting parties began to try to settle the issue through the courts, Congress passed a measure declaring null and void all contracts written in terms of gold. The president signed it on June 5. The resulting litigation would reach a sharply divided Supreme Court
in 1935, where the act was upheld in a decision that represented the first of many epic confrontations between the executive and legislative branches during the New Deal.

It was during this period that Roosevelt came most strongly under the influence of the farm economist George F. Warren of Cornell. Along with the statistician Frank Pearson, Warren had eyeballed a correlation between the price of gold and the prices of agricultural commodities. Rejecting Fisher’s more complex and subtle quantity theory of money, Warren sold this reductionist account to Roosevelt as a magic bullet for raising commodity prices. In his fourth fireside chat on October 22, Roosevelt announced that the RFC would begin buying gold on world markets (and from domestic sources like jewelers and dentists still allowed to hold gold) in order to create a managed currency. Each morning Warren and Roosevelt met to decide the prices at which the RFC would buy gold. This was in direct contravention of the Gold Act of 1900, which required the government to buy only at the official price, still set at $20.67 an ounce. John Maynard Keynes blamed this buying program for volatility, famously complaining that “the recent gyrations of the dollar have looked to me more like a gold standard on the booze than the ideal managed currency of my dreams.” In fact, volatility at the time wasn’t abnormal, and, as many contemporary bankers and economists understood, the problem was that the amount of RFC buying was actually too small to influence markets significantly.

Between Roosevelt’s inauguration and the middle of July, the economy boomed as never before or since: manufacturing expanded 78 per cent, durable goods 199 per cent, industrial production 57 per cent, and the stock market 71 per cent. This was almost certainly not because of actual inflation, which had only begun to be felt, but because of a regime-shifting swing in expectations. Everyone believed that inflation was at hand, and all behaved accordingly, stepping up purchases to avoid anticipated higher prices and moving investments into equities. In the summer, however, the administration started giving out mixed signals about the expansionist policy, and beginning in August a four-month crash saw manufacturing production collapse by 31 per cent, durable goods by 48 per cent, and overall industrial production by 19 per cent. It was time for an actual devaluation.

A depreciation of the dollar against gold enriches those who hold gold at the time of devaluation. By nationalizing gold holdings, Roosevelt made sure that the private sector would not reap the windfall. Indeed, in December the administration directed the Federal Reserve to hand its gold over to Treasury. The Gold Act signed on January 30, 1934 formalized the transfer as well as reaffirming Roosevelt’s powers to reset the value of the dollar. The next day the president decreed an ounce of gold equal to $35, an equivalency that would remain in force until 1971. Treasury used $2 billion of its profits to create an Exchange Stabilization Fund. Under secretary Henry Morgenthau, also a devotee of the ideas of Warren, the Treasury Department used the fund essentially to assume the role of central bank. While Treasury was led by the activist inflationist Morgenthau, the Fed would come under the direction of Marriner S. Eccles, a Utah banker whose views could be anachronistically but accurately described as Keynesian: he believed that monetary policy, the Fed’s stock in trade, was completely ineffective because of what would later be called a liquidity trap. Thus the Fed had paid for
its epic failures by being relegated to the back seat of monetary policy, a position it would occupy until after World War II.\textsuperscript{139}

Nonetheless, the Banking Act of 1935, crafted in large part by Eccles, built the structure that would one day enable the Fed to operate as a central bank.\textsuperscript{140} The bill increased the power of the Board in Washington, and especially of the Federal Open Market Committee, at the expense of the regional banks; and it made the Fed more independent by removing administration officials from the Board. This was much to the consternation of the aging Carter Glass, especially the provision that made permanent the Fed’s ability to define “eligible paper” any way it saw fit, effectively ending the Fed’s legal connection to the real-bills doctrine. With the Fed in the rear seat, these reforms had little immediate effect, and may indeed have been designed to distract attention from the growing power of the Treasury in monetary policy.\textsuperscript{141}

By raising the price of gold, the devaluation of 1934 quickly attracted gold to the U. S., some of it reflecting capital flight from an increasingly unstable Europe. Gold production around the world shot up.\textsuperscript{142} Unlike the Fed of the 1920s, the Treasury Department of the 1930s made no move to sterilize the inflow.\textsuperscript{143} An important if not dominant view among economists today sees that gold inflow and attendant money creation as key to the recovery from the Depression.\textsuperscript{144} Between 1933 and 1937, real U. S. GDP shot up some 43 per cent, a spectacular compound annual growth rate of 9.4 per cent.\textsuperscript{145} By 1937, real GDP had made up all its losses since 1929. Yet resources, notably including labor, remained chronically unemployed: what had started out as cyclical unemployment turned into long-term structural unemployment for at least 10 per cent of the labor force.\textsuperscript{146} It was the epitome of a “jobless recovery.”

In 1927, as he moved to lower U. S. interest rates to reduce pressure on the pound, Benjamin Strong had confided in Charles Rist of the Banque de France his fear that the cut would provide the stock market with “un petit coup de whisky.”\textsuperscript{147} The Roosevelt devaluation had provided the American economy with a brimming, frosty mug of beer. Roosevelt moved quickly to provide literal beer as well.\textsuperscript{148} Already in February 1933, Congress had passed and sent to the states a joint resolution to repeal Prohibition. At Roosevelt’s request, on March 16 Congress passed an act “to provide revenue by the taxation of certain nonintoxicating liquor,” which legalized 3.2 beer. It took effect on April 7, to much rejoicing. By the end of 1933, the requisite 36 states had ratified the Twenty-first Amendment. In the year after repeal, the government took in almost $260 million in alcohol taxes, about nine per cent of total federal revenue; by 1936 that was up to $505 million, or 14 per cent of federal revenue.\textsuperscript{149} Income-tax rates were indeed reduced, but only for middle-income payers, not for the very rich who had so ardently fought for repeal.

\textbf{The day of enlightened administration has come.}

That agricultural distress could have monetary causes was an understanding deep within the DNA of American populism since the nineteenth century. Yet, even among the inflationist agricultural interests, few believed that
restoring something like a monetary equilibrium would be the essential cure for the Depression. The catastrophe was so large, and seemed so obviously a fundamental breakdown of the market order, that much more revolutionary measures would surely be needed. For such measures, as many have noted, the New Deal would be able to draw on the early century’s font of Progressive ideas and on the administrative structures that had been created for the world war.\(^{150}\)

The decade of the twenties had shunted Progressive intellectuals into the shadows. Progressivism has always been an upper-middle-class movement, and during the twenties the members of that class found opportunity and optimism in the genuine prosperity.\(^ {151}\) Disaffected by the war and Prohibition, both of which were associated with Progressivism, intellectuals began defecting to a relatively apolitical modernism. Yet there remained strongholds of Progressive ideas. Herbert Croly continued to dispense his views from the New Republic until he suffered a stroke in 1928. And the Institutionalist school of economics remained important around the country, notably at places like Wisconsin and Columbia.\(^ {152}\)

The cataclysm of the Great Depression quickly reversed the fortunes of anti-market intellectuals. What thinking person could help but see the crisis as a colossal failure of market liberalism? Some looked for solutions to the Italy of Mussolini, who generated fascination across the political spectrum in America.\(^ {153}\) Many others naturally turned to socialist and communist models, especially as the Soviet Union remained shrouded in myth, mystery, and misinformation. Paid-up memberships in socialist and communist organizations grew, though they were never large, amounting only to several tens of thousands; and, although Norman Thomas polled more than 900,000 votes for president under the socialist banner in 1932, that was not more than Eugene V. Debs had garnered in previous elections.\(^ {154}\) It was among the intellectuals – who, in Schumpeter’s phrase, could “wield the power of the spoken and the written word” – that radical sentiment became significant.\(^ {155}\) And the more radical the better. “Becoming a socialist right now,” said the novelist John Dos Passos in 1932, “would have just about the same effect on anybody as drinking a bottle of near-beer.”\(^ {156}\) John Kenneth Galbraith reported that, when he was a student at Berkeley during the Depression, graduate students “were uniformly radical and the most distinguished were Communists.”\(^ {157}\)

It was from the Progressive thinkers and Institutionalist economists at Columbia that candidate Roosevelt recruited key members of his famed Brains Trust of advisors and speechwriters. Their ideas would inform Roosevelt’s policies even as those ideas resonated with what the candidate already believed. The leader of the group was law professor Raymond Moley, who recruited from his faculty economist Rexford Guy Tugwell and fellow lawyer Adolf Berle.

Tugwell had studied at Wharton under Simon Patten, where he absorbed the work of Veblen; once on the Columbia faculty he became a friend and colleague of John Dewey.\(^ {158}\) A fierce critic of laissez-faire economics, Tugwell was an apostle of central economic planning, and he sang the Croly version of the Progressive chorus. “National planning,” he told the meeting of the American Economic Association in December 1931, “can be thought of – in a technical rather than a political sense – merely as a
normal extension and development of the kind of planning which is a familiar feature of contemporary business.”

The son of a Congregationalist minister and himself a proponent of the Social Gospel, Berle had just completed *The Modern Corporation and Private Property* with economist Gardiner Means. The book latched together data on the rising concentration of ownership in American corporations with a legal argument about the rights of minority stockholders. Concentration was proceeding so fast, Berle warned candidate Roosevelt in a 39-page memo in May 1932, that “at the present rate of trend, the American and Russian systems will look very much alike within a comparatively short period – say twenty years.” Ultimately, “there is no great difference between having all industry run by a committee of Commissars and by a small group of Directors.”

For Roosevelt and the Brain Trusters, the central problem was to restore “balance.” Private decision-making had led to serious “imbalances” within the economy, and indeed these were the fundamental causes of the Depression. “In the years before 1929,” said Roosevelt in his acceptance speech at the Democratic convention,

we know that this country had completed a vast cycle of building and inflation; for ten years we expanded on the theory of repairing the wastes of the war, but actually expanding far beyond that, and also beyond our natural and normal growth. … Enormous corporate surpluses piled up – the most stupendous in history. Where, under the spell of delirious speculation, did those surpluses go? Let’s talk economics that the figures prove and that we can understand. Why, they went chiefly in two directions: first, into new and unnecessary plants which now stand stark and idle; and secondly, into the call money market of Wall Street, either directly by the corporations, or indirectly through the banks. Those are the facts. Why blink at them?

Overproduction was not a manifestation of the Depression; excess capacity had actually been created by speculation and overinvestment in the twenties. Indeed, as he told the graduating class of Oglethorpe University on May 22, this was a more general problem: the creative destruction of the entrepreneurial economy led to haphazard development and waste – waste that could be eliminated by planning.

In the same way we cannot review carefully the history of our industrial advance without being struck by its haphazardness, with the gigantic waste with which it has been accomplished – with the superfluous duplication of productive facilities, the continual scrapping of still useful equipment, the tremendous mortality in industrial and commercial undertakings, the thousands of dead-end trails into which enterprise has been lured, the profligate waste of natural resources. Much of this waste is the inevitable by-product of progress in a society which values individual endeavor and which is susceptible to the changing tastes and customs of the people of which it is composed. But much of it, I believe, could have been prevented by greater foresight and by a larger measure of social planning.
In what was arguably his most sophisticated campaign speech, to the Commonwealth Club of San Francisco on September 23, Roosevelt summed up his economic philosophy.

A mere builder of more industrial plants, a creator of more railroad systems, an organizer of more corporations, is as likely to be a danger as a help. The day of the great promoter or the financial Titan, to whom we granted anything if only he would build, or develop, is over. Our task now is not discovery or exploitation of natural resources, or necessarily producing more goods. It is the soberer, less dramatic business of administering resources and plants already in hand, of seeking to reestablish foreign markets for our surplus production, of meeting the problem of underconsumption, of adjusting production to consumption, of distributing wealth and products more equitably, of adapting existing economic organizations to the service of the people. The day of enlightened administration has come.

The goal would not be to restore the market; the goal would be to replace the market with “planning” – a system of conscious manipulation of relative prices.

At first glance, this emphasis on managerial planning would seem at variance with the message of The Modern Corporation and Private Property as understood, especially by economists, in the post-war period. As everyone knows, this book was the first important articulation of the what economists now call the agency problem between managers and stockholders. Berle and Means noticed for the first time that American corporations were increasingly being run by professional managers and no longer by their owners. Shareholding had become diffuse, reducing the incentive for stockholders to exercise control and giving managers free rein to pursue their own interests at the expense of those stockholders. As is true of a good many things everyone knows, of course, all of this is wrong. Berle and Means were far from the first to notice or worry about the separation of ownership from control. Their famous book was in fact arguably the culmination of a longstanding Progressive discussion of corporate governance. More significantly, Berle and Means were not in fact principally concerned with agency problems between managers and stockholders.

Major benchmarks in the Progressive conversation on corporate governance include the work of Veblen, Brandeis’s Other People’s Money, and, in 1927, Main Street and Wall Street by the erstwhile railroad expert William Z. Ripley. In a chapter entitled “a Birthright for Pottage,” Ripley offers the parable of two men from Maine who pass capital on to their sons. One gives his heir a Jersey heifer (cows being the dominant form of capital throughout human history) while the other gives his son shares in the local electric utility, which the father had had a hand in founding. Needless to say, the cow-owning son takes pride in his possession and personally tends to its wellbeing; but the other son discovers that the electric utility has been bought by a holding company, which has been bought by another holding company, which has been bought perhaps by yet another holding company. And thus the second son has no personal interest in or control over the use of his
capital; he has become a rentier. More significantly, those who do control the capital can take advantage of minority shareholders like the hapless second son and tunnel resources away from them. Significantly, however, Ripley does not identify control with managers. Like Brandeis, he has in mind mostly investment bankers who determine the directorships of corporations. An example: Dillon, Read’s control of Dodge after the deaths of the Dodge brothers. “Veritably,” Ripley warned, “the institution of private property, underlying our whole civilization, is threatened at the root unless we take heed.”

The message of Berle and Means is largely the same, albeit freighted with more data and legal argument. Only in the post-World War II period would thinkers begin to identify “control” with management in the sense of salaried professionals, thus creating the optic through which the Berle and Means argument is now viewed. By contrast, Berle and Means fully agreed with the Progressive understanding of management as dispassionate and omnicompetent scientific planning. “No better principle in carrying out business has yet been worked out,” they wrote, “than to find able men and give them the completest latitude possible in handling the enterprise.”

In his contribution to the book, Means was careful to distinguish among ownership, management, and control. Ownership were the stockholders, including importantly the numerous minority stockholders; management consisted of the directors and officers of the corporation; and control meant those who selected the directors and could therefore ultimately determine the direction of corporate activities and the distribution of profits. Berle often rode roughshod over the tripartite distinction, but only because he was writing about the legal status of minority shareholders with respect to the legally appointed board and officers. For both authors, the real issue was not the separation of ownership from management but the separation of ownership from control—those who appointed the directors and officers. In 1935, officers and directors held only 13 per cent of all corporate stock, a percentage that would actually increase rather than decrease over the century. But officers and directors constituted “control” only in a handful of widely held firms like AT&T, RCA, or the Pennsylvania Railroad. Much more typically, control resided in a majority shareholder; in substantial minority shareholders, notably family groups; or even in financial intermediaries like the House of Morgan, whose services were valuable in large part precisely because of the ability to exercise control. Holding companies in pyramidal structure could magnify control. In the Progressive account of corporate governance, the problem was that those who held control could enrich themselves at the expense of increasingly powerless minority shareholders. In this sense, the problem was too much owner control not too much manager control.

From the beginnings of the unrestricted corporate form in the nineteenth century, minority shareholders had routinely sued to claim misappropriation and self-enrichment by controlling interests. It was Berle’s position that such plaintiffs were entitled to redress in equity, under the theory that directors held the corporation in trust for the shareholders. American courts had long thought otherwise. Courts were reluctant to become involved in the internal disputes of corporations except in extreme cases, and they placed the burden of proof on the plaintiffs. Despite this,
and despite the widespread currency of anecdotal tales of misappropriation and self-dealing, the corporate form thrived as America thrived in the early twentieth century, and minority shareholders eagerly invested in those corporations. Although investors may have lacked the power of voice, they retained the power of exit: there is evidence that minority stockholders received a considerable discount on their shares to compensate for the threat of internal self-dealing. Indeed, from the perspective of economic history, it is odd to ensconce an eighteenth-century model of private property – exclusive control over a tangible asset (like a Jersey heifer) – as somehow a Platonic ideal. Yes, private property so conceived is a brilliant solution to the agency problem taken in isolation. But the ability of a simple model of property to solve the agency problem pales in comparison with the ability of the corporate form to extend the ownership of industrial property enormously and thereby fuel economic growth.

In the early twentieth century, the interests controlling the corporation were making themselves rich, and minority investors wanted to come along for the ride. The Great Depression rudely reversed that calculus. Minority shareholders had begun taking huge losses, especially in highly leveraged pyramids, and they wanted redress. It was to this audience that Berle and Means spoke volumes.

As the stock market continued to fall in spring 1931, blame came to rest on short-sellers who engaged in “bear raids.” Congress considered a spate of bills, including one that would tax short-selling profits at 25 per cent and another that would actually send short sellers to prison. Herbert Hoover also viewed short sellers as culprits, and he included among these Democratic financiers Bernard Baruch and John J. Raskob. Hoover prevailed upon his friend Frederick Wolcott of Connecticut to instigate hearings by the Senate Banking Committee, of which Wolcott was a member. Little came of the hearings, as Richard Whitney, the elegant president of the New York Stock Exchange, effortlessly parried all the charges leveled against him. After the election of 1932, however, the chair of the Banking Committee saw an opportunity to reopen the hearings and focus them on a far broader array of issues and potential culprits. A populist Republican from South Dakota, Peter Norbeck was the driving force behind Mount Rushmore and the principal reason that the visage of his hero, Theodore Roosevelt, would ultimately grace the pantheon. Although his views were closer to those of Franklin Roosevelt than to Hoover’s, Norbeck felt he needed additional cred with voters in the face of what would soon be a Democratic administration. After Samuel Untermyer and a number of others turned him down, Norbeck selected as special counsel Ferdinand Pecora, a scrappy New York prosecutor and fellow Bull Moose.

Like the Pujo hearings years before, the Pecora hearings, as they would be called, provided a town square in which legislators and a vicarious public could pillory a sample of the usual suspects. Pecora proved as able a ringmaster as Untermyer, even if his eventual confrontation with J. P. Morgan, Jr. lacked the historic drama of Untermyer’s interrogation of J. P. Morgan, Sr. Unlike the Pujo hearings, however, which had been targeted at the supposed “money trust” of concentrated and non-competitive investment banks, the Pecora hearings would be targeted at precisely the opposite phenomenon – the greatly increased competition in investment
banking that had arisen in the twenties. The principal target of the investigation early on, over more than a week of testimony in February 1933, would be the National City Bank, only recently passed by Chase as the largest bank in the country, and its hard-charging leader Charles E. Mitchell.

As we saw, in 1911 Frank Vanderlip, then president of National City Bank, had created the National City Company as a separately incorporated entity, designed initially to hold stock in various New York and regional banks as an end-run around legal restrictions on branching and interstate banking. When the Taft administration frowned on this, Vanderlip sold all the bank stock and began to concentrate on international branching, something permitted (thanks in large part to Vanderlip himself) by the Federal Reserve Act. As war production increased the demand for commercial loans, National City Bank expanded its customer base across the country, especially to smaller and newer businesses. At the same time, National City Company turned to distributing and then underwriting securities, in part by acquiring the brokerage firm of N. W. Halsey. This move was importantly a response to disintermediation in the twenties – something that would happen again late in the century – as companies large and small turned increasingly to securities markets for financing and switched away from bank loans.

National City Bank was a commercial bank; National City Company had become an investment bank. In 1929, National City bought a state-charted trust company, which became a third entity, City Bank Farmers Trust Company. Together the three banks constituted a horizontal business group: separate entities sharing a board of directors and some officers. Together they fulfilled Vanderlip’s dream: a global all-purpose financial intermediary not unlike a large European “main bank.”

Because National City was a newcomer to investment banking and had to compete with the likes of Morgan and Kuhn, Loeb, Vanderlip steered investment banking as well as commercial banking toward the new and the small; and, significantly, he established a business model driven by high-pressure sales tactics rather than clubby connections, an approach that had emerged out of the mass distribution of Liberty Bonds during the war. This was also very much the business model of Charles Mitchell, who started as head of National City Company’s bond business in 1916 and was chair of the board of all three banking entities by 1929. “In thirteen years,” notes Joel Seligman, “Mitchell boosted a four-person office into the largest investment house in the country, complete with nineteen hundred employees, sixty-nine branch offices, a private wire stretching 11,300 miles, its own engineers, accountants, bookkeepers, policemen, and annual securities sales averaging over $1.5 billion per year.” When at the Pecora hearings Senator James J. Couzens of Michigan charged that Mitchell was a better salesman than he was a financier, Mitchell took it as a compliment.

The hard-sell business model brought National City extraordinary success during the twenties, but it earned the disdain of the established banking houses and made the enterprise an inviting target for scapegoat hunters. The big reveal at the Pecora hearings was that Mitchell had earned $1 million in 1929 but paid no income taxes that year because he had sold depressed National City stock to his wife and then written off the loss. The high-flying Mitchell would leave Washington a broken man, forced to resign.
his position and ultimately hounded for more than $1 million in taxes. But the committee was after far more than personally discrediting financiers. The goal was to demonstrate the abuses of self-enrichment and self-dealing against which Brandeis, Ripley, and Berle had railed. Mitchell and other executives of National City received only nominal salaries and were compensated mostly by bonuses from a fund of 20 per cent of profits. Couzens believed that “these unreasonable salaries and these bonuses lead to unsound banking and unsound sales of securities.”

By contrast, of course, modern-day economists would be far more likely to consider the National City pay plan as an incentive system whose effect—ironically enough—was precisely to ameliorate the owner-manager agency problem, nowadays rightly or wrongly associated with Berle and Means, by better aligning the manager’s incentives with the interests of the stockholders.

Of far greater significance were the allegations of self-dealing that arose because of the tight relationship between National City’s commercial-banking operations and its investment-banking operations. Pecora charged that such integration permitted the bank to take advantage of the sacred trust it possessed with its banking clients in order to foist off upon them worthless securities, abusing what one senator called the public’s “childlike confidence.” It is certainly true that many of the securities National City had sold became worthless because of the Depression; but the bank’s securities during the twenties were highly rated. As we have seen, traders with inside information can indeed take advantage of clients, but such a possibility will be priced into the securities. At the same time, integration between underwriting and other activities can lower information costs relative to arms-length exchanges and can provide other synergies. The net result of these effects is an empirical question. And what the empirical evidence shows is that, before the Depression, securities issued by the underwriting affiliates of commercial banks were of higher quality and performed better than securities issued by independent investment banks. This effect was more pronounced for the lower-rated securities of smaller and younger firms, which benefited more from informational synergies between affiliates.

With banks collapsing all around, of course, the abstract questions of self-dealing and self-enrichment were less-pressing matters than assigning blame for the banking catastrophe and even for the Depression itself. As the real-bills doctrine taught, banks should limit themselves to self-liquidating short-term commercial loans; but, like many others, National City had channeled the savings of depositors into the call market. In the supercharged atmosphere of February 1933, Pecora didn’t need to show a connection between integrated banking and bank failure; he merely needed to show that National City had engaged in speculative activities. It was speculation, he believed, that had led naturally to “the catastrophic collapse of the entire banking system of the country.” As we saw, of course, the banking collapse was driven by small regional banks that weren’t members of the Federal Reserve. National City Bank itself had low leverage and a strong balance sheet; sixteen months earlier it had stepped in to bail out the Bank of America. Economic theory suggests that a bank is likely to be more not less stable when it can trade in securities because it can then hold a more diversified portfolio. The empirical evidence shows that, before the
Depression, banks with securities operations were indeed more stable on average and less likely to fail than those without such operations.\textsuperscript{194}

As early as December 1929, Herbert Hoover had asked Congress to look into the possibility of separating commercial and investment banking.\textsuperscript{195} Carter Glass initially reacted coldly to what was in fact a view he shared; but by the summer of 1930 he had introduced an early version of what was to become the second and more-famous Glass-Steagall Act.\textsuperscript{196} Like many others, both Hoover and Glass saw separation as a way to restrict commercial banks to real bills and keep them out of dangerous speculative activity. In early 1931, Glass’s subcommittee began holding hearings; but opposition from the banking community was fierce, and nothing emerged from the lame-duck Congress. The combination of the Pecora hearing and the installation of a new Congress quickly reversed the dynamic.

Shortly after his inauguration, Roosevelt met with James H. Perkins, who had replaced the disgraced Mitchell as the head of National City.\textsuperscript{197} On March 7, the National City board voted to sell the National City Company and remove from its board all of their directors. Winthrop Aldrich of Chase National Bank had also conferred with Roosevelt, and the next day, March 8, he also endorsed the separation of commercial and investment banking.\textsuperscript{198} More significantly, Aldrich insisted on an extension to the plan that Glass’s subcommittee was considering: the policy of separation must apply not only to chartered commercial banks like National City and Chase, Aldrich declared, but also to private partnership banks like J. P. Morgan & Co. Moreover, he insisted, overlapping directorates must be prohibited. Contemporaries saw these moves by National City and Chase as an attack by Rockefeller interests on their rival Morgan.\textsuperscript{199} Although many bankers continued to oppose the policy of separation vociferously, it was in fact relatively easy for the commercial banks to implement, as existing legal restrictions had imposed on them what was in effect a modular corporate structure. Affiliate corporations could simply be cut loose; and, in a period during which investment banking was unprofitable anyway, that would entail few short-term costs.\textsuperscript{200} By contrast, the House of Morgan was smaller and far more entangled, and relational synergies between deposit banking and investment banking were at the heart of the organization’s business model.\textsuperscript{201}

In view of the splash Aldrich’s proposals had made, Glass reluctantly allowed Aldrich to dictate provisions in the bill that set forth the policy of separation and outlawed overlapping directorates, thus finally fulfilling one long-time dream of Louis D. Brandeis.\textsuperscript{202} After the bill was signed June 16, 1933, the private banks had to decide whether to become commercial banks or investment banks. Kuhn, Loeb and most other partnerships ditched their deposit operations, but, perhaps surprisingly, Morgan took out a bank charter.\textsuperscript{203} Partners from the various private banks spun off and recombined to create an array of new investment houses, including Morgan Stanley.\textsuperscript{204} Although J. P Morgan & Co. and Morgan Stanley separately continued to earn significant profits over the years, their earnings, in the estimation of Bradford De Long, “have been an order of magnitude lower and their influence over American industrial development nonexistent compared to what would have been had the pre-Depression order continued.”\textsuperscript{205}

Although we nowadays associate Glass-Steagall with the idea of a “firewall” between deposit banking and investment banking, the Banking Act
of 1933 contained other significant provisions as well. Regulation Q, which forbade the payment of interest on demand deposits and authorized the Federal Reserve to set interest-rate ceilings on savings and time deposits at commercial banks. Carter Glass believed that “excessive competition” among banks was a source of the speculative activities that had caused the Depression; and he also hoped that the ceilings would induce country banks to invest locally rather than to accumulate deposits at larger regional banks, where, he was sure, those deposits would be used for speculative purposes. In the event, Regulation Q actually had little effect on either bank profits or inter-bank holdings: because inflation remained low until the 1960s, the Fed was able to make sure the constraint was seldom binding.

As more than 80 per cent of failed banks were small state-chartered outfits, the obvious way to prevent future crises would have been to do away with the fragmented unit-banking system by allowing unlimited national branching. Canada, which had only ten banks but nearly 4,000 branches, had had no bank failures. In 1932, Eugene Meyer told Congress that it should unify state and national banks under a more-powerful Federal Reserve. The American Bankers Association agreed. So too, reluctantly, did Carter Glass. Although branching went against his populist love for the small banker, Glass, as a father of the Fed, understood the fragility of the existing system. Thus the Senate version of the Banking Act called for national branch banking and centralized Federal Reserve control over the system. This alarmed and angered populists. During the lame-duck session, Huey Long staged a ten-day filibuster against the bill. But Representative Henry B. Steagall, Glass’s counterpart in the House, had a plan: federal deposit insurance.

This was not a new idea. Some 150 bills to establish deposit insurance had come before Congress since the nineteenth century; several states had set up insurance schemes, all of which collapsed. Populists had long sought federal deposit insurance as a way of propping up the unit-banking system. Because insurance premiums were to be calculated on the basis of a bank’s size not its riskiness, deposit insurance would force the larger and stronger banks to subsidize the smaller and weaker ones. President Roosevelt, who favored branching and centralized control by the Fed, told Business Week that deposit insurance “puts a premium on sloppy banking and penalizes good banking.” But, with the Pecora hearings maintaining the spotlight on banking failures, there was broad popular support for deposit insurance, and Steagall held all the cards. Glass and Roosevelt came to understand that creating the Federal Deposit Insurance Corporation would be the price they would have to pay for Regulation Q and the separation of commercial from investment banking.

Long influenced by Other People’s Money, Roosevelt wanted to fulfill another of Brandeis’s dreams: requirements for public disclosure in the selling of securities. (“Sunlight is said to be the best of disinfectants,” Brandeis famously wrote; “electric light the most efficient policeman.”) On March 29, 1933, the president urged Congress to pass legislation that would ensure “full publicity and information.” Already by January, Raymond Moley had enlisted the help of none other than Samuel Untermyer, who produced a bizarre draft of legislation that, among other things, would have
assigned securities regulation to the Post Office Department. Roosevelt was not pleased; and to Untermyer’s chagrin, Moley turned to Huston Thompson, a former chair of the Federal Trade Commission, for another try. This was better, and Congress began to run with a version of the Thompson bill. But Thompson’s version contained a provision that went beyond pure sunshine, empowering the FTC, where enforcement was to have been located, to revoke the registration of any securities it felt were unsound or pure speculation. Even financiers sympathetic to Roosevelt, including Averell Harriman, objected strenuously. So Roosevelt put in a call to his old friend Felix Frankfurter, a protégé of Brandeis and star professor at Harvard Law School. Frankfurter dispatched three of his own most brilliant protégés, James Landis, Benjamin Cohen, and Thomas Corcoran. Inspired by models from English company law, the three produced a bill that Roosevelt would sign on May 27 as the Securities Act of 1933. Enforcement would indeed be assigned to the FTC, to which Landis was duly appointed.

There was more to the Securities Act than sunshine, however. As had been the case with banking regulation, a central leitmotif in securities regulation in this period was the fear of “excessive” competition and of financial innovation generally. Many provisions of the Securities Act and of subsequent legislation reflected a deliberate attempt to limit competition and to reverse financial innovation.

During the early century, the large underwriting houses had developed the syndicate system of distribution. This was a form of resale price maintenance. Rather than allowing distributors to resell securities at any price they wished, the underwriters required the distributors to agree by contract to sell only at prices of the underwriter’s choosing. As always, preventing competition along the price margin serves to direct competition along non-price margins like information provision and selling effort. Resellers have an incentive to evade this restriction, because if they can lower price they can attract more customers while free riding on the non-price efforts of others. In the twenties, this system in underwriting faced pressure from new competitors and new modes of competition, and the Investment Bankers Association of America became deeply concerned not only about outright discounts but also about the tactic of “beating the gun” – arranging sales of securities before the lead underwriter was ready to release the issue. In the eyes of the Association, these were “unfair trading practices” that undermined the RPM scheme. The IBAA was thus grateful when the Securities Act of 1933 instituted a 20-day waiting period and – oddly for a disclosure statute – banned any disclosure, including radio and newspaper ads, before a securities issue was officially registered.

The Securities Act of 1933 applied to the initial offering of securities, not to existing securities that were traded on exchanges or over the counter. The Securities Exchange Act of 1934 would extend regulation to exchanges, and it would create a new independent agency, the Securities and Exchange Commission, to administer both pieces of legislation. Perhaps unsurprisingly, the tale of the birth of the SEC bears striking similarity to the story of earlier commissions like the ICC and the FTC. Crafted largely by the team of Landis, Cohen, and Corcoran, the legislation that came before Congress on February 9, 1934 empowered the FTC to limit strictly the ability to trade on margin; enumerated and forbade a raft of common exchange
practices, including a categorical prohibition against any kind of options trading; and, most controversially, demanded a separation between dealers and underwriters, effectively outlawing floor trading. To help the bill along, Ferdinand Pecora aimed the spotlight of his hearings on the New York Stock Exchange. Yet the honeymoon of the 100 days was over, and the financial interests whose oxen were to be gored rapidly mounted a withering counterattack of lobbying and publicity. The result was stalemate. It was Carter Glass who proposed the solution: a new independent commission to which all the controversial proposals could be assigned for study and for eventual rulemaking outside the legislative process. The Securities Exchange Act of 1934, reported out of committee in late May and quickly signed into law, created the SEC and endowed it with broad powers but no clear mandate. It was, writes Seligman, “a marvel of irresolution.”

Both Landis and Pecora were appointed to the commission, and both were considered likely candidates for the chair. But in a characteristically brilliant political move, Roosevelt chose Joseph P. Kennedy, a New Deal loyalist who had made his fortune in part by taking advantage of some of the financial practices the SEC was designed to eliminate. Pecora resigned in a few months, but Landis warmed to Kennedy and would go on to be a longtime friend and advisor to the Kennedy family. After a year, Kennedy too resigned and Landis became the chair. Kennedy and Landis appointed a large and talented support staff that included future Supreme Court Justices William O. Douglas (later himself to be SEC chair) and Abe Fortas. Yet, although its commissioners and personnel were more obviously competent than their counterparts on other federal commissions, the SEC could not evade the inevitable problem of information impactedness. As Landis understood from the start, the commission needed to engage in what Thomas McCraw called “participatory” regulation: essentially to shape and manage the securities industry’s regulation of itself. It was nothing less than Hooverian associationalism, albeit with a bigger stick. In 1935, the SEC volunteered to administer in addition the code of conduct that the Investment Bankers Association had crafted for the over-the-counter market.

Securities exchanges are formal markets that depend on a system of institutions to set the rules of the game. Creating and maintaining such institutions is a public good from the point of view of the participants in the market; and the rules created by the securities industry and enforced by the SEC can certainly be understood in this light. Perhaps this explains why disclosure remains perhaps the most unchallenged and unchanged instance of business regulation in American history. As we saw, when securities markets were undeveloped, investors substituted information about the quality of the underwriter (like the House of Morgan) for information about the quality of securities themselves. With greater competition for securities issue in the 1920s, investors began increasingly to look at information about the securities themselves; firms issuing the securities had an incentive to provide the information, and key investors, on whom uninformed investors could free ride, had an incentive to gather as much information as possible. It may well be that formalizing and standardizing the process created value. But fixing the rules of the game can also inhibit financial innovation, and the rules in this case created one-size-fits-all upfront costs that disadvantaged regional exchanges and the smaller firms they served. One notable
beneficiary of the process was the accounting profession, whose numbers increased some 270 per cent between 1930 and 1970 compared with roughly 70 per cent for physicians and lawyers.\textsuperscript{224}

The capstone of New Deal securities regulation was the Public Utilities Holding Company Act of 1935, which effectively brought an end to the pyramidal holding company in the utility sector and contributed to the overall demise of that organizational form in the U. S.\textsuperscript{225} In utilities, where financing and technology transfer had been the barriers to growth in the early century, holding companies had emerged, typically with multiple layers of ownership, to fortify and consolidate local utilities, often in a variegated geographical pattern. The signal instance of such a holding-company structure was the empire of Samuel Insull of Chicago. An early associate of Thomas Edison, Insull left General Electric shortly after the merger with Thomson-Houston to become head of Chicago Edison, then one of many small generating firms in that city.\textsuperscript{226} Relentlessly pursuing technological innovation, he built the company into the largest supplier in Chicago. Following the same playbook as AT&T in telephony, Insull helped instigate the practice of rate-regulation of utilities by local and then state governments, and he pioneered the financing of utilities by selling stock widely to the public, including to customers and employees.\textsuperscript{227} As residual claimants, these minority investors benefited from the bull market of the twenties, but they felt the brunt of the decline after 1929.\textsuperscript{228} By the beginning of the Depression, Insull’s empire was built of holding companies several layers deep, and in 1928-29 he had added two additional layers in an effort to fend off a takeover attempt. To support the structure in the falling market, he frantically moved resources among the holding companies and tried to borrow from Chicago banks; but in the end he found himself indebted to New York banks and unable to pay. In June 1932, Insull resigned all of his offices and directorships and set sail for Europe, leaving his hapless son to face the Pecora hearings in February 1933.\textsuperscript{229} The onetime hero of the small investor and the electricity consumer, whose face had graced the cover of \textit{Time} magazine in November 1929, was now a devil on the run.

As we have seen, the holding company, and especially the multi-tier holding company, had long been the \textit{bête noire} of Progressive thought on industrial organization, especially for followers of Brandeis. The fall of Insull coincided with the presidential race of 1932, and Franklin Roosevelt did not miss the opportunity to capitalize on it. On September 21, he regaled an audience in Portland, Oregon with tales of the “Insull monstrosity.”\textsuperscript{230} In his \textit{Commonwealth Club} address two days later, he famously decried “the lone wolf, the unethical competitor, the reckless promoter, the Ishmael or Insull whose hand is against every man’s.” The FTC had begun investigating utility pyramids as early as 1928, and in 1935 the commission issued an 80-plus-volume report that, while granting the important role of holding companies in building up local capabilities, accused them of misleading regulators and tunneling resources away from minority stockholders. Modern-day evidence suggests in fact that pyramidal structures in utilities in this period added value for stockholders—pyramids were worth more than the sum of their parts—and that tunneling away from stockholders was constrained by reputational and other mechanisms.\textsuperscript{231} But after the crash, pyramids were an obvious target for angry investors and voters.
As soon as the Securities Exchange Act was in the books, Roosevelt’s drafting team got busy on holding companies. The bill put before Congress in February 1935 contained a provision that came to be called the “death sentence”: the SEC would be required to reorganize all interstate holding companies into geographically concentrated operating companies and to ensure that each of the reorganized entities would “cease to be a holding company.” Once again industry responded with a massive lobbying campaign. But this time an investigating committee headed by Senator Hugo Black (another future Supreme Court justice) discovered that many of the telegrams Congress had received were in fact phony, ginned up by what we would nowadays call a propaganda farm. The House nonetheless defeated the original draconian form of the death sentence; but the version that remained was plenty strong enough, giving the SEC authority to demand that all operating companies in a holding company be capable of physical interconnection and banning outright all pyramids above a single level. In the view of William Leuchtenburg, the law “marked the most important triumph of the Brandeisian viewpoint in two decades.”

Litigation held up the process of unwinding the utility pyramids, but the Supreme Court repeatedly affirmed the constitutionality of the death sentence, and by the end of the 1940s America no longer had public utility pyramids. The Revenue Act of 1936 would go on to tax intercorporate dividends – something almost no other country does – ensuring, in conjunction with various SEC policies and other measures, that pyramidal business groups would never arise in other industries either, creating a stark contrast in corporate governance between the U. S. and much of the rest of the world.

The theme of Roosevelt’s entire speech in Portland, Oregon was electric power. Although he pronounced himself in favor in general of private ownership of electricity production and distribution, he insisted that municipalities had an inalienable right own their own electricity systems. So too did the federal government in the development of hydroelectric power. “The title to this power must rest forever in the people,” he told the audience. “No commission – not the Legislature itself – has any right to give, for any consideration whatever, a single potential kilowatt in virtual perpetuity to any person or corporation whatever.” Resurrecting the “yardstick” idea of his former boss Josephus Daniels, Roosevelt suggested that federally owned electric generation could set the standard for private utilities, serving in addition as “a ‘birch rod’ in the cupboard to be taken out and used only when the ‘child’ gets beyond the point where a mere scolding doesn’t do any good.” He pointed to ongoing and proposed federal hydroelectric projects in each of the “four quarters” of the country: the Columbia River in Oregon, of course; the St. Lawrence in the Northeast; Boulder Dam in the Southwest – and the Muscle Shoals project in the Southeast.

Although the Woodrow Wilson Dam had been completed in 1924, it produced no power, and the associated nitrate plants remained boarded up. Senator George Norris, a populist Republican from Nebraska and Congress’s most unbending proponent of federal hydropower, had twice shepherded bills through the legislature to develop Muscle Shoals, only to face Republican presidential vetoes. At the same time, Norris had beat back all attempts to privatize generation at the dam or even to sell power to private
utilities, including Henry Ford’s grandiose scheme to redevelop Muscle Shoals into a manufacturing center. Roosevelt’s election made Norris’s dream come true, and on May 18, 1933 the president signed the Norris-sponsored bill creating the Tennessee Valley Authority. The Act gave Roosevelt unprecedented and largely unconstrained power to develop and manage the river basin.

As we saw, the prosperity of the twenties drove and was driven by an increased urbanization. Agglomeration economies spurred urban trade and industry while economies of scale and technological change in agriculture reduced the demand for rural labor. The Depression halted this process. Like many in this period (notably including Henry Ford), Roosevelt believed that urbanization had gone too far and that Americans should return to the land. He envisioned for the denizens of the Tennessee basin the kind of piney-woods rural experience he was cultivating at his health spa in Warm Springs. Roosevelt’s choice as chair of the Authority, Arthur E. Morgan, a utopian visionary and president of Antioch College, agreed completely. The TVA would not just build dams for electricity and navigation; it would comprehensively plan the very lives of the local Appalachians, restoring the land and instructing its inhabitants on agricultural practices, personal hygiene, and diet, while elevating the population out of subsistence farming into a lifestyle of small handicraft industry. As James C. Scott observes, the original vision for the TVA epitomized high-modernist social engineering at mid-century, a paradigm of state-driven planning that would become ensconced in the popular imagination and emulated, with generally dubious results, around the world, including the Communist world.

In the event, the TVA did not live up the Roosevelt-Morgan vision, and it would become far more narrowly focused. Morgan’s appointees to the other two positions on the TVA board quickly ganged up against him and pursued their own agendas. Harcourt A. Morgan (no relation) was the president of the University of Tennessee and also head of the Association of Land Grant Colleges and Universities, whose system of federally funded experiment stations and extension services was closely linked to the American Farm Bureau Federation. The AFBF represented the larger and more successful farmers, and, as a result, the TVA ended up doing little for poor farmers, including African American sharecroppers, and it had little connection with the predominantly black agricultural colleges. Under the guidance of Harcourt Morgan, the TVA was finally successful in producing nitrates at Muscle Shoals, shipping 25,000 tons of fertilizer by 1936.

David E. Lilienthal was a former utility commissioner from Wisconsin and an ardent exponent of government ownership of electric power. For years after his appointment to the TVA, Lilienthal did battle with the private utilities in the Tennessee region, notably the Commonwealth and Southern, a subcompany of J. P. Morgan’s United Corporation headed by a talented executive called Wendell Willkie. The TVA was initially forced to sell power through Commonwealth and Southern and other private utilities, but Lilienthal encouraged local governments increasingly to buy out the private interests, which they did by threatening the owners with publicly funded construction of competing facilities. As public ownership crowded out private ownership in energy distribution, the TVA transformed from a utopian planning scheme into a federally owned but largely independent
electric utility, expanding not only in hydropower but eventually into coal and nuclear power as well. During World War II, much of the TVA’s electricity would be directed toward the production of aluminum and later toward the enrichment of uranium at Oak Ridge National Laboratory, which was located in Tennessee in part to take advantage of TVA power.

Indeed, although regulation was certainly one central component of the policy matrix of the Roosevelt administration, it is the TVA and similar efforts at direct federal mobilization of resources outside the framework of the private economy that animate popular images of “the New Deal.” During a period of severe contraction, with the price mechanism hamstrung in its ability to coordinate economic activity, the federal government could supplant the market and allocate resources through administrative fiat. Understood as humanitarian efforts, these federal programs were extremely valuable. Federal relief and job-creation spending in this era improved health outcomes, lowered infant mortality, increased the birth rate, and even lowered the crime rate. On the other hand, understood, as they were both at the time and since, as mechanisms for stimulating the private economy and ending the Depression, these efforts were almost entirely useless.

Soon after the inauguration, Congress passed the Emergency Relief Act of 1933, which created the Federal Emergency Relief Administration. To head the organization, Roosevelt brought in Harry Hopkins, who had been in charge of a similar temporary relief agency in New York State. Although most of the money came from federal coffers, FERA required states to match the grants. Assistance took the form of food and clothing rather than cash, which did little to connect recipients to the market economy. In the end, payments per family were the equivalent of a mere 50 cents a day. Far from considering it to be penurious, Harry Hopkins viewed such direct relief as morally corrosive, fearing it would create a society of cringing and fawning supplicants. “It is,” he said, “a spectacle of national degeneration.” So FERA experimented with work relief as an alternative; and in the fall of 1933, as the early New Deal rush of growth began subsiding and the winter months loomed, Hopkins persuaded Roosevelt to create the Civil Works Administration, which at its peak would employ almost half a million people in a wide assortment of public works and other projects. Alarmed at the expense and fearing that the program was creating a permanent dependent class of workers, Roosevelt shut the CWA down after only a few months.

But welfare rolls continued to burgeon, and, though more expensive than direct grants, work-based relief came to seem the lesser evil. In January 1935, the president created by executive order the Works Progress Administration, through which would flow almost 25 per cent of all federal grants in the period 1934-1940. The WPA employed mostly unskilled workers who would otherwise have filled the relief rolls, paying them below-market wages in the hope of preserving the incentive to seek private work. Concocted by local authorities, WPA projects ranged from raking leaves in the park to building and maintaining roads and bridges to erecting such iconic structures as Griffith Park Observatory in Los Angeles. (Large projects had to be broken down into a series of small projects in order to qualify.) Most famously, the WPA funded a large number of significant mid-century artists, writers, musicians, and performers.
The most emblematic — and perhaps the most popular — work-relief program of the New Deal was the Civilian Conservation Corps, created in April 1933. This was an explicitly military organization, run by the military, that took young men “off the street corners” and instilled in them the martial virtues that William James had extolled in his famous Stanford talk. The conservation soldiers mustered at recruitment stations; traveled in troop trains; wore surplus World War I uniforms; slept in tents; and generally lived a life of military discipline. More than 75 per cent of the recruit’s salary was sent directly home to his parents or other dependents. Within months, a quarter million young men were in the field.

The approach of these work-relief programs stood in contrast to the approach to public-works embodied in the rival Public Works Administration and its specialized sister agencies. Created by the National Industrial Recovery Act in early 1933 and placed under the direction of Interior Secretary Harold Ickes, the PWA was intended to plan and construct large public-works projects using private subcontractors paying private wages. It was essentially an extension of what Herbert Hoover had already initiated. Thus although planners for the WPA invoked “the purchasing power theory of the development and maintenance of prosperity” — one even drawing a multiplier-effect diagram not unlike those of Hoover’s planners in 1921 — it was far more crucial for the WPA than for the PWA to argue that investment in public works would have important spillover effects on employment. This was a hard political case to make in the face of the palpable direct employment results of the WPA, and as a consequence the WPA won far greater allocations from Roosevelt than did the PWA. Like the WPA, however, the PWA ultimately left behind a legacy of major public-works construction, even if much of its early efforts were directed at shovel-ready naval projects, including the carriers Yorktown and Enterprise, before Congress forbade military spending in 1935. It was PWA funds that enabled municipalities in the Tennessee Valley to threaten and then buy out private electricity systems. Modern-day studies have been unable to detect much in the way of positive spillover effects on private employment by any of the New Deal public-works programs, though some have argued that the finished construction projects themselves may have contributed to U. S. productivity in the post-war era through a kind of supply-side effect.

The first pillar of New Deal policy was the containment and roll-back of innovation in securities markets and corporate governance. The second pillar was the direct mobilization of resources for public projects and work relief. The third pillar was the attempt to manipulate real relative prices directly by mandating, during a period of devastating poverty and deprivation, the creation of artificial scarcities in the economy. At the center of this last initiative, both intellectually and politically, stood Rexford Guy Tugwell.

The drive to raise farm prices had long been couched in the language of imbalance; prices must be restored to “parity,” meaning the record-high level of 1914. Even though agricultural products were increasingly coming under tariff protection, farmers felt, not without reason, that tariffs on non-agricultural products had unfairly harmed them and advantaged industry. During the twenties, as we saw, the leader of the movement to raise farm prices was George N. Peek, a former member of the War Industries Board.
and the president of the Moline Plow Company. Despite Peek’s efforts, Calvin Coolidge repeatedly vetoed the McNary-Haugen bill, which would have empowered the federal government to buy crops at high prices and dump the resulting surpluses in overseas markets. By the late twenties, Tugwell had become convinced that the McNary-Haugen approach was wrong and that the only way to obtain the proper “balance” in pricing would be to require farmers to take land out of cultivation. Henry Wallace and others were thinking along similar lines; and, when at Roosevelt’s request Tugwell met with Wallace and his colleagues at an agricultural conference in Chicago, Tugwell quickly became an enthusiastic supporter of the domestic-allotment system. Under this system, the federal government would literally bribe farmers to take land out of cultivation in order to reduce agricultural output.

Between November 1932 and March 1933, with rural unrest escalating into violence, Tugwell, Wallace, and a small team worked on drafting legislation and selling the domestic-allotment idea to Congress and the country. The strongest opposition came from Peek, who staunchly defended the alternative McNary-Haugen approach. Roosevelt responded by instructing his team to include in the bill every possible technique of agricultural support, thus giving the Secretary of Agriculture wide discretion. This satisfied Peek, and the bill creating an Agricultural Adjustment Administration was signed on May 12. Peek was named administrator. Almost immediately, however, vicious bureaucratic infighting broke out between Peek on the one side and Tugwell and Wallace on the other. Roosevelt had always favored the allotment system, so it was inevitably Peek who would be forced out, in December 1933.

Because the agricultural year had started, Wallace and Tugwell had to figure out how to restrict production that was already underway. The result was perhaps the most vivid episode in the history of American farm policy. Pork products were a major U.S. agricultural export, but prices had fallen to historic lows with the collapse of international trade. Wallace agreed to buy some six million piglets and another 200,000 pregnant sows at inflated prices; arrange for slaughter; and then distribute the products to relief families. In the end, the processing plants proved unable to handle immature pigs, and more than 80 per cent of the slaughter was wasted, some of it tossed into the Mississippi River. Prices in the market for pigs did increase, though not obviously by more than the inflation rate.

Cotton farmers were also facing a bumper crop, and county agents of the AAA fanned out through the South offering cash to planters willing to plow up their land. In the end, ten million acres of cotton were uprooted, for which farmers received $100 million. Obviously, allotment restrictions could proceed less visibly in later years because reductions could be arranged before production started. But the system – which continues to this day in many sectors – raised real food prices for consumers who were often desperately poor in the 1930s. “It’s all a strange mixture,” Irving Fisher wrote to his son in August 1933. “I am against the restriction of acreage but much in favor of inflation. Apparently FDR thinks of them as similar – merely two ways of raising prices! But one changes the monetary unit to restore it to normal while the other spells scarce food and clothing when many are starving or half naked.” The system also had other unintended
consequences. Farmers who restricted output required fewer workers, so those receiving payments laid off their least-productive laborers, even though AAA contracts technically forbade layoffs. In cotton, the reductions in output eliminated economies of scale in the use of labor, speeding mechanization and displacing sharecroppers in large numbers.261

Although agriculture represented for Tugwell the greatest imbalance in the system, proper balance in the economy could be had only if all production were united in a grand central planning process. As any kind of planning would require enormous quantities of detailed industry-level knowledge, all proposals took the familiar Hooverian form: planning would be orchestrated by industry trade associations, which would devise and promulgate codes of “fair” competition under the supervision of a federal agency. Perhaps the most influential model was that put forth by Gerard Swope, the president of GE, which included an elaborate system of unemployment insurance, pensions, and other benefits, modeled on programs GE had inaugurated for its own workers.262 Tugwell found fault with this and other proposals because they were voluntary; planning, he understood, would require “more teeth in the penalties.” So he threw his weight behind the draft being worked up by General Hugh S. Johnson, the version that would find its way into law in June 1933. A graduate of West Point, Johnson had begun designing and implementing the selective-service system during World War I even before it was passed into law, and he rose to become a principal liaison between the General Staff and the War Industries Board.263 Like Peek, he was a senior official of the Moline Plow Company after the war before leaving to become a personal advisor to Bernard Baruch. Roosevelt quickly tabbed Johnson to run the new National Recovery Administration.

The National Industrial Recovery Act had something for everyone: business obtained the ability to formulate pricing agreements blessed by the government and free of antitrust scrutiny; organized labor received collective bargaining and a stipulation that codes must set minimum wages; and Progressives finally got the long-desired ability to license business at the federal level.264 It was, thought Tugwell, a “great collectivism” that promoted production without competition.265 Once again, of course, many economists pointed out that restricting output and raising real prices was not a solution to the Depression but a way to make matters worse.266 “I cannot detect any material aid to recovery in the NRA,” sniffed John Maynard Keynes.267 He was right.

The NRA began processing industry codes as they trickled in, focusing first on the largest industries. But Johnson was impatient. Had the Depression not affected the average American far more than the distant Great War in Europe? The crisis called for decisive action – and for the same tactics of propaganda and mass mobilization that the general had marshaled to such good effect during the war. In the face of qualms from Tugwell and others, he persuaded Roosevelt to issue a one-size-fits-all President’s Reemployment Agreement on August 1, 1933, which effectively implemented Roosevelt’s vision for the labor-oriented aspects of the hoped-for codes.268 Bypassing the trade associations in favor of individual business owners, the agreement called for collective bargaining, a national minimum wage, and a maximum work week of 35 hours.269
In order to ensure compliance with the Reemployment Agreement – only the official industry codes would have the force of law – Johnson called upon an idea that Baruch had recently articulated, one with roots in the War Industries Board. All who signed the agreement would display a readily identifiable abstract symbol attesting to their participation, and buyers would be pressured to boycott businesses that refused to comply. This was the Blue Eagle. “Those who are not with us are against us,” said Johnson, “and the way to show that you are a part of this great army of the New Deal is to insist on this symbol of solidarity exactly as Peter of the Keys drew a fish on the sand as a countersign and Peter the Hermit exacted the cross on the baldric of every good man and true. This campaign is a frank dependence of the power and the willingness of the American people to act together as one person in an hour of great danger.”

By August 1, the Post Office began distributing agreements to be signed, along with stickers and placards bearing the NRA emblem. In emulation of the Selective Service system, telegrams went out to America’s mayors, urging them to enlist fellow local figures in boosting and enforcing the program. Four-minute men once again took to the stump, and the Boy Scouts were once again called upon to chip in. In Johnson’s mind, the real foot soldiers of the campaign would be the housewives who controlled the family budget. “It is women in homes – and not soldiers in uniform – who will this time save our country from misery and discord and unhappiness. They will go over the top to as great a victory as the Argonne. It is zero hour for the housewives. Their battle cry is ‘Buy now under the Blue Eagle!’” The NRA also orchestrated massive public rallies around the country, including the largest parade in the history of New York City, dwarfing the ticker-tape event that had greeted Charles Lindbergh in 1927. A reported 1.5 million people, including Eleanor Roosevelt standing beside General Johnson and local governors, watched 250,000 pro-NRA marchers file uptown from 1:00 p.m. until midnight. The parade included some 6,000 brewery bands and a troupe from Radio City Music Hall; 47 military planes flew overhead. In November 1933, Time named General Hugh S. Johnson its man of the year.

The effect of the President’s Reemployment Agreement was exactly as economic theory would suggest. Immediately after the PRA was put into force in August, wage rates suddenly rose to a higher plateau. Average hourly earnings in manufacturing went up 17.5 per cent, an increase much faster than inflation. The number of people employed did increase, by 11.5 per cent over the same period. But because, as intended, the hours restriction encouraged work-sharing, employees were working fewer hours. Between July and September, the average work week in manufacturing decreased 11.6 per cent for men and 17 per cent for women. Total hours worked in manufacturing fell during the period.

The process of evaluating and approving industry codes proved to be a cumbersome one, and by 1934 it had also become contentious. The American industrial landscape was highly variegated. Industries with easily identifiable participants that produced an undifferentiated product could fairly easily craft and – crucially – enforce cartelizing industry codes. Cement was a notorious example. But both the crafting and the enforcement proved far more difficult in industries that made a variety of differentiated
products and where entry at small scale was easy. In lumber, for example, high code prices did indeed attract entry, and enforcement broke down completely.\textsuperscript{278} Contention grew as the process of resource allocation increasingly moved out of the market and into a political environment.\textsuperscript{279} Participants saw that they could use the process to advantage themselves relative to competitors, suppliers, or customers. Complaints poured in from small firms, who found themselves especially disadvantaged in the code-making process: whereas large firms could compete along non-price margins and had superior access to finance capital and managerial talent, small firms competed importantly on price – and one of the central functions of NRA codes was to eliminate price cutting.\textsuperscript{280}

The Supreme Court would soon put the NRA out of its misery. In addition to limiting the maximum workweek, setting a minimum wage, and asserting the right to collective bargaining, the Live Poultry Code for the New York area included a variety of “fair competition” provisions: for instance, the policy of “straight killing” required all retailers to purchase an entire run of poultry from the slaughterhouses, potentially including sick chickens, without inspecting and selecting individual birds.\textsuperscript{281} The NRA charged the four brothers who ran the A. L. A. Schechter Poultry Corporation, the largest slaughterhouse and distributor of kosher chicken in Brooklyn, with violating the code. A court found the brothers guilty, including on ten counts of allowing customers to pick their own chickens. The conviction was upheld on appeal. The brothers pushed their case before the Supreme Court, charging that code-making under the NIRA constituted an illegal delegation of legislative power to the executive branch and that, in any case, their business was within the State of New York and did not constitute interstate commerce (even though the birds they bought from commission agents sometimes came from out of state).\textsuperscript{282} In a unanimous decision on May 27, 1935, the Court found for Schechter.

A few months later, the Court overturned the Agricultural Adjustment Act.\textsuperscript{283} In a 6-3 decision, with Louis Brandeis, Benjamin Cardozo, and Harlan Fiske Stone dissenting, the Court held that the Act usurped regulatory power that was constitutionally the prerogative of the states. Within weeks, however, Henry Wallace pushed through Congress the Soil Conservation and Domestic Allotment Act, which paid farmers to take crops out of production under the pretext of soil conservation.\textsuperscript{284} By 1938, with a friendlier Court empaneled, a second Agricultural Adjustment Act, even stronger than the first, made its way through Congress. No similar attempts were undertaken to rewrite NIRA, though some of its provisions were resuscitated by the National Labor Relations Act in 1935 (which guaranteed collective bargaining) and the Fair Labor Standards Act in 1938 (which provided for hours restrictions and a minimum wage).

It is striking that government cartelization took hold much more firmly and decisively in agriculture than in American industry more generally. Economists point to the relative homogeneity of agricultural products and the nature of the agricultural production process, which make monitoring relatively cheaper than in many industries. But some credit must go to how American agriculture was organized. Unlike the NRA, which was an independent agency, the AAA was housed in the well-established and highly capable Department of Agriculture. During the early New Deal, the
Agriculture Department was “an island of state strength in an ocean of weakness.”\textsuperscript{285} The allotment program could thus benefit from the department’s many resources, including its collection of statistics and, more importantly, its extension services, which provided “a ready-made field administration for organizing local groups of farmers to implement AAA programs.” This meant that, like the TVA, the AAA and its successor programs would be closely allied with the American Farm Bureau Federation and would cater centrally to larger commercial farmers.

\textbf{Research and development.}

The Great Depression severely hampered the ability of the price system to allocate resources effectively. Especially during the years of contraction, the price system was all but destroyed. Through a number of mechanisms, this gave advantage to larger firms, which were able to allocate resources, crucially including capital resources, internally. At the same time, the unintended if not intended consequences of New Deal policies favored large firms over smaller ones on the whole (though with some exceptions) and worked to further muddle relative prices after 1933. The Depression-era distortion of relative prices and the accompanying destruction of market-supporting institutions, soon to be followed by the imperatives of a war economy, would set the stage for the emergence of the large Chandlerian corporation of the post-war world.

As we saw, the debt-deflation of the contraction phase between late 1929 and late 1933 had adverse real effects on the economy. Prominent among these was an increase in the real cost of borrowing on external financial markets.\textsuperscript{286} Deflation worsened the financial position of businesses by raising their expenditures for short-term debt while lowering the value of their collateral; these firms saw their sales revenue plummet, but could do little about their fixed costs. All of this diminished the creditworthiness of these firms in the eyes of banks and other external sources of funds, which as a result demanded higher rates or refused to loan at all. At the same time, banks felt their own cost of capital increase as deposits evaporated, and the supply of loans decreased accordingly. Banks tended to engage in selective rationing of loans, meaning that external financing was even less available than the prevailing high real interest rates would suggest. Faced with declining cash flow, businesses were forced to cut production and employment, and of course many closed down. By contrast, the largest firms were able to increase their cash-to-receipts ratios as both sales and receipts fell.\textsuperscript{287} Indeed, the cash holdings of American firms increased some two-and-a-half fold between the early 1930s and the mid-1940s.\textsuperscript{288} This cash was concentrated in the largest firms, reflecting an attempt to accumulate precautionary savings in a highly uncertain macroeconomic and political environment. Because there was virtually no stock issue during this period and debt was being retired, retained earnings accounted for more than 100 per cent of financing for the American corporate sector as a whole.\textsuperscript{289}

This did not escape the notice of the Roosevelt administration. Already by 1933 Marriner Eccles and Rexford Guy Tugwell were among those calling for a tax on undistributed profits.\textsuperscript{290} Like Keynes in the \textit{General Theory}, Eccles viewed the “financial prudence” of retained earnings as deflationary
oversaving that was prolonging the slump.291 Equally characteristically, Tugwell bizarrely saw the matter the opposite way: retained earnings were allowing corporations to overproduce – to produce more than consumers wanted to buy.292 A tax on retained earnings, he believed, would force corporations back into external capital markets, which would provide a check on excessive production. This dovetailed with the view of Berle and Means, who saw retained earnings as permitting those who controlled the corporation to misappropriate and misallocate what rightfully belonged to the minority stockholders.293

In the event, however, it would be the revenue demands of the Treasury that motivated the administration to seek a tax on undistributed profits. Over Roosevelt’s veto, Congress had approved a $2 billion veterans bonus, and the demise of the AAA had eliminated the $200 million annual tax on agricultural processors that had funded the payments to farmers. Always a proponent of the balanced budget, the president needed revenue. At the instigation of Gardiner Means, Treasury Secretary Morgenthau proposed a tax on retained earnings, which Roosevelt endorsed in March 1936 and Congress passed three months later.294 Marginal tax rates on personal income had been restored to levels near those of World War I, and a tax on retained earnings, the Treasury felt, would force corporations to distribute their earnings as dividends, where they could be taxed at those high marginal rates. Some large and relatively unprofitable corporations did in fact increase their payout of dividends; but the brunt of the tax fell on small and medium-sized firms in growing industries, which faced such high costs of borrowing in external markets that paying the tax was the better option.295

Firms of all sizes strenuously objected to the idea of taxing undistributed profits, which they viewed as worse than a corporate income tax. In a 1936 letter accompanying General Motors’s dividend payments, Alfred P. Sloan declared that it would be “little short of a catastrophe” to interfere with “the employment of accumulated profits by aggressive and intelligent management.”296 In October 1937, General Robert E. Wood of Sears complained to Roosevelt that forcing enterprises back into the capital markets was leaving them “at the mercy of the bankers.”297 Some Democrats, including Bernard Baruch and Joseph P. Kennedy, began warning Roosevelt that New Deal corporate tax policies were sowing uncertainty and retarding much-needed business investment. By 1938, a large enough coalition had formed in Congress to essentially eliminate the undistributed-profits tax and lower the capital-gains rate from 39 to 30 per cent.298 The corporate income tax was left untouched. Thus was born the modern regime of double taxation of corporate income: taxed once by the corporate income tax and then taxed again as personal income when it became dividends or realized capital gains. Because the tax rate on capital gains was lower than the personal rate for high earners, stockholders throughout the century would come increasingly to focus on equity growth rather than income from dividends.

During the contraction phase of the Depression between late 1929 and late 1933, output and employment fell both because many firms were driven out business and because most of the firms that survived produced less and employed fewer workers. Hardest hit were businesses that made long-lasting products, whether capital goods or consumer durables. Sectors that produced more-ephemeral products like food, tobacco, and petroleum
products suffered a milder decline than average and recovered more quickly.\textsuperscript{299} Automobiles and radios, two of America’s high-tech growth industries in the twenties, suffered declines much worse than the economy-wide average. Over this period, the real value of manufacturing output in the U.S. fell something like 40 per cent; in automobiles it fell 60 per cent, and in radios and photographs it fell 80 per cent.\textsuperscript{300} In automobiles, there were only 58 per cent as many establishments in 1933 as there had been in 1929; in radio, there were only 46 per cent as many.

“Liquidationists” like Andrew Mellon saw this destruction as largely creative: the Depression was weeding out the relatively less-fit plants and firms. In both industries, there was in fact considerable heterogeneity among establishments in size, technology, organization, and measured productivity. Using data from the Census of Manufactures, Timothy Bresnahan and Daniel Raff examined in detailed the shakeout in automobiles.\textsuperscript{301} They found that unemployment was disproportionately the result of plant closings. Plants that continued to operate during the downturn, they believed, were those that had adopted mass-production techniques and thus had lower average costs.\textsuperscript{302} More recent research has revisited the data and called into question whether selection was operating so clearly on efficiency.\textsuperscript{303} At least in the passenger-car segment, it appears that sheer size was a far more important filter than productivity, and this mechanism operated through the greater ability of larger outfits to obtain financing. The evolutionary process was not symmetric: although the decline witnessed large-scale exit, the resurgence of the industry after 1934 was accomplished by growth within the surviving firms rather than by significant entry of new firms. “Already by 1935, the auto industry resembled its postwar self: a standing body of mass-production plants with quasi-permanently affiliated management and labor.”\textsuperscript{304}

Peter Scott and Nicolas Ziebarth carried out a similar exercise for the radio industry and found a similar pattern of shakeout, albeit with some crucial differences.\textsuperscript{305} In automobiles, the largest firms like GM, Ford, Chrysler, and Hudson tended to be the ones that produced high volumes using mass production, whereas smaller firms tended to cater to higher-end tastes using costlier production processes. In radio, it was the reverse, with smaller firms typically targeting the low-price segment and larger firms – centrally RCA – producing more upscale devices at higher prices. This was because, as we saw, the radio was a far more modular product than the automobile, and this enabled producers to lower costs through vertically disintegrated chains of supply and distribution. As there were essentially no economies of scale in radio assembly, economies of scale could not be the criterion of selection. Instead, the firms that tended to survive were the ones that cultivated their own distinctive brand along with a curated network of suppliers and distributors. Those with a less-developed network, including firms that operated as original-equipment manufacturers for department stores and other branders, were overrepresented among the entities selected out. Creating a brand and cultivating relationships with suppliers are investments that imply fixed costs; and firms bearing such costs were more likely to continue to produce so long as they could (mostly) cover their variable costs. For firms without branding and network investments, exit was a cheaper option.
In an sense, of course, the automobile and radio industries reacted in a similar fashion to the catastrophe of the Depression. Like American industry in general, they largely turned from a business of making standardized durables at increasingly lower cost to a business of making new and distinctive products. As many have suggested, the annual model change could be understood in exactly this way – as a mechanism for making the automobile a more-ephemeral product.\textsuperscript{306} Already underway at GM in the twenties, the annual model change became institutionalized across the industry in the thirties. This was thanks in part to the NRA, whose automobile code standardized to autumn the timing of the change for all firms, a coordination equilibrium that would long survive the agency’s demise.\textsuperscript{307}

Alexander Field has pointed out that, contrary to what most imagine, the Depression era may well have been the most technologically progressive decade of the century in the United States.\textsuperscript{308} The rate of growth of total-factor productivity over the period rivaled, and by some estimates exceeded, that of any other decade.\textsuperscript{309} Although the shakeout in American industry sometimes tended to select for size and cohesion rather than for productivity, the Depression nevertheless set in motion a technological revolution in industry. Field offers two mechanisms for this resurgence.\textsuperscript{310} The first is the rapid growth of research and development within American industry. Even during the downturn, the number of scientists and engineers employed in manufacturing continued to increase, from 6,272 in 1927 to 10,918 in 1933.\textsuperscript{311} By 1940 the number was 27,777. The second mechanism Field identifies is adversity, the imperative to change and reorganize in the face of catastrophe. These mechanisms are not as distinct as they may seem, especially if we think about research and development in the right way. In their formal models, economist tend to think of R&D as a specialized stage of production that combines inputs, notably including skilled labor, to manufacture a distinctive good called “knowledge.” This good then becomes an input to the production of other goods; but, unlike ordinary inputs, knowledge operates exclusively to increase the effectiveness of all the other inputs and thus to lower costs of production.\textsuperscript{312} Although this is for many purposes an insightful way to think about the knowledge-generation process, if taken literally it seriously mischaracterizes the nature and function of research and development in industry. As we have seen repeatedly, both firms and markets are themselves mechanisms of knowledge generation. With their very different organizational structures, both Ford and GM were learning organizations in the years before the Depression; the network of independent suppliers was also a learning ecosystem. Research and development must be understood as one part – not the only part – of the firm’s (and the market’s) ability to learn.

Students of the history of technology have long derided what they call the linear model of R&D, in which knowledge is created \textit{ex nihilo} in a research lab, gets handed off to development, and then gets handed off to production. The elements of the process are actually far more intertwined, and the R&D function exists in significant part as a resource for solving problems on the ground within the firm, not as a font of new ideas. In many cases, it is only when the technological problems the firm faces become refractory to existing capabilities that the organization attempts to delve deeper into the underlying
scientific principles, only then – and not always even then – generating a more formal commitment to scientific research.\textsuperscript{313} “The advantages of placing R&D within the firm reflect the fact that the sources of many commercially valuable innovations do not lie in scientific laboratory research,” writes David Mowery. “Instead, much of the knowledge employed in industrial innovation flows from the firm’s production and marketing activities.”\textsuperscript{314} In this respect, the increased recourse to R&D during the Depression was simply one face of the response to adversity.

Although the number of scientists and engineers employed in R&D rose during the period 1927 to 1933, an absolute increase of 4,500 people isn’t likely to have had a significant impact on nationwide total-factor productivity. Indeed, in the original 1960s calculations by John Kendrick on which Field relies, TFP actually fell at a rate of three per cent per year over the period 1930-1933 – a significant technological regression.\textsuperscript{315} Recent estimates think that TFP growth in those years was positive but low.\textsuperscript{316} According to a National Research Council survey of industrial research laboratories in 1933, corporate spending on research and development had held steady through 1931 but fell in both 1932 and 1933.\textsuperscript{317} In both of those years, more firms were cutting budgets than raising them or keeping them constant. In 1932, average spending on R&D fell by 27 per cent. There is also evidence from patents that innovative efforts became less risk-taking and less original in this period, a phenomenon linked to bank distress and the high cost of external finance.\textsuperscript{318}

By all calculations, it was not until after 1933 that the takeoff in productivity began. And it was also during the post-1933 period that research and development, and the industrial R&D lab, came into its own as part of industry’s response to the Depression. In the early twentieth century, innovation had been driven importantly by individual entrepreneurs operating within a thriving market for intellectual property.\textsuperscript{319} These inventors sold their patents, or sometimes sold what amounted to small startups, to firms that could further develop their ideas. During the 1920s, smaller enterprises that developed or acquired technology could avail themselves of increasingly well-functioning securities markets as well as of what we would now recognize as venture capital.\textsuperscript{320} Regional securities exchanges were especially important for these small firms. Centralized corporate research labs were beginning to spring up, but these were concentrated in the mid-Atlantic states, where science-oriented industries like chemicals and electrical equipment were located; the East-North-Central states, which tended to produce complex-systems products like the automobile, remained the province of the independent inventor-entrepreneur.\textsuperscript{321} One of the central functions of a corporate research lab has always been to keep abreast of relevant technology and to scan the horizon for new ideas generated outside the firm, often with an eye to acquiring the resulting patents.\textsuperscript{322} In the 1920s, a significant number of the most valuable patents held by large firms originated outside those firms’s own R&D labs.\textsuperscript{323}

As bank distress raised the cost of external financing after 1929, and as the Securities Exchange Act of 1934 imposed higher costs on regional securities exchanges, the market-based network of inventor-entrepreneurs found its access to funding diminished. Larger firms, many of which possessed formal R&D labs, fared much better. The East-North-Central
states, which relied heavily on the system of independent inventors, were affected more adversely than the mid-Atlantic states, where formal R&D labs were prevalent.324 Measured in terms of relative employment of technical personnel, small firms continued to be as research intensive as large firms, and they continued to benefit from R&D.325 But those of the largest firms that maintained formal R&D functions were better able than those without labs to maintain their rankings in the league tables of America’s top 200 firms, probably both because R&D contributed to profitability and because those firms that were generally better able to survive the forces of the Depression were also the ones more able to afford R&D labs. Significant new patents started to emerge increasingly from corporate labs. “Large firms would come to dominate technological discovery more completely over the middle third of the century, but contrary to the standard literature, the change was more a result of the differential effect of the Great Depression than of the inherent superiority of in-house R&D.”326

As the Depression reoriented firms away from mass production and toward greater emphasis on product innovation and branding, research and development likewise redirected its focus. “There has been a decided change in the object of research during the past four years,” declared the National Research Council survey in 1933.327 “In 1928, the major emphasis was upon the lowering of production costs. In 1931, it was on the development of new products and increasing the quality of existing products.” As we have seen, once a product becomes relatively standardized, the business of making the product more cheaply does not necessarily advantage the large firm or implicate vertical integration. Standardization renders innovation relatively autonomous, meaning that technical change is able to proceed within established design boundaries; this in turn means that the innovative process can take advantage of a diverse array of independent sources, leading to rapid trial-and-error learning.328 By contrast, creating new products often requires systemic innovation, combining or recombining elements in a way that supersedes existing design boundaries and destroys existing pathways of supply and distribution. Even systemic innovation can take place through the price system in some cases.329 Yet there clearly can be transaction-cost advantages to executing systemic innovation (mostly) within a single organization, where owners or managers can exercise fiat and where a central research laboratory can provide bureaucratic space to test out new configurations. This is especially true – and here, of course, is the point – when, as during the Great Depression, the alternative of negotiating systemic change through the market is impeded by high costs of external finance, by the wholesale elimination of potential trading partners, and by the unreliability of price signals.

For Alfred Chandler, the emergence of the corporate R&D lab was closely tied to the organizational innovation of the multidivisional structure. And, for the most part, we do not observe a genuinely effective central lab in firms that have not also created a strong central office.330 Like a central office, in which executives are freed in principle from day-to-day operational concerns in order to engage in long-range strategic thinking, a central research lab provides a sheltered sphere in which researchers can in principle look ahead unimpeded while providing services that spill over to multiple divisions. As with the M-Form more generally, of course, what was true in principle worked differently in practice, and it became a thorny problem of
management to keep the (often geographically isolated) technical staff adequately plugged into the knowledge and needs of the divisions and to provide the right kinds of incentives to keep the researchers focused on corporate goals.\textsuperscript{331}

When the multidivisional research system is working smoothly, the result is a process of internal product diversification. In Chandler’s account, as in the related account of Edith Penrose, diversification occurs when a firm finds itself with excess capacity, which could be literal production capacity or more intangible excess resources like management knowledge.\textsuperscript{332} The job of the lab is to find new products over which the fixed costs of the excess capacity can be spread. If the lab comes up with a product that doesn’t fit well with the firm’s capabilities, the technology might be licensed to the market. In general, however, the firm will simply add the new product to its portfolio, slotting it in within an existing division if it fits well enough but creating a whole new division if it does not. “The multidivisional structure adopted by General Motors, Du Pont, and later by United States Rubber, General Electric, Standard Oil, and other enterprises in technologically advanced industries institutionalized the strategy of diversification,” wrote Chandler. “In so doing, it helped to systematize the processes of technological innovation in the American economy.”\textsuperscript{333}

That the large multidivisional firm systematized the process of technological innovation was of course a foundational contention in twentieth-century discourse about the corporation. It provided a crucial refinement to the longstanding Progressive claim that salaried professionals could scientifically plan production: now they could even create new products, more or less at will. But what Chandler (and Penrose) fail to emphasize is that whether it is cheaper to produce a new product internally or license that product depends not only on the internal capabilities of the firm but also on the capabilities of “the market” – which is to say, on the capabilities of other firms that might potentially take up the technology. A well-functioning market will provide far more opportunities to unload a new technology profitably than will a poorly functioning one. And a well-functioning market has mechanisms in addition to internal diversification for generating new products and processes, notably startups and spinoffs, both of which operated extensively before and after the Depression. In the trough of the Depression, however, markets were not functioning well, and internal diversification by large firms would indeed be a central mechanism of innovation during the recovery. As Chandler himself rightly noted, the Depression created rampant excess capacity, and firms moved to take advantage of that capacity by generating new products.\textsuperscript{334}

In the period from 1921 through 1946, the most research-intensive sector of manufacturing was chemicals, the prototypical science-based industry.\textsuperscript{335} And dominating chemicals was E. I. du Pont de Nemours & Company, which was in turn the prototype of Chandler’s model of research-driven diversification. Already before World War I, Du Pont had begun diversifying in response to major episodes of excess capacity in smokeless-powder production. In 1908, the military canceled a major order, and two years later the Army and Navy both built up their internal production capacity in response to Congressional hostility to Du Pont.\textsuperscript{336} The company responded by developing other products, like artificial leather and the organic
substance pyroxylin, which could be made with the same cotton-based nitrocellulose technology as smokeless powder. The war quickly put an end to excess capacity, while forcing diversification of a quite different kind. Du Pont found it needed to produce internally many of the inputs it had once bought on the market as well as to supply products, notably dyes, that had been German specialties. After the war, the company was thus left with an impressive array of excess capabilities, including know-how, physical facilities, and cash, for which it began seeking uses in the production of peacetime products. “Such exploration,” wrote Chandler, “would transform the Du Pont Company from the nation’s largest explosives manufacturer into its largest chemical producer.”

Yet this diversification was not driven by internal science or invention, let alone by the company’s central research lab, which did not begin to take shape until 1924. Almost all of the diversification took place through acquisition. This was a period of scientific ferment in chemistry, during which chemical technology was evolving rapidly, especially in Europe. Ideas were there for the taking. During the 1920s, major new products like viscose rayon, tetraethyl lead, and cellophane were produced by Du Pont but invented elsewhere. The company’s most important excess resource was actually its ability to sell to the huge American market. Taking advantage of its experience in manufacturing, the company positioned itself as a supplier of basic organic chemicals and related products, and it largely refrained from integrating backward into feedstocks or forward into final products. This all required extensive adaptation and technology transfer to customers, of course, but in the end that was a matter of development not research.

Between 1929 and 1933, Du Pont sales plummeted nearly 50 per cent. Except for a 20 per cent cut in 1931-32, however, the company maintained its level of expenditure on R&D. In tune with the spirit of the times, Lammot du Pont, the company president, declared a policy of “refinement” not retrenchment in research, meaning “elimination of the weaker employees.” This the company did.

In 1927, at the instigation of research director Charles M. A. Stine, the Du Pont board had approved the creation of a fundamental research program within Stine’s Chemical Department, the largest of the company’s decentralized research units. Stine’s argument was that existing research facilities were too busy doing scutwork for the production departments. What was needed was a capability to “invent some good, big, profitable things.” Funded at $25,000 a month through 1929, the program was able to store up a reserve that tided it over the worst years of the Depression without a reduction in expenditure. Stine attracted away from Harvard the brilliant but troubled polymer chemist Wallace H. Carothers to head the program. Drawing on academic research by Father Julius A. Nieuwland at Notre Dame, by 1931 Carothers’s group had invented neoprene, the first general-purpose synthetic rubber. Although more expensive than natural rubber, neoprene possessed a number of desirable properties, including resistance to petroleum products, which earned it a profitable niche market.

But the best, biggest, and most profitable thing was to be nylon, whose discovery and commercialization became the paradigm of the linear model of R&D. As a producer of rayon, Du Pont was on the lookout for new artificial fibers, and this became one focus of the Carothers lab. In the same
month as the discovery of neoprene in 1930, one of Carothers’s assistants was cleaning out a reaction vessel when he noticed that a promising superpolymer had formed. Over the next five years, the lab worked, through trial and error, to find a similar polymer that would be suitable as a commercial fiber. At one point, Carothers temporarily gave up. But on February 28, 1935, the lab synthesized polymer 6-6, which would become nylon. Learning to mass produce the new fiber turned out to be a systemic development problem, for which Du Pont could draw on existing internal capabilities, especially in its ammonia and rayon departments, while also creating new capabilities. In May 1940, textile mills began shipping one of the iconic consumer products of mid-century – nylon stockings.

During this same period, Du Pont continued to diversify through acquisition, buying up lucite, polyvinyl acetate, and the patents for titanium pigments, which the company subsequently improved. In 1943, a Du Pont researcher working with tetrafluoroethylene as a refrigerant accidentally discovered Teflon, which the company had little difficulty producing and marketing.

Oil was another industry in which research in scientific chemistry would ultimately become important. In 1924, university research sponsored by Jersey Standard dramatically reduced the costs of tetraethyl lead, the gasoline additive that had been invented by Kettering’s lab at GM and was being produced more expensively by Du Pont. Yet the major oil companies were far slower than Du Pont in establishing central research laboratories. After World War I, Jersey Standard president Walter Teagle believed that most important new technology of value to the company would come from external sources, and he approved what would be called the Development Department to scrounge for and then develop those external ideas rather than to engage, at least initially, in creative research.

In the years leading up to the Depression, the biggest technical problem facing the oil industry was the efficient production of gasoline. In 1909, the value of petroleum products distributed in the United States was split roughly equally among kerosene, fuel oil, gasoline, and lubricant oils; in 1919, gasoline accounted for 55 per cent of the value, fuel oil 23 per cent, and kerosene and lubricating oils 11 per cent each. The advance of electrification had eroded the market for kerosene as a source of illumination, and the automobile was hungry for gasoline. Already before the breakup in 1911, Standard of Indiana, the most technologically progressive unit of Standard Oil, had begun experimenting with thermal cracking, which used heat to break (or crack) the long molecules of crude oil to generate a greater yield of gasoline and other higher distillates. In 1913, under the direction of William M. Burton, a Johns-Hopkins-trained chemist who had been with the company since 1889, Indiana Standard developed and patented a thermal cracking process. Other refiners, notably Jersey Standard and a technology startup called Universal Oil Products Company, began experimenting with thermal cracking, and many aspects of their developments overlapped with the principles of the Burton patents. By 1919, after litigation and the threat of litigation, the industry was faced with a patent thicket not unlike those that had emerged in the contemporary aircraft and radio industries. Between 1919 and 1923, the application of new cracking technology virtually ceased.
In 1923, however, the major players negotiated a cross-licensing agreement that amounted to a patent pool – the “patent club.”

As it increased the efficiency of gasoline production, the new technology also increased the scale of production; in the early twenties, a state-of-the art refinery came at ten times the cost of a simple Burton still. This put pressure on the large number of small refiners who together produced a fifth of the industry’s output. These small refiners vented their anger in Washington, where in 1923 Senator Robert M. La Follette had convened a Senate subcommittee to investigate “the High Cost of Gasoline and other Petroleum Products.” With the Teapot Dome scandal unfolding in parallel, the Coolidge administration quickly filed an antitrust suit against the firms in the patent pool, charging violation of both Section 1 and Section 2 of the Sherman Act. The newly appointed William J. Donovan was made chief prosecutor. The defendants protested that a patent case should not be litigated under an antitrust statute, but a federal district court in Illinois handed the matter over to a Master in Chancery for adjudication. The Master found for the defendants and ordered the charges dismissed. The government appealed, and, in a 2-1 decision, an appellate court reversed the Master on many counts and ordered the patent pool dissolved. Finally, in 1931, Louis D. Brandeis delivered a unanimous Supreme Court decision reversing the appeals verdict. Patent sharing and pooling in refining would have the sanction of the high court.

During the 1920s, Eugène Houdry became obsessed with producing higher-quality motor fuel. A French engineer and industrialist – as well as an automotive enthusiast – Houdry began work on a process to crack crude oil using chemical catalysis rather than just heat, drawing on contemporary European attempts to extract oil from coal. By 1929, he had spent much of the family wealth on the project, with little to show for it; and after 1929, European firms (and the French government) showed no interest. So Houdry turned to the U.S., where the Vacuum Corporation began supporting the research, relocating it to New Jersey. But as the Depression deepened, Vacuum started cutting back; and when the company merged with Standard Oil of New York in 1931 to form Socony-Vacuum (eventually Mobil), Houdry’s research was in jeopardy. He looked about frantically for new sources of support, and within a couple of years had caught the attention of the small, entrepreneurial, and privately held Sun Oil Company. With the often hands-on help of the owning Pew family, Houdry was finally able to get a profitable process up and running. By the end of the decade, a number of Houdry plants were in operation around the country, and catalytic cracking had emerged as clearly the future of refining. Because the process yielded gasoline of high octane – just as Houdry had always intended – all American Houdry plants were dedicated to aviation fuel during World War II, and 90 per cent of U.S. aviation fuel came from those plants.

But the oil industry’s biggest problem in this era was not technological. It was a problem of collective action and political economy. Uniquely in the world, American law applied the rule of capture to oil production. This means that one comes to own oil only by removing it from the ground; one cannot stake a claim to an entire pool of oil beneath the surface. Thus oil production was subject to a tragedy of the commons, perfectly analogous to the one in the international fisheries, which also operate on the rule of
capture (by default because of the mobility of fish and the absence of enforceable international law). Just as every fisher wants to catch as many fish as possible as quickly as possible, every producer who has drilled into an underground oil field wants to suck up as much of the collective oil as possible as quickly as possible. In oil, the inefficient dissipation of rents occurs because pumping the fluid out of the ground at too high a rate means that, because of the dynamics of sub-surface pressure, the pool will ultimately yield less, sometimes considerably less, leaving under the ground much valuable oil that can then be removed only at much higher cost. This problem, which was clearly understood at least by World War I, could have been solved by collective action – by a single producer owning an entire pool or by unitization, under which one owner operates the entire field but compensates the other owners according to a formula. Both of these alternatives create the incentive to try to maximize the net present value of the oil in the ground and to pump at a slower, more nearly optimal rate. Some economist have speculated that eventually producers would have recognized that unitization was in their collective interest. But, because of the uncertainty surrounding the value and the geological characteristics of fields, the transaction costs of writing unitization contracts were extremely high.

Thus in American oil fields in the early century, it was every man for himself, especially among the thousands of small drillers who hoped to strike it rich. Indeed, the only unitized field in the U. S. in this period was Teapot Dome, which Interior Secretary Albert Fall had leased in a block to Mammoth Oil. Despite the fact that this form of leasing was the key to oil conservation, the leases were opposed by conservationist groups, including the Yale School of Forestry, as well as by the small drillers who were shut out of the field. Along with Interior’s rival Department of Agriculture, these groups fomented the hearings that led to the revelation of Fall’s self-enrichment. In another symbolic response to the scandal, in 1924 the Coolidge administration created the Federal Oil Conservation Board, on which sat the Secretaries of the Interior, Commerce, War, and Navy Departments, along with industry representatives. The organization had no actual power to implement unitization but concentrated instead on forecasting demand to assist state bodies that were trying to regulate crude-oil production. In this respect, the Board foreshadowed the form federal intervention would soon take.

In the years before the Depression, politicians, journalists, and the American in the street fretted that the country might be running out of oil. To oil producers, the experience was quite the reverse: as new fields were continually being discovered, the producers, not unlike America’s farmers, were worried about “overproduction” and falling prices. The oilmen’s worst fears came to pass in the calamitous year of 1930. A 70-year-old wildcatter named Columbus Marion Joiner elicited the first gusher from what would prove to be the humungous East Texas oil field, more than ten times larger than any previously known field in the U. S. The resulting supply shock, combined with the ongoing monetary deflation, sent the price of oil into freefall. In 1926, standard-grade crude had sold for $2.29 a barrel; by 1933, the price was 10 cents. When in 1931 the Texas Railroad Commission, which had long been charged with regulating the literal physical waste of oil, attempted to place limits on production in the new field and to prorate the reduction among wells, a federal district court ruled that the Commission had
exceeded its statutory authority and was merely attempting to create a price cartel.\textsuperscript{366} Claiming that East Texas was on the brink of violence, oilmen then persuaded Texas governor Ross Sterling to declare martial law, which he did in August, sending in 1,300 troops from the Fifty-sixth Cavalry Brigade of the Texas National Guard to enforce prorationing.\textsuperscript{367} In spite of the military presence, “hot oil” – oil produced in excess of prorationing quotas – continued to flow from East Texas wells. By 1933, the federal courts had reversed themselves on the legality of prorationing; but as of March of that year, East Texas was producing a million barrels a day, 600,000 over the quota set by the Railroad Commission.\textsuperscript{368}

It was the NRA to the rescue.\textsuperscript{369} The oil code put in place in September 1933 gave the federal government authority over prorationing, and it made Interior Secretary Ickes the oil czar. Crucially, the code made illegal any interstate shipments of hot oil, which effectively enforced state prorationing. Once again, Congress responded to the demise of NIRA in 1935 by crafting a legislative replacement targeted at a specific industry. The Connally Hot Oil Act reinstated the prohibition against interstate shipment of above-quota oil, and it created a Federal Petroleum Board to administer prorationing.

Thus, between 1933 and 1972, the production stage of the oil industry in the U.S. would be a government-run cartel.\textsuperscript{370} As would often be the case in other industries, the regulatory apparatus in oil worked to keep the nominal (not the real) price relatively constant over the years. Prorationing was not unitization; the very smallest wells were exempt completely from prorationing, and because quotas operated on a per-well basis, nothing stopped drillers from sinking new wells. But limiting output did at least move in the direction of correcting the externality problem in extraction. Because East Texas was so large and the oil so close to the surface, production costs there were extremely low, which threatened the thousands of small producers dispersed throughout the midcontinent and the many local businesses that supplied them. With the voting power of the scattered oil communities firmly in mind, state prorationing boards worked diligently to allocate oil quotas to small high-cost producers and away from large low-cost producers. As a result, for four decades in the middle of the century, the United States produced its oil in the costliest way possible.

Steel, America’s other mammoth nineteenth-century industry, was even slower than oil to adopt the central research lab. Andrew Carnegie had hired a chemist; but in the late nineteenth and early twentieth centuries, innovation in steel was driven mostly by the users of the product, not by the industry itself.\textsuperscript{371} As the Depression began, United States Steel continued to dominate the industry. In 1930, it had assets of $2.4 billion, more than the next six largest competitors combined and more than three times the company’s nearest competitor, Bethlehem Steel.\textsuperscript{372} Yet in the first three decades of the century, U.S. Steel’s share of the market had collapsed from something like two-thirds to more like one-third.\textsuperscript{373} The relaxed stewardship of Judge Gary had allowed the company’s smaller, more aggressive competitors to steal a march on the lumbering giant. This was nowhere more evident than in the domain of innovation.

The central technical problem of the 1920s was to improve the quality and efficiency of rolled steel strip, especially the wide strip increasingly in demand by the automobile industry, which was moving rapidly to the closed-
body car. The technology of rolling had remained essentially unchanged since the nineteenth century: it was a labor-intensive batch process in which standardized quality was difficult to achieve. By the 1920s, however, the advent of small electric motors suggested the possibility of mechanizing the process. In 1921, John Butler Tytus began leading a systematic effort to develop technology for continuous rolling of sheet steel at the Ashland, Kentucky plant of the American Rolling Mill Company (later Armco), a small, closely held firm traded on the Cincinnati exchange. By January 1924, the plant had rolled its first sheet, and by 1926, Tytus had a patent on the system. Harry M. Naugle and Arthur J. Townsend were thinking along similar lines, and in 1926 their firm, Columbia Steel, essentially a startup funded by Mellon venture capital, had a superior mill in operation at a former train-wheel plant in Butler, Pennsylvania. Unlike the Armco project, which took place largely in secret with intellectual property in mind, the Columbia development involved the visible cooperation of both suppliers and customers, an example of what is nowadays called “open” innovation. In March 1927, the Butler plant was rolling 16,000 tons of sheets a month. Seeing the threat to its own technology, Armco quickly acquired Columbia and consolidated the patents, creating what would prove to be the dominant design in mechanized steel rolling for decades. In less than ten years, more than 70 per cent of cold rolling was produced by the continuous process, a rate of diffusion of new steel-making technology surpassed only by the Bessemer converter in the nineteenth century. By 1930, Armco was the sixth-largest steel company in the country.

As it produces a durable product virtually by definition, steel was hit hard by the Depression. An industry that had been running at almost full capacity in 1929 essentially shut down in December 1932, when average capacity use reached 15 per cent. The NRA steel code offered temporary respite, even though, unlike those of other industries, it was written in terms of price stability not quotas; there would be no special legislation for steel after 1935. Although the steel industry responded to the Depression by closing inefficient plants, the productivity effects of this attempt at shaking out were probably lower than in automobiles and radios. Because of tight technical complementarities between stages of production—including the need to feed molten iron directly from a smelter into a steel converter—firms were on the whole less flexible in reallocating work to superior facilities.

The biggest companies, like U.S. Steel and Bethlehem, found themselves seriously overinvested in “heavy” products like rails and girders, the demand for which had declined by two-thirds, instead of “light” products like rolled sheet steel for cars and canned goods, the demand for which had declined far less and would recover far more quickly. In 1932, U. S. Steel lost $71 million and Bethlehem lost $19.4 million; by contrast, Armco lost only half a million during the entire Depression, and National Steel, also a producer of light products, actually turned a profit of $26 million between 1931 and 1935. Over the course of the Depression, Bethlehem worked to lower the share of heavy products in its output from 78 per cent to 47 per cent, though by 1938 only 23 per cent of its capacity was in sheet, strip, or tinplate. The company came to regret its backward integration into minerals, as those could be had at distressed prices on markets during the downturn, although it benefited from its high rate of utilization of scrap, which could also be had cheaply. At the same time, it increasingly integrated forward
during the Depression to gain control of distribution and even retail outlets, notably for the supply of pipes and other oil-production equipment. Bethlehem emerged from the Depression a more diversified steel company than it had been in the 1920s. In 1936, the original New Jersey corporation was merged into a new Delaware corporation along with two subsidiaries; in 1938, Bethlehem Shipbuilding Corporation was merged into the Delaware corporation as well.\textsuperscript{381}

Shortly before his death in 1927, Judge Gary announced to the stockholders of U. S. Steel the formation of a central research laboratory in Kearny, New Jersey. It was, he told the stockholders, “the finest thing which we have done or attempted to do up to date.”\textsuperscript{382} Yet in 1927, the steel behemoth was not well organized to take advantage of those new research capabilities. Despite slow attempts at reform and integration since its founding, the company was still a super-sized gallimaufry of mismatched subsidiaries and divisions up and down the supply chain. Jack Morgan and the board were well aware that structural change was necessary, and they lined up activist executives to replace Gary, including Myron C. Taylor, head of the finance committee and eventually the new chairman and CEO.\textsuperscript{383} Taylor demanded a study of corporate structure and instigated a $200 million plan for expansion and modernization – just as the Depression hit. Unsurprisingly, U. S. Steel responded slowly to the crisis, and was late in cutting prices and laying off workers. Even after hastily closing plants and consolidating holdings, the company still had 20 manufacturing subsidiaries and 143 works in 1932. The problem, suggested Fortune magazine helpfully, was that U. S. Steel “has been too big for too long.”\textsuperscript{384} Yet the Depression would ultimately provide the catalyst for major structural change. In addition to recommending further closings and consolidations, a consultant’s report in 1935 called for the creation of a new Delaware corporation to sit between the holding company and the operating divisions. The new corporation would house the kind of large general staff that Alfred P. Sloan had put in place at General Motors. By the end of the Depression, under new president Edward R. Stettinius, Jr., a former GM executive and son of the man who had headed J. P. Morgan’s Export Department during the war, the giant steel company would become – albeit briefly, as it would turn out – a multidivisional firm.\textsuperscript{385}

Aluminum was not yet a major substitute for steel in this era. But World War I had provided many new uses. Critical parts of the Liberty Engine were cast from the metal, and in 1927 the \textit{Spirit of St. Louis} crossed the Atlantic clad in aluminum. Far more than steel, aluminum was a science-based industry from the start, as it required knowledge of both chemistry and electricity to extract a usable metal from the mineral bauxite. In 1898, the Pittsburgh Reduction Company, which held the crucial patents, became the beneficiary of venture capital from Andrew Mellon. It transformed into the Aluminum Company of America, and continued to dominate aluminum production long after the original patents expired.\textsuperscript{386} During the Depression, Alcoa reacted along familiar lines, deemphasizing cost-cutting research on refining and smelting in favor of research on new alloys for new products.\textsuperscript{387} Many of these innovations were carried out in collaboration with users, in spheres as diverse as screws, beer barrels, buses, and, perhaps especially, aircraft, where the material’s light weight offered clear advantages.
In 1929, the American automobile industry had produced almost 5.3 million motor vehicles; by 1933, that number was little more than 1.8 million. In 1932, the industry as a whole lost $200 million. Yet, in contrast to parts suppliers and dealers, who had their own separate codes, the large carmakers greeted the NRA with little enthusiasm. Much to the consternation of General Johnson, Henry Ford flatly refused to sign the auto code, and there was absolutely nothing the NRA could do about it. Ford maintained the $7 day for unskilled workers for two years, but he cut labor costs in other ways, including by lowering the wages of skilled laborers. The company turned to subcontracting, in part to take advantage of lower wages among suppliers, which increased in number from 2,200 in 1929 to some 3,500 in 1930; the Rouge shut down facilities making brakes, rear axles, shock absorbers, and differential housings. Although he made a show of insisting that suppliers pay high wages, even sometimes suggesting unionization, he drove the suppliers hard, and reports became rampant of speedups on the lines, both at Ford plants and among the suppliers. In 1933, workers struck at a Briggs body plant operating as an inside contractor at Highland Park, but the strikers won only token concessions. In the middle of 1931, half of Ford employees were on a three-day week.

As he had in 1921, Ford was quick to cut prices when the Depression began, and, thanks in large part to the Model A, sales initially sagged only slightly. Ford had sold 1.7 million vehicles in 1929, and the number held at 1.3 million in 1930. Ford gained market share as smaller competitors failed. But by 1931, Chevrolets and Plysmouts appeared at competitive prices with advanced features. Henry Ford responded boldly by shutting down the Model A in late 1931 in favor of a new model with the option of a V-8 engine. Largely because of Ford's willingness to rely on outside suppliers, the changeover to the V-8 was far briefer and less painful than the changeover to the Model A had been, despite the need to replace half the machine tools in the engine plant. But the shutdown, combined with the competition from GM and Chrysler, sent Ford sales tumbling to little more than 600,000 in 1931 and fewer than 330,000 in 1932. In a brilliant act of innovation, the aging and increasingly isolated Ford demanded that the block for the V-8 be cast in a single piece. The casting process was successful, but the engine initially performed poorly, as customers complained that it burned a quart of oil every 100 miles; and the superior economies of scale Ford imagined never materialized.

Even though sales would reach one million again in 1935, the Depression was a period of relative decline for Ford. Many have understood this as a failure of research and development. “Being an engineer of the old school,” wrote Barron's in 1932, “Ford proceeds by the empirical method. He builds, tries and approves or rejects projects without due regard for theory or science.” Although it had labs scattered around its plants, the company had no central R&D unit, and it even lacked a proving ground and basic testing facilities. To Nevins and Hill, accomplishments like casting the new V-8, “while more astonishing for being wrought without adequate research facilities, merely emphasized the need for them.” It didn’t help, of course, that the autocrat vetoed many of the innovations, including hydraulic brakes, longitudinal springs, and six-cylinder engines, that his underlings were proposing and his competitors were adopting.
If Ford’s star was in relative decline, Chrysler’s was very much on the rise. The symbol of Walter Chrysler’s audacity, the magnificent Chrysler building in Manhattan, opened to commercial success in early 1930. Between 1929 and 1930, sales of Plymouth did fall 25 per cent. But Chrysler lowered the price by $100, and in 1931 Plymouth was selling some 94,000 units, more than it had sold before the crash. In 1932, it sold almost 118,000. These numbers were small compared to those of Ford and Chevrolet; but unlike those of Ford and Chevrolet, they were moving in the right direction.

“I never cut one single penny from the budget of our research department,” Chrysler bragged. With a staff of 300 housed in its own five-story building in Highland Park, the company’s research efforts were far more in the nature of development and testing than of basic research. Two months before Ford introduced the V-8, Chrysler brought out a new six-cylinder car, the result of a $9 million investment program in the teeth of the Depression. Although its price was competitive with Chevrolet and not much higher than Ford, the Plymouth 6 came loaded with advanced features, including hydraulic brakes, an all-steel body, a rigid x-frame chassis, and a system of rubber mountings to dampen engine vibration. Perhaps most significantly, Chrysler turned the new car into a genuine modular platform: customers could order from a menu of options including color and upholstery, and their choices would be transmitted to the assembly line to customize each car. “Timing is so perfect,” marveled Fortune magazine, “that the specific car ordered by the specific customer comes together as rapidly and smoothly as though the 1,800 cars produced daily at the Plymouth plant were all identical instead of varied.”

During Chrysler’s push into the low-price field, the company relied more heavily on vertical integration, especially the facilities made available by the acquisition of Dodge. Yet Chrysler remained far less vertically integrated than its competitors; and it was in large part this shallow vertical integration and reliance on innovative suppliers that underpinned the company’s strategy of flexible product innovation. In 1933, Plymouth sold more than 250,000 units; in 1934, more than 300,000. By 1937, the Chrysler Corporation as a whole had edged out Ford as the number two carmaker in the country, selling more than a million units.

At General Motors, the Depression required a dramatic if temporary retreat from Alfred P. Sloan’s strategy of product diversification and from the multi-divisional structure. A car for every purse and purpose made sense as incomes were rising; but as incomes (and confidence about future income) declined, sales of income-elastic mid-price vehicles fell faster than those of low-end cars. More integrated than Chrysler, GM had to amortize its fixed costs over fewer units. In 1932, the Operations Committee decided to consolidate the manufacturing of Pontiac with that of Chevrolet (under William Knudsen) and the manufacturing of Oldsmobile with that of Buick. Sales of Buick, Oldsmobile, and Pontiac were assigned to a single entity called B. O. P., and dealers were made to sell more than one marque. Significantly, the retrenchment destroyed much of the “decoupling” that had existed, in principle if not always in practice, between the divisions and the central headquarters: the systemic changes needed to effect drastic production economies required central control.
Already in 1924, GM had established the industry’s first dedicated proving ground. In 1925, Charles Kettering’s laboratory was relocated from Dayton to Detroit. By the time the lab moved into its new eleven-story building in 1929, it boasted a staff of 400, and by the end of the 1930s it would command a budget of $2 million a year. In principle, 40 per cent of the lab’s activities involved consulting on routine technical matters with the divisions; another 40 per cent was directed to advanced engineering; and the remaining 20 per cent focused on fundamental research, including topics like infrared spectroscopy and the molecular composition of fuels. The GM central research lab was responsible for the first mass-produced automatic transmission, the Hydra-Matic, in 1939. Yet the lab remained a one-man show in many ways, and Kettering had free rein for his ideas, which often veered outside the automotive. In the 1920s, he had improved the compression refrigerator for GM’s Frigidaire division, leading to a joint venture with Du Pont to produce Freon. By the 1930s, Kettering’s attention had turned in a direction that would yield another avenue of diversification: the diesel engine.

In this era, railway locomotives were almost all driven by steam engines, and they were manufactured by only three firms, the American Locomotive Company (or Alco) and the Baldwin Locomotive Works, with 40 per cent of the market each, and the Lima Locomotive Works, trailing with 20 per cent. By powering a dynamo to drive the kind of electric-traction systems that General Electric and Westinghouse had long been making for street trams, the diesel engine offered a potential alternative to steam. Alco had a diesel locomotive in service for specialized switching uses as early as 1924. But the four-stroke engines of the time were heavy and inefficient. Kettering was sure he could do better. He began developing a light and powerful two-stroke version, initially with marine uses (notably submarines) in mind. He even fitted out his own yacht with one, the better to tinker in the engine room while on vacation. But when Ralph Budd of the Burlington Railroad saw the experimental two-stroke in operation at the 1933 Chicago World’s Fair, he insisted that it power a new streamlined passenger train he was having built – the Pioneer Zephyr, which would make a record-setting dawn-to-dusk run from Denver to Chicago on May 26, 1934. Kettering did not have to work hard to persuade Sloan to diversify into locomotives. GM had already purchased two failing firms, the Electro-Motive Company, which made gasoline-electric railroad cars, and the Winton Engine Company, which made diesel engines; these became GM’s locomotive division. A new manufacturing plant went up in Illinois in 1935. After World War II, the GM diesel locomotive would supplant steam even in long-haul freight uses.

After it received the authority to set railroad rates in 1920, the Interstate Commerce Commission had evolved a system of keeping rates relatively constant and permitting a steady return of about 5.5 per cent. Railroad profitability increased relative to the era before World War I and its variance declined; but capital investment continued its slow downward trend. The net stock of locomotives, freight cars, and passengers cars sank slowly over the decade of the twenties; so did employment. Always sensitive to the business cycle, the roads were hammered by the Depression. Freight tonnage plummeted from 1.4 billion in 1929 to 679 million in 1932. Passenger revenue had already receded by a third between 1920 and 1929 under
pressure from automobiles and buses; between 1929 and 1933, passenger revenue fell again by almost two thirds in nominal terms.

America's large automobile firms, all controlled by founders or dominant blockholders, were financed mostly with equity, held relatively little debt, and had stored up considerable retained earnings to tide them over the worst years of the Depressions.\textsuperscript{416} In stark contrast, America’s railroads were typically owned diffusely or by holding companies, were financed importantly by bonds of maturity as high as 50 years, and retained almost no cash.\textsuperscript{417} Thus when revenues plunged in the Depression, the railroads were faced with fixed interest charges that were rising steadily in real terms. As Alexander Field puts it, “railroads were the poster child for Irving Fisher’s debt-deflation thesis.”\textsuperscript{418} But there would be a silver lining: the railroads, Field believes, are an excellent example of how adversity spurred productivity growth during the Depression.

The railroads’s initial response to the crisis was not to increase productivity; rather the opposite. Unable to borrow from the collapsing banking system, the roads diverted cash from maintenance, especially maintenance of way.\textsuperscript{419} In effect, the railroads borrowed against their own future. This led to costly storage of machines and materials and the deterioration of the human capital of maintenance workers. Yet by the end of the Depression, Field shows, railroads were carrying more passengers and freight by value with fewer cars in less time, which suggests improvements in rail cars and in speed. Most of this effect occurred after 1939, when the economy was already gearing up for World War II.

Clearly, some roads did respond to the downturn by innovating. Prominently among these was the Burlington, which in this era was still controlled by the Great Northern and the Northern Pacific, which jointly owned more than 98 per cent of its stock. A veteran of the Panama Canal, Ralph Budd had risen through the ranks at the Great Northern as a top lieutenant to James J. Hill, ultimately becoming president in 1919, three years after Hill’s death.\textsuperscript{420} When he took charge of the Burlington in early 1932, Budd moved forward with the program of diesel-electric passenger trains. He also persuaded a feeder line to build an important short-cut, and he closed down some unprofitable routes, over the initial objections of the ICC. The Burlington avoided bankruptcy. Many others were not so fortunate. By 1935, some 30 per cent of U. S. railway mileage was in receivership.\textsuperscript{421} The Reconstruction Finance Corporation moved quickly to help railroads avoid bankruptcy by lending them funds to cover their fixed charges. There is evidence, however, that those firms that actually entered bankruptcy fared better in the long run than those that borrowed from the RFC.\textsuperscript{422} An RFC loan postponed the reckoning; but an appointed receiver had authority to make the kinds of sweeping changes that were necessary to regain profitability. For its part, the Burlington refused to borrow from the RFC.\textsuperscript{423}

Whereas automobile makers responded to deflation by cutting prices, the ICC made sure to keep rail rates constant in nominal terms – which meant that rates were rising in real terms.\textsuperscript{424} The commission even permitted an emergency rate increase. Under the leadership of Progressive commissioner Joseph Eastman, the ICC pushed through the Emergency Railroad Transportation Act of 1933 to create what was intended to be an NRA for the railroads. Eastman became the Federal Coordinator of Transportation,
empowered to implement measures to reduce waste, including the pooling of facilities. Unsurprisingly, railroad managers stonewalled and threatened layoffs whenever Eastman proposed anything, including a central research bureau. In the end, “he could accomplish little beyond the filing of learned reports and the introduction of some minor economies.”

Although they could not agree about how to coordinate among themselves, the railroads easily united against what all saw as a common external threat: the trucking industry. Initially, of course, railroads and trucking were highly complementary, and the railroads supported the growth of the trucking industry. Until well into the decade of the 1920s, decent roads did not extend beyond the city gates, so trucks provided last-mile shipping for the railroads in a much cheaper way than constructing dedicated rail spurs, and trucks couldn’t compete with rails for intercity hauls. But there had been a “good roads” movement since the early century, spurred initially by bicycle enthusiasts as much as by automobile drivers. By the early 1920s, Hoover’s Commerce Department was holding conferences to standardize across states such crucial aspects of highway travel as the rules of the road and the meaning of traffic signals. In 1926, the states finally coordinated on how they would implement a federal mandate to create a national highway system, and interstate road construction and improvement began in earnest – to be picked up in the next decade by the Public Works Administration and the Works Progress Administration. (Field believes that the supply-side benefits of this build-out of the road system were a further contribution to high productivity growth during the Depression.) At the same time, technological advances continued to improve the capacity and durability of trucks.

Between 1925 and the end of the decade, the number of trucks on the road had increased by 50 per cent, and those trucks were increasingly carrying freight between cities. Moreover, ICC ratemaking principles for railroads were designed to subsidize bulk shipments (notably of agricultural commodities) at the expense of high-value-added shipments like manufactured goods. This cross-subsidy allowed trucks to cream-skim. By 1933, the trucking industry was becoming a serious problem for the railroads. Of course, truckers also saw their revenues decline in the Depression: as economies of scale were non-existent, anyone who could scrape tougher enough for a used truck could enter the business unimpeded, leading to what the large truckers considered destructive cutthroat competition. So truckers welcomed their NRA code, although they strongly opposed ongoing attempts to place highway carriage under the authority of what they saw as a railroad-minded ICC. After the evaporation of NIRA, however, the railroads made sure that the Motor Carrier Act of 1935 did exactly that.

The Act gave the ICC the same powers over trucks as it had over railroads, including the setting of rates and the supervision of securities issues. Common carriers had to obtain certificates of public convenience and necessity, and contract carriers required licenses. (Agricultural shippers – surprise – were explicitly exempted.) Existing carriers were grandfathered in, but the requirements implied formidable barriers to new entry. The system tended to benefit larger trucking companies, which could spread the fixed costs of dealing with the ICC over a larger volume. As ICC control extended
only to safety and hours regulation for private carriers, the Act also created an incentive for manufacturers and distributors to integrate vertically into trucking. The industry quickly warmed to the new environment as rents began flowing both to the protected firms and to the unionized Teamsters who drove the trucks. For 45 years, an industry with no detectable natural-monopoly characteristics would be regulated like a utility.

The federal government also worked hard during this period to create another competitor for the railroads, commercial aviation. After World War I, American manufacture of aircraft cratered: whereas the U.S. had produced 14,000 planes in 1918, it turned out a mere 263 in 1922. Yet many entrepreneurs saw a potential in commercial air transport. One of these was William B. Stout, who solicited funds for a startup in his native Detroit in 1922. Among the investors were Henry and Edsel Ford. So taken were the Fords with the idea of aviation that before long they had bought out Stout’s company and begun manufacturing the first great commercial transport, the Ford Trimotor. Ford Motor Company created an airport in Dearborn and developed its own air-freight service. Ultimately 199 Trimotors would be built, some remaining in service into the 1950s.

Commerce secretary Herbert Hoover was also a believer in the future of commercial aviation, and he saw it as his responsibility to ensure that the U.S. had a strong and vibrant industry. By 1925, the controversial general Billy Mitchell was also issuing a stinging critique of America’s military preparedness in the air. At Hoover’s instigation, the Coolidge Administration convened a President’s Aircraft Board in 1926 to assess the state of American aviation. Howard E. Coffin was a prominent member, and the chair was Dwight W. Morrow, a Morgan partner, aeronautical enthusiast, and future father-in-law of Charles Lindbergh. Following the Board’s recommendations, Congress quickly enacted legislation calling for 1,600 new aircraft for the Army and 1,000 for the Navy by 1931. It also passed the Air Commerce Act, conferring on the Commerce Department broad powers to promote commercial aviation, including building navigation and other facilities, devising traffic and safety rules, and licensing planes and pilots. Hoover enlisted the relevant trade associations and began calling conferences. By 1928, the department had licensed 2,000 planes and 3,000 pilots and had helped establish 207 municipal airports. In the view of William P. MacCracken, the assistant secretary for aeronautics, the department had also eliminated “competition from patched-up war surplus.”

As the American aviation industry developed, it began coalescing into several vertically integrated holdings companies structured not unlike General Motors under Billy Durant. In 1925, an engineer called Frederick B. Rentschler was looking for venture capital for a spinoff to produce a new radial air-cooled engine he had devised with Navy contracts in mind. His brother, a director (and eventually chairman) of National City Bank, put him in touch with Colonel Edward A. Deeds, who was then chairman of the Niles-Bement-Pond Tool Company. In spite of his ill-treatment in the aviation hearings after World War I, Deeds provided Rentschler $250,000 and access to his company’s Pratt & Whitney facilities on Capitol Avenue in Hartford, once the home of the Pope Electric Vehicle Company but now relegated to warehousing bales of shade-grown Connecticut River Valley cigar leaf. Rentschler incorporated the Pratt & Whitney Aircraft Company,
its stock owned half by the Pratt & Whitney Tool Company (which was owned in turn by Niles-Bement-Pond) and half by Rentschler and a partner. 439 By the end of 1925, Rentschler's team had produced the Wasp engine, which quickly became a technological and commercial success. In 1928, with the help of the National City Company, Rentschler instigated the creation of a holding company called United Aircraft and Transportation Corporation to encompass not only Pratt & Whitney Aircraft but also an assortment of airframe makers including Boeing and Sikorsky, parts makers like Hamilton Standard, and several associated airlines.

A less-integrated holding company was North American Aviation. It brought together a variety of aviation properties, some of them owned by General Motors, which would end up with a 30 per cent share. One of the company's divisions manufacturer the other important trimotor transport of the era, under license from the Dutch designer Anthony Fokker. 440 The group also featured a number of airlines, including Eastern Air Transport, Western Air Express, and Transcontinental Air Transport. The holding company's jewel in the crown was Curtiss-Wright – an ironic-sounding merger of the two warring patent litigators of the early industry, even though neither personage was actually connected to the enterprise any longer – which made an air-cooled engine competitive with the Wasp. As GM's role in North American increased, Curtiss-Wright spun off and became a major aviation company in its own right. The fourth major player was the Aviation Corporation (or AVCO), which had been set up by a group that included Sherman M. Fairchild, with funding from the Harrimans and Lehman Brothers. An inventor and entrepreneur, Fairchild had gone into aircraft manufacture because he couldn't buy on the market any planes suitable for the aerial-photography equipment he had developed. In addition to airframe and engine producers, AVCO owned American Airways. Major investors (including GM) held stock in more than one of these holding companies, and there was non-negligible overlap in their boards of directors. Charles F. Kettering was involved with at least three of them in one way or another.

Why did the aviation industry organize in this way during this era? As had been the case with Durant's GM and with contemporary utilities, the holding company form brought together a coherent portfolio of complementary assets, creating a low-transaction-cost investment vehicle for money that was bullish on the prospects of a sector as a whole, thereby providing smaller complementary businesses with access to capital. Beyond this, however, the group form of organization provided coordination benefits within a rapidly changing technological environment. An airplane is a complex-systems product; and, especially in this early period of systemic design change, close coordination could be crucial across stages of production that relied on very different knowledge bases. For example, the military rejected the controllable-pitch propeller as not worth the cost. But designer Frank Caldwell understood that the invention would be valuable only if airframes themselves were suitably re-engineered to take advantage. When he moved from a military lab to Hamilton Standard, he was able to work with Boeing to incorporate controllable-pitch propellers into the design of the company's future planes. 441 Also, like rail, aviation was a high-fixed-cost industry, and a holding company could act as an internal capital market to fund up-front development costs and to buffer what were typically large and lumpy sales.
It goes without saying that American aviation between the wars was a beneficiary of what we now call industrial policy. For the most part, that took a form that would remain typical in the U.S.: military procurement. As was universal around the world, the government was the dominant buyer of aircraft. The Army also engaged in its own aeronautical research, especially in its facility at McCook Field (now Wright-Patterson Air Force Base). The research facilities of the National Advisory Committee for Aeronautics also made important contributions. Consciously choosing to focus its limited resources on aerodynamics, the organization developed, among other things, the famous NACA cowl, a streamlined housing to incorporate engines into the airframe. Perhaps because its successor agency NASA is not perceived as a military organization, many have understood NACA to have been an instrument of civilian industrial policy. In fact, it was focused centrally on military technology, even more so after Hoover’s abortive attempt to commande it for the Commerce Department; much of NACA’s research was classified.

During the interwar period, technological advance in aircraft came from a variety of sources: from the aircraft companies themselves, spurred by both military and commercial demand; from military research; from universities; from the airlines; and from Europe. Although there were certainly spillovers to commercial aviation from the military, technology in this era flowed as often in the other direction as well. The result was a revolution in aircraft design and performance, the apotheosis of which, in the commercial sector at least, was the Douglas DC-3 in 1936. By one appraisal “the most important innovation in the history of commercial aircraft up to that time,” the DC-3 would become the dominant design for commercial airliners until the era of the jet engine.

The only genuine civilian industrial policy toward aviation in this era came from Herbert Hoover. The U.S. Post Office had been relying on small existing aircraft, mostly war-surplus DH-4s, to deliver the mail. In 1925, the Kelly Airmail Act authorized the Post Office to contract with private carriers for airmail delivery. Hoover was dissatisfied with the system, which, he believed, charged rates that were too high. He also thought the system did little to encourage passenger transportation, and it involved too many companies, flying routes that were too short. When he became president, Hoover moved to remake air transportation. At his insistence, Congress passed the McNary-Watres Act in 1930, which changed the basis for computing airmail rates. It also effectively subsidized passenger transportation and the use of more-sophisticated aircraft, and it endowed the Postmaster General with near-dictatorial authority to reorganize the industry. Hoover instructed his Postmaster General, Walter Folger Brown, to call together the big carriers – in what became known as the “spoils conference” – to split the country into four east-west routes and a handful of north-south routes. Brown even demanded that North American merge together its Transcontinental Air Transport and Western Express airlines, along with a couple of smaller lines, into Transcontinental & Western Air (TWA). The idea was to develop a few financially strong long-distance carriers that would energize a market for bigger and more-comfortable passenger planes. To this end, Brown let contracts not to the lowest bidder but to the lowest “responsible” bidder, the better to keep out what he considered wasteful competition from shoestring operators using war-surplus equipment.
Smaller operators became upset when they discovered that they had lost contracts despite having submitted substantially lower bids. After Franklin Roosevelt took office, word of this reached Senator Hugo Black, who launched well-publicized hearings. Although United Aircraft had been a reluctant participant in the spoils system – not having wanted to share the skies with its lesser rivals – the Black hearings focused the spotlight on United and on Rentschler personally. Roosevelt immediately canceled all the airmail contracts and assigned the Army Air Corps to deliver the mail. During a bitter winter, a dozen ill-trained and ill-equipped corpsmen died in the attempt. It was left to Roosevelt’s Postmaster General, James Farley, to clean up the mess, which he did by reassigning the airmail contracts back to all the disgraced airlines, although at lower rates.

The associationalist scheme that Hoover and Brown had cooked up for aviation was, of course, very much in the spirit of the NRA and the early New Deal. (The airlines had not even bothered to put together a code by the time NIRA was off the books.) Hugo Black was thus flying very much against the zeitgeist (albeit against a Republican instantiation of the zeitgeist) when he sponsored what would become the Air Mail Act of 1934. The Act capped rates and even personal salaries; forbade mergers and interlocking directorates; and assigned the ICC joint authority with the Post Office in supervising contracts. Most significantly, the Act vertically unbundled the aviation holding companies, spinning United Airlines off from United Aircraft, American Airlines off from AVCO, and Eastern Airlines and TWA off from North American. In keeping with Black’s animus against United, the Act also split that company’s manufacturing operations in two, creating a western company around Boeing in Washington and an eastern company (retaining the United Aircraft name) around Pratt & Whitney, Hamilton Standard, and Sikorsky in Connecticut.

Yet the zeitgeist could not be kept at bay for long. The administrative aspects of the 1934 Act were a disaster, and in 1938 Congress passed the Federal Aviation Act, creating a new independent agency, the Civil Aeronautics Board, to provide the airlines with the same kind of classic public-utility regulation enjoyed by other modes of transport. For 40 years, the CAB would eliminate airfares as a margin of competition and would maintain all-but-impregnable barriers to entry in commercial air travel, requiring certificates of public convenience and necessity for all new routes. American, Eastern, TWA, and United, along with Juan Trippe’s Pan American Airways, would have virtually exclusive control over U.S. trunk routes for more than a generation.

In the era before World War II, the electrical equipment and electronics industries rivalled chemicals in the creation of internal research and development capabilities. As befitted an organization that could trace it roots to Thomas Edison, General Electric was the first major American company to establish a formal central R&D lab. Although Edison’s Menlo Park operation had been run more like a twentieth-century corporate lab, including the use of scientific principles, than is generally credited, the Morgan-led merger with Thomson-Houston initially refocused GE’s attention on consolidating the key technologies of the electrical revolution rather than on innovation. Before the turn of the century, the company hired the German-born physicist Charles Proteus Steinmetz in the Calculating Department of
its huge Schenectady works devoted to electricity generation and transmission machinery. The brilliant Steinmetz was able to characterize the behavior of alternating current mathematically. He soon began pushing GE to create a genuine research-and-development lab. In 1900, Steinmetz enticed an MIT chemist named Willis R. Whitney to work three days a week in the carriage barn behind his personal residence on the banks of the Erie Canal. The next year, Steinmetz finally persuaded the company to make the lab official. In GE's annual report for 1901, vice president Edwin W. Rice told stockholders that "it has been deemed wise during the past year to establish a laboratory to be devoted exclusively to original research. It is hoped by this means that many profitable fields may be discovered."  

Because General Electric encompassed a nexus of still relatively inchoate technologies at the core of electricity and electronics, it would indeed move into many profitable fields, a process of increasingly unrelated diversification that, for good or ill, would come to characterize the company throughout the century. As the research lab, and the company itself, worked to solve technological problems and overcome bottlenecks, the solutions they came up with frequently created new capabilities that pointed to subsidiary and sometimes clearly distinct industries.

As the electrochemical lab took shape with Whitney as its director, GE brought on board promising scientists like Irving Langmuir (who would win the Nobel Prize in physics in 1932) and William Coolidge. Once Langmuir got his hands on the De Forest audion tube, the science behind which De Forest himself had never understood, he was immediately able to improve it dramatically, leading to powerful tubes that could be used to improve broadcasting. Coolidge took the technology further up the frequency spectrum, creating an efficient high-voltage x-ray tube that gave the start to GE's medical-imaging business. Langmuir solved problems of heat transfer for GE's refrigerator division, which would become the avatar of the company's white-goods line of business. (GE had entered the refrigerator business late, taking advantage of the mistakes of earlier entrants in an industry that was exploding in size and undergoing a rapid shakeout of small firms. Americans had bought only 75,000 refrigerators in 1925; by 1928 they were buying almost half a million; and by 1930 GE alone was selling a million units, less than GM's Frigidaire division but more than third-place Kelvinator.) Other parts of the company had developed the steam turbine for electricity generation, creating capabilities that would enable GE's post-war foray into jet aircraft engines. Inspired by the polymer discoveries of Carothers at Du Pont, GE even began moving into plastics, drawing on company-wide knowledge of the properties of electrical insulators.

For most of the pre-World War II period, some 20 per cent of GE's business emanated from Edison's famous invention, the incandescent light bulb. Following the typical turn-of-the-century pattern, GE formed a cartel of lamp makers after Edison's basic patent expired. This included a market-sharing arrangement with Westinghouse. GE also engaged in resale price maintenance and other non-standard forms of contract, and it surreptitiously acquired control of one of its main competitors, the National Electric Lamp Company, which was the sole supplier of lamp bases in the country. The Taft administration filed an antitrust suit; but GE was pleased to give up all these arrangements in a consent decree that affirmed as immune...
to antitrust law its genuine source of market power, patents. Bizarrely, the consent decree demanded that GE completely dissolve National and run that business under the GE name. The decree also specifically barred the company from engaging in resale price maintenance. GE responded by setting up a consignment system to evade the ban, and it pushed the Justice Department into an antitrust suit to test the validity of the scheme. In 1926, the Supreme Court resoundingly declared that “both the Westinghouse licensing agreements and the consignment system were legal mechanisms for General Electric to obtain the maximum revenue from its patents.”

GE’s real problem in this period was technological. The basic Edison lamp had evolved little, and it remained dim, reddish, inefficient, and short lived. European competitors, backed by strong German science, were tinkering with alternative materials for the bulb’s filament. In 1909, Coolidge developed and patented a process to make tungsten ductile enough to be formed into a filament, which yielded a new and brighter bulb that GE would market as the Edison Mazda lamp, named after the Zoroastrian god of light. The company’s attention turned to mass production, dramatically lowering prices to consumers over the next decades as it devised and improved manufacturing technology; labor productivity in lamp-making increased fourfold over the twenties. A 75-watt bulb that cost 75 cents in 1920 cost 20 cents in 1933 and 15 cents in 1938. As GE came to dominate the lamp business, its products established national standards, including those for bulb sizes and types.

Because it consisted largely of durable goods, GE’s overall business suffered in the Depression. The research lab, which had been spending some $2.6 million with a staff of some 250 scientists and engineers in 1929, saw its fortunes reduced to $1 million a year in the early thirties and its staff cut in half. (The need to fire so many people drove the already unstable Willis Whitney into a nervous breakdown.) But profits from light bulbs – a quintessential ephemeral product – helped tide the company over. In 1933, the heavy-equipment businesses lost $11 million, whereas the lamp division made a profit of $17.6 million. GE maintained its prices for lamps during the worst years of the Depression, making up for lower sales by continuing to reduce costs. Sales of lamps turned up in 1933, and in 1935 the company slashed prices across the board. Like other large corporations, GE relied on retained earnings during the Great Depression and World War II, never turning to the financial system for funds. Indeed, in 1935 it paid off all its debt and preferred stock.

GE’s rival Westinghouse also had a long tradition of research driven by the need to solve engineering problems. Before the turn of the century, Nicola Tesla worked for Westinghouse briefly and ineffectually after selling the company his patents; other Westinghouse researchers had greater success at introducing science and mathematics to the design of induction motors. In 1916, eight years after founder George Westinghouse had been forced out, the firm set up a formal R&D lab for basic research in a separate facility near the East Pittsburgh plant. The lab began hiring Ph.D. scientists, including the young Arthur Compton, a future Nobel laureate who would become one of the most significant figures in American science in the twentieth century. Yet, unlike its counterpart at GE, the Westinghouse lab failed to generate new lines of business diversification. In part, this reflected the tension
between the engineering culture at Westinghouse and the scientific aspirations of the researchers. Arthur Compton grew frustrated trying to conduct his experiments on x-ray diffraction while at the same time being directed to work on the development of sodium-vapor lamps. He left for a brilliant academic career in 1919. More significantly, perhaps, Westinghouse’s incentives to innovate, especially in incandescent lighting, had arguably been blunted by the 1911 consent decree, which accorded the company access to more than 200 GE lamp patents. By 1920, as we saw, Westinghouse had begun to focus on the new technology of radio broadcasting. Although (unlike at GE) radio had originated outside of the research lab, it began to absorb most of the lab’s energies after the company acquired the patents of inventor Howard Armstrong. The first era of fundamental research at Westinghouse was over.

Smaller and always more financially fragile than GE, Westinghouse – diffusely held since the ouster of the founder – was hit harder by the Depression than its rival. Even though its cash position was worse than that of GE, the company was nonetheless able to avoid the market for short-term debt before the recession of 1937. As the economy improved in 1935, Westinghouse management decided to try to emulate the kind of “blockbuster” innovation coming out of places like GE and Du Pont, and reoriented the lab once again toward fundamental scientific research, including nuclear and solid-state physics and mass spectroscopy. Yet Westinghouse would be only a junior collaborator in the breakthrough lighting product of the era, which would emerge from GE’s lamp-development department rather than primarily from the Schenectady lab.

In 1938, General Electric and Westinghouse introduced fluorescent light.

Like GE and Westinghouse, AT&T evolved out of the work of inventors, not only Alexander Graham Bell but also his great rival Elisha Gray, whose Western Electric Company fell under control of the Bell interests in 1881. In the early years, technical matters were supervised by Thomas Watson, Bell’s famous interlocutor, who was a trained scientist. Technical change was driven almost entirely by small outside inventors. When he took charge of AT&T in 1907, Theodore Vail energized a more formal commitment to science and invention. This was in large part because there were technological problems standing in the way of his goal of universal service, which, as we saw, meant not a phone in every home but a single unified telephone system under Bell control.

Vail’s first problem was long-distance service. Without cross-country communication, a nation-wide network would be impossible. But even using step-up transformers, a telephone signal would barely make it from New York to Chicago. In 1911, a special research branch within Western Electric began the hunt for some kind of active amplification – for a “repeater.” After trying various mechanical approaches without success, the researchers caught wind of De Forest’s audion, and in 1914 AT&T acquired the patent. By the end of that year, there were repeaters strategically placed across the country. In January 1915, AT&T conducted the first official transcontinental phone call with great ceremony. Alexander Graham Bell in New York uttered his iconic tagline: “Mr. Watson, come here, I want you.” Speaking from the Panama-Pacific International Exposition in San Francisco, Watson laughed that it would now take him five days to get there. President Woodrow Wilson
was also on the call from Washington, and a vacationing Vail was looped in from Jekyll Island. Improving the vacuum-tube-based repeater would occupy the attention of Western Electric research for the next decade and beyond.

As Vail's vision of a unified system took shape, AT&T found itself hooking together local operating companies with a bewildering assortment of idiosyncratic technologies. Standardization was thus another critical issue. This was a job for engineering not research, and in 1919 standardization came under the direction of Bancroft Gherardi, head of the operations and engineering department of Western Electric, which had been broken off from the research department that would soon become Bell Labs. Balancing collaboration and fiat, Gherardi operated as an in-house Herbert Hoover, calling conferences and assembling manuals of best practice. By 1929, “engineers in the Bell System had created standards for an astonishing variety of functions, including telephone plant design, underground cables, raw materials, manufacture, distribution, installation, inspection, and maintenance of new equipment, business and accounting methods, non-technical supplies (such as office furniture, appliances, janitors' supplies, cutlery, and china), and provisions for safety, health, and even responses to sleet storms.”

In January 1925, under new president Walter S. Gifford – the statistician who had worked for Howard W. Coffin and the War Industries Board during World War I – AT&T spun off the research functions of Western Electric into a separate company, leaving behind the engineering and development functions. With some 3,000 employees, Bell Telephone Laboratories would be owned 50 per cent by AT&T and 50 per cent by Western Electric. This completed the company’s transformation into its mature mid-century form: two regulated arms, the local operating companies the Long Lines division, and two unregulated feet, Western Electric and Bell Labs. The relationship between the regulated and unregulated parts of AT&T would be the fulcrum of conflict between the company and its regulators for much of the century.

Although the telephone had penetrated deep into American households, it remained enough of a luxury that, as the Depression descended, millions began to disconnect. In 1931, the number of Bell phones in service fell by almost 300,000; in 1932 the number slid by more than 1,650,000. Counting independents, one American phone in ten had disappeared. As in other regulated sectors, rates began to rise in real terms because nominal rates remained unchanged. In Wisconsin, David Lilienthal, the soon-to-be TVA administrator, was at the forefront of a movement among state regulatory agencies to eliminate red tape so that rates could be cut more quickly. AT&T began laying off workers – 32 per cent at both the local operating companies and Bell Labs and an astounding 78 per cent at Western Electric, whose equipment was no longer needed. The division lost $12.6 million in 1932 and $13.8 million in 1933. The transition from human operators to mechanical dialing was already underway before the Depression, and many of the layoffs at the regional companies were among operators, mostly female; at the same time, in Gifford’s estimation, Western Electric might have shut down completely if not for work converting to the mechanical system. AT&T tried its best to spread the work around. Yet the company did not lower wages for those who remained employed. Nor – significantly – did the
company reduce its annual dividend from the accustomed $9 a share even though earnings per share were significantly below that number until 1936. Many understood AT&T’s policies as harming labor for the benefit of capital, but Gifford also earned much praise for maintaining “purchasing power.”

Maintaining high dividends for AT&T’s diffuse legion of stockholder was no doubt also motivated in part by the company’s ongoing existential fear – amplified by the New Deal – that telephone would be nationalized into the postal system, as it had been in most other countries around the world.477 Research was at the forefront of AT&T’s strategy to avoid “postalization.” By slowly and steadily lowering costs and improving technology, the company could demonstrate its superiority over its state-owned counterparts in places like Britain and France, which was not necessarily a high bar to clear.

Despite the stringencies it imposed, the Depression was indeed a period of rapid advance at AT&T.478 The company made improvements in areas such as radio telephony and switching; in 1936, it introduced coaxial cable. There is some evidence that, as has often been claimed, AT&T suppressed potentially disruptive innovations. This famously included magnetic-tape recording, which Bell Labs developed in 1934.479 AT&T officials believed that users would fear having their secret conversations recorded, to such an extent that it would destroy telephony. At the same time, however, because Bell Labs was funded directly by a formula from the rate base, it did not have to drum up business from the operating divisions; and it thus became arguably the American corporate lab most dedicated to genuinely fundamental research. In 1927, Harold S. Black invented the negative-feedback amplifier, still widely in use, which would open up, among many other things, the possibility of high-fidelity sound reproduction. In 1937, Clinton J. Davisson won the Nobel Prize for his experiments on electron diffraction, the first of several that Bell scientists would earn. In that same year, Mervin J. Kelley, the director of research at the Labs, approached one of Davisson’s colleagues, a young physicist in the vacuum-tube department named William Shockley, with the challenging proposition that solid-state physics might one day yield a radically new approach to telephone switching. Although Shockley’s research would be postponed by the war, it would ultimately lead to the most disruptive innovation of all.
References.


Notes.

1 Galbraith (1955, p. 168)

2 “Time has not been kind to the school of thought that blames the Depression on the stock-market crash” (Temin 1989, p. 43).
As we will see, Keynes actually had little or no influence on American policy during the Depression, which was in fact animated by a homegrown folk “Keynesianism” (which Keynes himself would ostentatiously build upon in the *General Theory* (1936)). I treat Keynes more carefully later in the post-war context.

Edwards (2018). Faced with the new consensus among economic historians, Eric Rauchway has recently attempted to resuscitate the conventional view that Keynes and Roosevelt saved capitalism – now, astoundingly, because of the *monetarist* policies they advocated and enacted, especially the repudiation of the gold clause (Rauchway 2015).

Miller was well-acquainted with fellow Laughlin student H. Parker Willis, who was still advising Carter Glass, now head of the Senate Banking Committee. When Glass had been on the Fed Board *ex officio* as Treasury Secretary, Willis was the Board secretary.

Bordo and Wheelock (2013, p 84); Toma (2013, pp. xii-xix).


Chandler (1971, pp. 72-73).


Meltzer (1976, p. 462).


Allen (1931, p. 286). “There has been a little distress selling on the Stock Exchange,” Lamont calmly explained to reporters.


Smith, Suchanek, and Williams (1988).

Ahamed (2009, pp. 349-350); White (2012, p. 68). Fisher had put his money where his mouth was. In 1925 he sold Remington Rand his patent on an early version of the rolodex and invested the proceeds in the stock market on margin. He was worth some $10 million at the time of the crash and lost everything, including his house in New Haven.

Fisher (1930, pp. 35 and 89).

McGrattan and Prescott (2004); Nicholas (2007).

Eichengreen and Mitchener (2004).

To those who hold this view, it is a delicious irony that Winston Churchill, who always seemed to gravitate to the important historical events of the century, was present in the observation gallery of the New York Stock exchange on Black Tuesday. Churchill himself lost more than $50,000 in the crash and was wiped out (Ahamed 2009, p. 300; Galbraith 1955, p. 100).


U. S. Senate (1931, p. 134).

Hoover (1952b, p. vi). Of course, it was Strong who lowered rates, not the Board. Perhaps in a wry allusion to his travails during the Midwestern flood, Hoover sarcastically referred to the events of 1929 as a second “Mississippi bubble.”

The most important contemporary proponent of this view was Robbins (1934). For an intellectual history, see White (2012, chapter 3). Inflation as measured by the CPI was actually low in the 1920s. But proponents
of the malinvestment theory point out that, as happened in the late nineteenth century, an economy with rapidly growing productivity and a stable money supply ought to have been experiencing mild deflation. A stable price level in such circumstances actually indicates an inflationary policy. In this theory, the downturn in 1929 was caused by a productivity shock as entrepreneurs realized that some of their investments were valueless (Vedder and Gallaway 1997, p. 89).

Friedman and Schwartz (1963, p. 298); Hamilton (1987); Meltzer (2003, pp. 253-257). Temin (1989, p. 7) places even Keynes in that camp, at least putting aside the small matter of Keynes’s fallacious belief that investment opportunities were diminishing, which would have constituted a real supply shock.

Chandler (1971, pp. 78-82).

Fishback (2010, p. 390).

Meltzer (2003, pp. 304-305).

Between the beginning of September 1929 and the end of April 1930, industrial production had fallen 15 per cent. Federal Reserve Economic Data, Table IBP50001N. https://fred.stlouisfed.org, accessed April 12, 2019.


Cecchetti (1998, p. 184). As we have seen, the idea that interest rates have to be corrected for expectations about inflation or deflation is associated with Irving Fisher.

“The economies of the United States and much of the rest of the world became victims of the Federal Reserve’s adherence to an inappropriate theory [the real-bills doctrine] and the absence of basic economic understanding such as that developed by [Henry] Thornton and Fisher” (Meltzer 2003, p. 321). Fisher’s work was not entirely unknown at the Fed, and Fisher and Strong were well acquainted. In the twenties Fisher testified in favor of a bill that would have required the Fed to maintain the price level. Unsurprisingly, Strong, who did not want the Fed bound by legislation, testified against it, rightly worrying that such legislation would be used by agricultural interests to force the Fed to prop up commodity prices (Fisher 1934, pp. 162-163). In general, officials at the Fed rejected any purely “academic” basis for policy, believing that the complexities of markets called for the on-the-ground skills of bankers responding to situations as they arose (Barber 1985, pp. 23-27).

Calmirris (2013, p. 208).

Fisher (1933).

Bernanke (1983). See also Chandler (1970, p. 11). More generally, as Clower and Leijonhufvud (1975, p. 187) put it, “sustained and serious coordination failures might occur because insolvency of trade specialists would temporarily eliminate from the economy market homeostats that are essential for effective coordination of the notional economic plans of individual agents.”

It may be suggestive of the atmosphere of the times that the hapless superintendent of banks who ordered the Bank of United States closed, one Joseph Broderick, was subsequently indicted for having failed to shut the bank down quickly enough. After two trials, he was acquitted.

Bordo and Wheelock (2013); Calomiris (2013).


Friedman and Schwartz (1963, p. 317).

Friedman and Schwartz (1963, p. 320).


Friedman and Schwartz (1963, p. 321); Meltzer (2003, pp. 357-358). The Senate sponsor of the bill was none other than Carter Glass, and it was not lost on him that expanding “eligible” paper flew in the face of his beloved real-bills doctrine. This bill was also backed by Henry B. Steagall on the House side, but it is the Banking Act of 1933 (on which more below) that people nowadays mean when they refer to “the Glass-Steagall Act.”


Hawley (1981a, p. 48).

Hawley (1981a, p. 48); Metcalf (1975, p. 69). This amounts to what the French after World War II would call indicative planning.


Hawley (1981a, pp. 64-65); Leuchtenburg (2009, pp. 61-62).

Hoover (1952b, p. 42).


Brown (1956); Chandler (1970, pp. 139-140); Fishback (2010).

Ford (1926, p. 9).

Filene (1923, p. 411).

Foster and Catchings (1928); Hobson (1930).


Hoover (1952b, pp. 43-44).


Yeager (1956). I am indebted to the lucid exposition of this idea by George Selgin in his introduction to Yeager (1997, pp. xv-xvi).
Hawtrey (1947, p. 140).

Eichengreen (2002).

Hoover (1952b, p. 30). Mellon was far from alone in this view. “When he lectured on the economy at Harvard in the midst of the depression,” recalled Robert Heilbroner, “Joseph Schumpeter strode into the lecture hall, and divesting himself of his European cloak, he announced to the started class in his Viennese accent, ‘Chentlemen, you are worried about the depression. You should not be. For capitalism, a depression is a good cold douche.’ Having been one of those startled listeners, I can testify that the great majority of us did not know that a douche was a shower” (Heilbroner 1999, p. 291).

Leijonhufvud (1968, pp. 75-81).

Yeager (1997, p. xvi). This coordination problem is akin to what we will return to later in the century as the phenomenon of network effects.

Garrett (1952, p. 16). By 1931, Ford had reduced the highest wage back down to $6. Average employment at Ford had been more than 100,000 in 1929; by 1932 it was little more than 56,000 (Nevins and Hill 1957, p. 588).

Margo (1993, p. 43).


Rose (2010).

Even Alfred P. Sloan was a believer. “We must pay higher wages to stimulate purchasing power,” he wrote in his first autobiography (1941, p. 193). “We must reduce prices to stimulate consumption,” he quickly and more sensibly added.

Margo (1993, p. 44), citing unpublished work by Stanley Lebergott.


“I am told that never before in history have so many economists been able to agree upon anything,” said Franklin Roosevelt to an audience in St. Paul, Minnesota on April 18, 1932.


Hoover (1952b, p. 48).


Norpoth (2019).

McGirr (2016, p. 5).
A teetotaler wasn’t someone who drank tea in preference to spirits. It was someone who believed in abstinence – or prohibition – totally with a capital T.


Fisher (1927). The sobriety of the American workforce, still to make itself fully felt, was one of the reasons Fisher had been so bullish on the stock market. In fact, however, such benefits were almost certainly illusory on the aggregate level, and local company-sponsored temperance programs were more effective (Gordon 2016, p. 314). Present-day research, which takes into account the endogeneity of alcohol consumption, tends to find that returns are higher to moderate drinkers than to those who abstain completely (MacDonald and Shields 2001).

Okrent (2010, p. 39). He matched at a rate of 10 per cent.

Geisst (1997, p. 166). Prohibition had destroyed some $150 million worth of British assets in the American liquor industry, in some of which Churchill had personally had a stake.


Okrent (2010, p. 350). He had already cut off funding to the ASL by 1926. Rockefeller himself pointedly did not drink. Indeed, in 1933 the Rockefeller family ordered removed the socialist-realist mural it had commissioned from Diego Rivera for the lobby of the RCA Building in Rockefeller Center, then under construction, because the mural depicted Rockefeller Jr. with a martini in hand. Of course, it didn’t help that Rivera’s hero, Vladimir Ilyich Lenin, was also prominently depicted. “Rockefellers Ban Lenin in RCA Mural and Dismiss Rivera,” The New York Times, May 10, 1933, p. 1.

Leuchtenburg (2009, p. 95).


Shannon (1948, p. 466).


After the inauguration, the Board did begin to enforce inter-district rediscounting.

The bill was in fact written by George Harrison and officials from the Hoover treasury department, including Arthur Ballantine, who would stay on as undersecretary in the Roosevelt administration. “The emergency banking bill represented Roosevelt’s stamp of approval for decisions made by Hoover’s fiscal advisors” (Leuchtenburg 1963, p. 43). The bill also called for the issue of what were derisively called “greenbacks”: bank notes that looked like ordinary Federal Reserve Notes but included fine print specifying that they were not redeemable in gold (Edwards 2018, p. 38).

This account of devaluation and the abrogation of the gold clauses follows Edwards (2018).

The amendments also authorized the printing of greenbacks to pay off federal debt and made some gestures toward monetizing silver.


Taylor and Neumann (2016, p. 54).

Temin and Wigmore (1990); Jalil and Rua (2016).


Meltzer (2003, pp. 477-478). Attempting to use monetary policy, he told Congress, would be like “pushing on a string.”

Calomiris (2013, pp. 199-200).


Calomiris (2010, p. 554).


At least until 1936-1937, when sterilization motivated by a fear of inflation caused a significant but short-lived recession. The recession has often been blamed on the president’s decision to tighten fiscal policy or the Fed’s decision to increase bank reserve requirements, but in fact these effects were small compared with those of the Treasury’s gold-sterilization program (Irwin 2012).


Fishback (2010, p. 403); Okrent (2010, p. 361).
Eisner (2000); Leuchtenburg (1964, p. 84).
Hofstadter (1955); Link (1959).
Rutherford (2011, chapter 8).
Diggins (1972, pp. 204-239).
Schumpeter (1950, p. 147).
Quoted in Bell (1996, p. 136). Dos Passos would soon become disillusioned with socialism after his experiences in the Spanish Civil War, where he witnessed the ruthlessness of radical infighting and the fecklessness of his fellow intellectuals.
Tugwell (1932, p. 76).
Berle and Means (1932). Born in South Windham, Connecticut, Means was also the son of a Congregationalist minister. As we will see, he held views on planning very similar to those of Tugwell.
Quoted in Barber (1996, p. 6).
Leuchtenburg (1963, p. 35).
Astonishingly, this speech was written largely by the newspaper reporters who accompanied the Roosevelt campaign, especially Ernest K. Lindley of the Herald Tribune and James M. Kieran of the New York Times (Moley 1939, p. 24; Tugwell 1957, p. 219). Tugwell considered this Roosevelt’s best speech, in part because it “represented the high tide of collectivism.”
The speech was based on a draft by Berle, with input from Moley, Bernard Baruch, and others in addition to Roosevelt himself (Moley 1939, p. 58).
See for example Stigler and Friedland (1983).
Lipartito and Morii (2010); Wells (2010).
Ripley (1927). Ripley was in fact a man of many interests. His widely influential first major work used cranial measurements to argue that there was not just one Aryan race in Europe but three: Teutonic, Alpine, and Mediterranean. Of the Jewish “race” he warned that this “swamp of miserable human beings ... threatens to drain itself off into our country” (Ripley 1899, p. 372). Gardiner Means took Ripley’s course on the economics of the corporation as a graduate student at Harvard in the mid-twenties, just as Ripley was writing the articles that became Main Street (Lee 1990, p. 675). Two decades earlier, an undergraduate Franklin D. Roosevelt had taken the same course from Ripley (Fusfeld 1954, p. 25).
Ripley (1927, pp. 85-86). As we saw, Walter Chrysler would acquire Dodge Brothers only months after Ripley’s book hit the bookstores.
Lipartito and Morii (2010, pp. 1028-1037).
Berle and Means (1930, p. 60).
Kroszner and Rajan (1994).
Rosenberg (1983).
The public would be shocked a few years later when Whitney was found guilty of having embezzled from the Exchange (Perino 2010, p. 295).
The encounter was not entirely unmemorable. After the proceedings were described as a “circus” in the press, a promoter for Ringling Brothers brought in a midget called Lya Graf and, before testimony for the day began, sat her on the lap of Jack Morgan. Morgan’s grandfatherly treatment of the young woman actually burnished his image. A German national of Jewish descent, Graf would ultimately perish at Auschwitz (Perino 2010, pp. 283-286).
Cleveland and Huertas (1985).
Kroszner (1996, p. 74). Between 1922 and 1929, the share of the total assets of American financial institutions held by commercial banks dropped from more than 60 per cent to 54 per cent. At the same time, the share grew for investment companies, securities brokers and dealers, finance companies, and insurance companies.
There were two other ways commercial banks could organize securities affiliates: (1) the bank could own the affiliate as a subsidiary or (2) a holding company could own both the bank and the affiliate. Legal restrictions prevented banks from selling equity and many other kinds of securities through their own internal departments; even the sale of bonds by a bank was considered *ultra vires* until the McFadden Act of 1927 (White 1986, p. 35).
Cleveland and Huertas (1985, p. 156).
Perino (2010, p. 145). A populist Republican, Couzens had been a ground-floor investor in and former general manager of the Ford Motor Company. After a falling out with Henry Ford, he turned to politics and philanthropy. Ultimately Ford bought him out for $30 million.
Cleveland and Huertas (1985, p. 185).
Benston (1990, p. 110).
Huertas and Silverman (1986, p. 96).

Pecora (1939, p. 71).

Cleveland and Huertas (1985, p. 169). This instantiation of the Bank of America was an old New York bank that had been bought by A. P. Giannini’s Transamerica Corporation in 1928 as part of Giannini’s effort to engage in interstate branch banking through a bank holding company.

White (1986).

Hoover (1952b, p. 121).

Kelly (1985).

Cleveland and Huertas (1985, p. 197).


Schlesinger (1958, pp. 434-435); Tabarrok (1998). National City had been the principal bank of William Rockefeller, the brother of John D. Rockefeller, Sr.; and the William Rockefeller family had intermarried with the family of National City president James Stillman. Winthrop Aldrich was the son of Senator Nelson Aldrich and the brother-in-law of John D. Rockefeller, Jr. He had only recently taken charge of Chase, which had grown through mergers and acquisitions. Aldrich was in the process of remaking the bank and purging older directors and officers, including those with Morgan associations. (One particularly lavish golden parachute raised eyebrows at the Pecora hearings.) Aldrich’s proposals for the Glass-Steagall Act were arguably part of this process, as the Act’s provisions would give banks authority to limit the number of their directors. Amusingly, in the year 2000 Chase would merge with J. P. Morgan & Co. to form today’s JPMorgan Chase.


Chernow (1990, p. 375).


Chernow (1990, pp. 384-387).


As we will see, the “firewall” provisions would be repealed in 1999. After the financial crisis of 2008, there were calls for a “new Glass-Steagall Act.” This despite the fact that most of the entities that failed in the crisis – including Bear Stearns, Lehman Brothers, Merrill Lynch, and Morgan Stanley – were pure investment houses, whereas the entities called upon to bail them out – like JPMorgan Chase and Bank of America – were integrated operations. William D. Cohan, “Bring Back Glass-Steagall? Goldman Sachs Would Love That,” The New York Times, April 21, 2017.
Gilbert (1986). The Banking Act of 1933 covered only Fed member banks; the ceilings were extended to all commercial banks by the Banking Act of 1935.

In the 1960s, the Vietnam War inflation and the rise of mutual funds combined to induce savers to withdraw their funds from the banking system. Commercial banks were reduced to giving away steak knives and toasters to attract depositors, and they clamored for repeal (Calomiris and Haber 2014, p. 194). Regulation Q was eventually phased out in the 1980s.


Deposit insurance of the kind set up under the Glass-Steagall Act also creates serious problems of moral hazard: because premiums aren’t tied to the riskiness of a bank’s loans and because the bank’s liability is limited to the value of its net worth, the system encourage risky lending; and because deposits are insured, it eliminates the incentive for depositors to monitor the quality of banks. This is why the earlier state experiments with deposit insurance failed. In the 1980s, a similar insurance system would take down the entire American savings-and-loan industry (White 1989).


Brandeis (1914, p. 92).


Landis (1959, p. 32).


Mahoney (2001).


The code had been devised as one of many industry codes under the National Industrial Recovery Act (on which more below), and indeed the SEC agreed to administer the code just days before the NIRA was declared unconstitutional by the Supreme Court.


Mahoney (2015, p. 98); Neal and White (2012, p. 111).


Kandel et al. (2015).


Indeed, Insull’s sympathetic biographer attributes the downfall of the Chicago empire not to the crash or to Insull’s own missteps but to the House of Morgan, which was attempting though its United Corporation
to create a nationwide monopoly in electricity akin to the Bell monopoly in telephony (McDonald 1962, p. 250).

In fact, revenue in the electricity sector declined only six per cent during the early years of the Depression. Reductions in demand from industry were partly counterbalanced by increases in the consumer sector, where those workers still employed spent their increased real incomes on energy-using appliances (Ramsay 1975, p. 78).

Perino (2010, pp. 118-120). The elder Insull was extradited back to the U. S. from Turkey in 1934 to face charges that included federal mail fraud. He would be acquitted of all the charges.

Mahoney (2012, p. 39).

Mahoney (2012, p. 44).

Leuchtenburg (1963, pp. 154-156). In a further presentiment of current concerns, contemporary critics charged that Black’s committee had seized information without proper warrants (Moley 1939, p. 338).


Kandel et al. (2015, p. 17).


The yardstick claim was manifestly untrue, of course, as the very different costs structures of federal power facilities made them entirely incommensurate with private utilities (McCraw 1971, p. 73; Neufeld 2016, p. 180). Based archival records of the TVA, the Federal Power Commission, the Rural Electrification Administration, the National Electric Light Association, and the Edison Electric Institute, Kitchens (2014) determined that the average monthly bills paid by TVA residential consumers differed little from what consumers paid private firms operating in the same area.


Selznick (1966, pp. 112-113).


Fishback (2017, p. 1455). Even counting those on work relief as “employed,” unemployment in 1933 was more than 20 per cent; 16 per cent in 1934; 14 per cent in 1935; 10 per cent in 1936; and nine per cent in 1937 (Margo 1993, p. 43). Economist generally do not count those on work relief as employed because they were not in fact employed in the private economy. In view of their level of compensation, relief workers have more in common with today’s recipients of unemployment benefits.

Attewell (2018, pp. 6-7).
Despite the lower wages, workers considered the federal jobs more stable than private jobs and they clung to them, often for years, despite official assurances that they could return to federal work if they lost a private job (Margo 1993).


Leuchtenburg (1963, p. 133).


Blakey (1967).

Leuchtenburg (1963, p. 73).

Barber (1996, p. 50).

Depew et al. (2013); Whatley (1983).

Loth (1958, pp. 204-205).

Johnson (1935).


John Maurice Clark and Paul Douglas, neither of whom could be considered *laissez-faire* economists, also made this point (Leuchtenburg 1964, p. 128).


Schlesinger (1958, pp. 112-115).

Taylor (2019, p. 8).

Johnson (1935, p. 250-251).

“In war,” said Roosevelt in announcing the program during a fireside chat on July 24, “in the gloom of night attack, soldiers wear a bright badge on their shoulders to be sure that comrades do not fire on comrades. On that principle, those who cooperate in this program must know each other at a glance. That is why we have provided a badge of honor for this purpose, a simple design with a legend, ‘We do our part,’
and I ask that all those who join with me shall display that badge prominently. It is essential to our purpose.”


Johnson (1935, p. 264).

Taylor (2019, pp. 56-57).

Johnson (1935, p. 264).

“1,500,000 Cheer Vast NRA Parade; March of 250,000 City’s Greatest; Demonstration Lasts Till Midnight,” The New York Times, September 14, 1933, p. 1.

Taylor (2019, pp. 70-72).

Chicu et al. (2013).


Hawley (1966, p. 70).


Schechter also charged that, “in certain provisions, [NIRA] was repugnant to the due process clause of the Fifth Amendment,” but the Court held that, having found the law unconstitutional on other grounds, it didn’t have to rule in the merits of this claim.


Hawley (1966, pp. 192-193); Leuchtenburg (1963, pp. 172-73). This was, of course, a period of severe drought in many parts of the country, and the collective-action problems of small farmers had led to the massive soil erosion of the “dust bowl.” These problems were ameliorated after 1937 by the implementation of soil-conservation districts (Hansen and Libecap 2004). The allotment system had little effect on soil erosion.


Bernanke and Gertler (1995); Calomiris and Hubbard (1990).


Graham and Leary (2018, p. 4296). After the war, cash holdings slowly returned to pre-Depression levels by about 1970.


Brownlee (2016, p. 130); Keynes (1936, p. 100).

Tugwell (1933, pp. 206-207).

In his memo to Roosevelt, Berle too assailed the “corporate hoarding” of the 1920s, which “upset the balance of production and consumption,” leading to the Depression. Instead of distributing retained earnings to the stockholders, “corporate administrators have
assumed that they were private funds, capable of being withdrawn from personal uses and used to satisfy unrestrained ambitions for expansion.” Quoted in Bank (2010, p. 157).

Schlesinger (1958, p. 507).

Calomiris and Hubbard (1995).

“Decreed Dividends Opposed by Sloan,” The New York Times, June 12, 1936, p. 33. In fact, over the course of the 1930s, GM paid shareholders 91 per cent of net income, “for we found that we had more funds than we could profitably invest under the generally depressed economics conditions of this period” (Sloan 1964, p. 199). Over the period 1929-1932, GM paid investors $95 million more than the company earned, yet was able to increase holdings of cash and short-term securities by $45 million.

Schlesinger (1958, p. 508).


This was so even though continuing plants had lower-than-average labor productivity, probably because they rendered unemployed fewer workers relative to output declines than did failed firms. The larger firms were engaging in “labor hoarding.”


Scott and Ziebarth (2015).


Cooper and Haltiwanger (1993).

Field (2012).

See also Bakker et al. (2017) and Watanabe (2016).

He also cites the supply-side benefits of the build-out of the U. S. highway system in the twenties. I return to this in the context of rail and trucking below.

Field (2012, p. 56).

In these models, product innovation is compressed into process innovation. Whereas process innovation is the ability to produce an existing product at lower costs, product innovation is represented as the ability to extract greater value from an existing product without increasing costs. Paul Romer recently won a Nobel Prize for thinking about the production of knowledge in this way. See for example Romer (1994).

On the distinction between science-based products and complex-systems products, and the importance of this distinction for intellectual property rights, see Merges and Nelson (1990).


Nicholas (2009).

Lamoreaux et al. (2011).

Mowery (1983).

Lamoreaux et al. (2011, p. 236).

Holland and Spraragen (1933, p. 3).

Baldwin (2008); Langlois (1992); Nelson and Winter (1977); Teece (1986).

For example, as we shall see, in the case of the personal computer. In order for systemic innovation to proceed through market interfaces, the design involved has to be relatively modular and the market has to be dense and sophisticated enough to provide the necessary components.
Carothers suffered from severe depression and committed suicide in 1937 at age 41.


It is, wrote Schumpeter, “the cheap cloth, the cheap cotton and rayon fabric … that are the typical achievements of capitalist production, and not as a rule improvements that would mean much to the rich man. Queen Elizabeth owned silk stockings. The capitalist achievement does not typically consist in providing more silk stockings for queens but in bringing them within the reach of factory girls in return for steadily decreasing amounts of effort” (Schumpeter 1950, p. 67). Writing before 1942, he probably had not yet even heard of nylon.

Mueller (1962).

Gibb and Knowlton (1956, p. 541). Leaded gas was, of course, one of the great public-health disasters of the century. The toxicity of lead was well known at the time, but industrial researchers viewed it largely as an occupational-health problem – dozens of workers were killed or driven insane by exposure early on – not as an environmental problem. Yet many contemporaries in public health did speak out against lead. In 1925, the Surgeon General opened an investigation, and, despite wildly conflicting testimony, declared that there was no reason to ban the additive (Leslie 1983, p. 541). Jersey Standard became a co-owner (along with GM and Du Pont) of the Ethyl Gasoline Corporation to market the product, but initially Jersey itself refused to use the additive in its own gasoline (Gibb and Knowlton 1956, p. 543).


Universal Oil Products was founded by meatpacker J. Ogden Armour, who believed that refining should emulate the continuous-process (rather than batch) approach to production meatpacking had pioneered.


U. S. Senate (1923).

Gibb and Knowlton (1956, pp. 555-559); Giddens (1955, pp. 266-280); Williamson et al. (1963, pp. 389-391).

Enos (1962, chapter 4).

Libecap (1984). One ironic outcome of the Teapot Dome scandal was that all federal leases after 1930 would require unitization.

Ise (1926, pp. 402-422). In 1920, the director of the U. S. Bureau of Mines predicted that oil would run out in 18 to 20 years.


Nash (1968, pp. 128-152).


Hogan (1971, pp. 847-856).

This short-lived Columbia Steel Company is not to be confused with the West-Coast-based Columbia Steel Company acquired by U. S. Steel in 1929 (Hogan 1971, p. 894).

Aylen (2010).

Gold et al. (1970).


Bertin et al. (1996).


Hogan (1971, pp. 1216).

Mowery (1981, p. 113).


Chandler (1962, p. 334). Although Stettinius had come from GM, his duties as an assistant to Sloan had been largely in the realm of public and government relations (Farber 2002, p. 152). Chandler credits the “highly rational business school graduate” Enders M. Vorhees with actually spearheading the change to the multidivisional structure at U. S. Steel.

Nicholas (2019, p. 64).

Graham and Pruitt (1990, p. 214)

FTC (1939, p. 7). Motor vehicle registrations dropped only 10 per cent, meaning that Americans largely kept their old cars in service instead of buying new ones. Between 1930 and 1937, registrations increased by 20 per cent, most of that after 1933 (p. 17).
This model became a favorite of hot-rodgers in the 1950s and 1960s, immortalized by the Beach Boys as the *Little Deuce Coupe* – “deuce” referring to the 1932 model year. My father owned one of these in the late 1940s, having won it, he claimed, in a game of craps. (He always called it a Model B, but the B was the four-cylinder version; the V-8 was the Model 18.) Family lore has it that he would tour around with my uncle in the passenger seat and my mother and my aunt consigned to the rumble seat.


Nevins and Hill (1957, p. 594). This was as against bolting to the crankcase two separate castings of four pistons each.


Nevins and Hill (1962, pp. 59-60).

FTC (1939, pp. 27, 536, 602, 653); Kennedy (1941, p. 235).

Chrysler (1950, p. 200).

“There Are No Automobiles,” *Fortune*, vol. 2, issue 4, October 1930, pp. 73-77.


Curcio (2000, p. 501); FTC (1939, pp. 27 and 602).

Sloan (1964, p. 177).


Sloan (1964, p. 253).


General Motors Corporation (1975); Leslie (1983, pp. 229-275); Marx (1976).

Leslie (1983, p. 268). An alternative account claims that it was H. L. Hamilton, head of GM’s Electro-Motive Division, who brought the engine to Budd’s attention (Overton 1965, p. 394).
Chrysler was, of course, the exception, and it began the Depression indebted from its purchase of Dodge. But the company’s countercyclical success in the product market allowed it to retire all of its debt by 1935 (Chrysler and Sparkes 1950, p. 201). Schiffman (2003).


Schiffman (2003, p. 806).

Overton (1965, pp. 369-382).

Schiffman (2003, p. 804).

Mason and Schiffman (2004).

Overton (1965, pp. 377).

O’Brien (1989c).


Field (2012, pp. 70-78).

Vinsel (2019, p. 61).


At about the same time he owned the Ford V-8, my father and a buddy got hold of a used truck and briefly tried their hand at the trucking business. No ICC permit was applied for. He continued to drive trucks of various sorts for most of his career, eventually at the end snagging a unionized position driving a tractor-trailer for a small secondary steel plant. But my father was a Steelworker not a Teamster: the truck belonged to the plant itself. This was really a mild instance of tapered integration, as most of the plant’s shipping was handled by a (recently deregulated) contract carrier.


Rae (1968, p. 3).

Nevins and Hill (1957, pp. 238-247).

Immortalized (among many other places) in *Indiana Jones and the Temple of Doom* (1984).


Also on the Board was Connecticut Senator Hiram Bingham, a Yale political scientist, aviator, and the amateur archaeologist who brought to modern world-wide attention the ancient Inca ruins of Machu Pichu. He is often alleged to have been an inspiration for the character Indiana Jones, though it is not known whether he ever flew a Ford Trimotor.

Rae (1968, p. 23).

Hawley (1981b, p. 113).

Freudenthal (1968, pp. 76-83); Rae (1968, pp. 28-29 and 39-48).
In 1931, the crash of a TWA Fokker transport killed the famed Notre Dame football coach Knute Rockne, on his way to Hollywood to consult on a movie. The resulting adverse publicity is said to have helped motivate the developments in aircraft technology that led to the DC-3 and later mature airliners.

Rae (1968, p. 63).


Rae (1968, p. 59).


Hoover (1952a, pp. 243-244).

Mowery and Rosenberg (1982); Rae (1968, pp. 52-54).

Hawley (1966, pp. 240-244).

Dempsey (1979).

Reich (1985); Wise (1985).


Rees (2013, pp. 147-152).

Coe (2000).

Bright (1949); Reich (1992).


Implying that the real sin was thought to be secretive ownership rather than market power. In fact, National was well-run company with its own research lab, and it almost certainly generated more value for GE as an independent subsidiary than as an internal division (Rogers 1980, pp. 97-98). GE continued to give its National division free rein for years after the consent decree.


Rogers (1980, p. 113).


Bright (1949, p. 269). That’s a decline by two-thirds in real terms, from roughly $9.60 of today’s dollars in 1920 to $3.96 in 1933 to $2.73 in 1938. At the same time, the reliability of the bulb had improved.


Reich (1992, p. 331).


Kline and Lassman (2005).
As we will see, after Congress initiated an investigation of AT&T in 1935, the Federal Communications Commission found plenty to complain about. But it had only good words to say about the company’s efforts in standardization. “The equipment and methods used in the Bell System have been standardized to a remarkable extent with resulting economies in manufacture of equipment and operation of telephone plant; flexibility in the interchange of equipment and trained personnel between different parts of the System; and a uniformly high quality of service” (U. S. Federal Communications Commission 1939, p. 584).


Temin and Galambos (1987, p. 13). The spinoff of Bell Labs was part of a larger restructuring in which AT&T sold off its international operations to ITT and, as we saw, divested itself of radio broadcasting.

Adams and Butler (1999, p. 132); Brooks (1976, pp. 188-192).

When he was an official of the Post Office Department, Daniel C. Roper, Roosevelt’s commerce secretary, had drafted a report calling for telephone to be incorporated into the U. S. Post Office. By 1934, however, he was a supporter of regulation rather than nationalization (John 2010, p. 411).


Clark (1993).