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The Advesity/Hysteresis Effect:
Depression Era Productivity Growth in the U.S. Railroad Sector

by

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The historical episode we are now living through is the latest example of a cycle of financial boom and bust which has characterized the United States throughout its economic history. Boom periods are marked by weakened or absent regulation of the financial sector and a growing willingness on the part of households, nonfinancial businesses, and financial businesses to hold riskier assets and to finance these positions with higher leverage (higher debt to equity ratios). These twin engines fuel soaring financial sector profits and remuneration so long as asset prices continue to appreciate, but they (especially the trend toward higher leverage) render the system vulnerable when asset bubbles burst. In the boom phase, as the financial system becomes more interconnected, with narrowing capital cushions and complex webs of rights to receive from and obligations to pay to, it becomes more fragile and vulnerable. The failure of one financial institution now has the potential to bring down others, like a row of dominoes, with the potential for devastating impacts on the real economy as credit flows seize up.

This cycle is evident in the late 1920s (boom) going into the 1930s (bust), and it is evident in the first decade of the twenty first century. In each instance, while the upswing of the cycle supercharged the accumulation of physical capital, particularly structures, its aftermath retarded it. The boom and bust cycle of physical accumulation had and has predictable short run impacts on productivity. The upswing of the financial cycle laid the groundwork for a subsequent contraction in physical accumulation, which, amplified by multiplier effects and only partially counteracted by fiscal and monetary policy, contributed in both cases to the decline in aggregate demand that induced

recession, which produced (and in the current instance is likely to produce) a predictable short run adverse effect on both labor productivity and TFP.

But what long run effects, if any, does the financial cycle, and the cycle of physical accumulation to which it helps give rise, have on productivity growth? This requires consideration of potentially beneficial and adverse consequences of both boom and bust. The most obvious influences are clearly negative. In the later stages of a credit boom, as lending standards deteriorate, and as financial institutions push credit on borrowers rather than just responding to their demands for it, it becomes increasingly less likely that physical capital will be allocated to its best uses. The wrong types of capital goods may be produced, and they may be sold or leased to the wrong firms or installed or built in the wrong places. These problems are more easily remedied for equipment, because producer durables are physically moveable, and in any event, are relatively short lived.

Structures are longer lived and generally immobile and in their case a configuration decided upon in haste in the upswing may foreclose other infrastructural developmental paths. It is not always simply a problem of overbuilding, with an overhang that can be worked off in a few years. Some decisions about structural investment are irreversible, or reversible only at great cost. In growth models, more physical capital accumulation is generally better than less, but the reality is that in some cases the economy would have been better off (because of disposal and remediation costs) had poorly thought out prior investment not occurred at all.

Zoning and other types of planning and land use regulation can partially mitigate these effects. These were largely absent in the 1920s, and so the adverse effects on the revival of accumulation were more acute in the interwar period than they were in the

1980s or will likely be today. During and after the Depression, and partly in response to it, and alongside the more well known apparatus of financial sector control, municipalities developed a locally administered system regulating the physical accumulation of structures (both government and privately owned). The regulation of land use and construction survived the deregulatory enthusiasms of the last quarter century more successfully than did the restraints on finance. Why this was so is an interesting story in itself. It had to do in part with the lower concentration of the real estate development industry, the fact that battles would have had to have been fought at the level of hundreds of local jurisdictions rather than primarily at the federal level, and the fact that land use regulation and local building codes, although sometimes perceived as an irritant, did not hinder the potential for private sector profit as much as did the legacies of New Deal regulation of the financial sector.

One of the consequences of the persistence of a regime of land use and construction regulation was that the adverse effects of a prior building boom were less severe in the aftermath of the Savings and Loan debacle of the late 1980s, and, for the most part will probably be so for the current crisis as well than they were in the 1930s. Still, the real estate collapse today is geographically specific in the severity of its impact, and it is possible some new construction may well end up evolving into blighted neighborhoods that will ultimately need to be razed.

The second adverse impact on potential output takes place during the downturn. In the bust phase of the cycle, as the financial crisis disrupts lending and other financial intermediation, physical accumulation slows down. Assuming that the speculative fever has broken, we can now expect the borrowing and lending that takes place to be more

considered. But because both borrowers and lenders' balance sheets are weaker, lending is perceived as riskier, and less of it takes place. So the bust imposes a purely quantitative loss to potential output in the form of accumulation not undertaken. On the expenditure side, a recession represents foregone opportunities for investment as well as consumption. Stilled productive capacity could have been used to add to the nation's physical capital stock but wasn't. Idle productive capacity (representing the unused service flows of both labor and capital) is like an unsold airplane seat or hotel room. The dated service flows represent potential gone forever if not utilized. And so some houses, warehouses, apartment buildings or producer durables are not acquired or built that could have been.

In sum, a financial boom/bust cycle misalllocates physical capital in an upswing, in some cases with irreversible or expensively reversible adverse consequences. And the downswing deprives the economy of capital formation that might have taken place in the absence of the recession. In contrast with an imagined world in which accumulation took place at steadier rates, both of these effects on aggregate supply have to be entered on the negative side in an accounting of the effect on the trend growth rate of productivity of the boom/bust financial cycle and the closely related cycle of physical capital accumulation..

The question I now pose is whether there is some compensatory effect during a recession – some positive impact on the long run growth of potential output. In other words, is there a silver lining to depression? A subterranean theme in some economic commentary today seems almost mystically to view depression as a purifying experience, not only purging balance sheets of bad investments and excessive leverage, but also

refocusing economic energies on what is truly important, and perhaps stimulating creative juices in a way that expands the supply of useful innovations. This style of argument is reflected in Posner (2009) in a chapter entitled "A Silver Lining?" and it echoes Treasury Secretary Andrew Mellon's approving depression era encouragement to "Liquidate labor, liquidate stocks, liquidate the farmers, liquidate real estate….It will purge the rottenness out of the system. …People will work harder, live a more moral life..."

Is it possible for a diet of feast then famine to toughen up the economic patient, ultimately allowing the economy to grow more rapidly, compensating for the effect on potential output of misallocated capital in the boom and foregone accumulation in the trough? The years of the Great Depression (1929-41) were the most prolonged period in US economic history in which output remained substantially below potential. That period was also the most technologically progressive of any comparable period in U.S. economic history (Field, 2003, 2008). Is there a connection? It is natural to ask whether there was and whether, because the Depression experienced such pronounced advance in this regard, we could expect some boost to longer run growth as a direct consequence of our current recession.

With respect to recent economic history, Bureau of Labor Statistics productivity data show that the decade long IT productivity boom ran out of steam in 2005. The latest available data show that although TFP for the private nonfarm economy grew at 1.46 percent per year between 1995 and 2005, it has grown much more slowly since then – only .62 percent per year between 2005 and 2008 (BLS Series MPU491007, accessed 6/03/2009). This retardation is before any of the likely cyclical effects on productivity of

the downturn have been felt. Over the next few years (how long this will be will depend in part on the length of the recession), productivity advance will almost certainly be weak or even negative, as it was between 1929 and 1933 (see Field, 2009).

We won't have much real evidence on the longer run trajectory of TFP for some time, since trend growth in my view can only be reliably measured between business cycle peaks. Thus we will need to await the closing of the output gap and the economy's return to potential output to get a good reading. Even then there will be a question – as there is in the case of the Depression – as to how much of the advance would have taken place anyway. Still, the issue of whether we can expect a "recession boost" to potential output is obviously on a number of people's minds, and it is natural to turn to the Depression experience for possible indications as to whether this is likely. That long run trajectory bears on a number of important issues, including the adequacy of Social Security funding, our ability to address escalating health costs, and the more general question of what will happen to our material standard of living.

I offer a nuanced response to the question of whether 1929-41 bred productivity improvements that might foreshadow what will happen over the next decade. The issue is best approached by thinking of TFP growth across the 1930s as resulting from the confluence of three tributaries. The first was the continuing high rate of TFP growth within manufacturing, the result of the maturing of a privately funded research and development system. The second was associated with spillovers from the build out of the surface road network, which boosted private sector productivity, particularly in transportation and wholesale and retail distribution. The third influence, which I call the adversity/hysteresis effect, reflects the ways in which crisis sometimes leads to new and

innovative solutions with persistent effects. It is another name for what adherents of the silver lining thesis describe, and it is a mechanism reflected in the folk wisdom that necessity is the mother of invention.

In the absence of the economic downturn, we would probably have gotten roughly the same contribution from the first two tributaries. That is, certain scientific and technological opportunities, perhaps an unusually high number of them, were ripe for development in the 1930s, and they would have been pursued at about the same rate even in circumstances of full employment. With or without the depression Wallace Carothers would have invented nylon. Similarly, by the end of the 1920s, automobile and truck production and registrations had outrun the capabilities of the surface road infrastructure. Strong political alliances in favor of building more and improved roads had been formed, and issues regarding the layout of a national route system had been hashed out by 1927. It is highly probable that the build out of the surface road network would have continued at roughly the same pace in the absence of the Depression. So it is the third effect, the kick in the rear of unemployment and financial meltdown, that is most relevant in terms of a possible causal association between depression and productivity advance.

The adversity/hysteresis mechanism is familiar to households unexpectedly faced with the loss of a wage earner or suddenly cut off from easy access to credit which had been formerly available. Under such circumstances, successful families inventory their assets and focus on how they can get more out of what they already have, not just how they can get more.

Adversity does cause some people to work harder, just as it causes some people to take more risks: these are people for whom the income or wealth effects of adversity

dominate the substitution effects. For others, the substitution effect leads to withdrawal from the labor force, or discouragement. In more severe forms this is evident in a variety of mental and physical disorders that show up clearly in aggregate statistics on alcoholism, depression, suicide, and divorce. The overall effect on innovation, work effort and risk taking is not easy to predict, given that, in economic terms, both income and substitution effects are operative, and that they pull in opposite directions (blanket opposition to tax increases based on their effects on aggregate supply typically focuses only on substitution effects). There is merit in the adage that what doesn't kill you makes you stronger. It's just that sometimes it kills you. Not all families or firms are successful, and in some instances adversity destroys them. So I am skeptical overall that we can take an unqualified optimistic view of the effects of economic adversity on innovation and creativity.

These qualifications aside, there is one important sector which appears to have benefited from the silver lining effect during the Depression, and that is railroads. Railroads confronted multiple challenges. They faced adverse demand conditions specific to the industry that would have continued to plague firms with or without the Depression. The automobile was already eroding passenger traffic in the 1920s, and trucking was changing the freight business by providing strong competition in the short haul sector. For an industry faced with these challenges and characterized by heavy fixed costs, the downturn in aggregate economic activity was particularly devastating, and pushed many railroads into receivership. Access to capital was disrupted, although some ailing roads received loans from the Reconstruction Finance Corporation and, paradoxically, bankrupt rails, no longer required to meet obligations to their original creditors, could obtain credit,

especially short term financing for equipment purchases, with greater ease than lines which had not gone bankrupt. But access to cheap fifty year mortgage money – widely available in the 1920s -- was pretty much gone (Schiffman 2003). Railroads responsible for roughly a third of US track mileage were in receivership by the late 1930s, and had their financing constraints somewhat relaxed. A corollary, however, is that railroads responsible for the remaining two thirds were not in receivership. With generally weak balance sheets, they faced limited access to credit.

Confronted with these challenges, both labor and management took a hard look at what they had, and worked to use their hours and capital resources more effectively. Both capital and labor inputs declined substantially.[1] Underutilized sections of track, for example, were decommissioned,[2] and the net stocks of both railroad structures and railroad equipment declined (Figure 2) as did the number of employees (Figure 6). Rolling stock went down by a third, and the number of employees declined by almost that percentage.

Yet logistical innovation enabled railroads to record slightly more revenue ton miles of freight and book almost as many passenger miles in 1941 as they had in 1929. Kendrick's series for sector output, drawn from Barger (1951), shows overall output (a weighted average of freight and passenger traffic) 5.5 percent higher in 1941 than it was in 1929. Given the big declines in inputs, this was a very impressive achievement. Other factors, largely independent of the business cycle, certainly contributed to the strong

[1] Posner captures the silver lining hypothesis insofar as it applies to productivity in these words: "A depression increases the efficiency with which both labor and capital inputs are used by businesses, because it creates an occasion and an imperative for reducing slack…. When a depression ends, a firm motivated by the recession to reduce slack in its operations will have lower average costs than before…" (2009, pp. 222-3)

[2] First track mileage operated was roughly unchanged from 1919 to 1929 (263, 707, declining to 262,546). But between 1929 and 1941, it dropped 5.9 percent (262,546 to 245,240) (Statistical Abstract, 1945, Table 521, p. 470).

productivity performance of railroads during the Depression. For example, the build out of the surface road network facilitated a growing complementarity between trucking and rails. But some of the productivity improvement resulted from responses internal to organizations. And whereas in households it is sometimes argued that memories are short and there is little permanent carryover of behavioral changes when times improve, institutional learning and memory particular to the corporate form probably allowed some hysteresis. Beneficial organizational innovations when times were poor persisted when times improved, and contributed to permanently higher levels of TFP, and the far superior performance of the US rail system in the Second World War as compared with the First.

In exploring this question, we need to keep the larger context in mind. If we compare total GDP in 1929 and 1941 using the Bureau of Economic Analysis's chained index number methodology, we see from the latest revisions that the aggregate grew at a continuously compounded growth rate of 2.8 percent per year over that twelve year period (NIPA Table 1.1.6). This is close to the 3 percent per year often viewed as the long run "speed limit" for the US economy. GDP surpassed its 1929 level in 1936, and was 40 percent above its 1929 level by 1941. Because private sector labor and capital inputs increased hardly at all over that period (hours were flat and net fixed assets increased at only .3 percent per year (FAT Table 1.2)), virtually all of this was TFP growth. We would like to have a sense of how much of this, if any, was the result of this adversity/hysteresis effect, relative to the other two tributaries.

If the adversity/hysteresis mechanism has some empirical punch to it, then it is possible that the storm clouds of recession/depression can have something of a silver

lining. The disruption of credit availability and an increase in the cost of equity finance were both central features of the 1930s, just as its easy accessibility and cheap cost through most of the 1920s had been a feature of that decade. The boom/bust cycle was associated with declining physical capital accumulation and productivity, particularly between 1929 and 1933. At least in the case of railroads, however, there appear to have been longer run benefits to the downswing phase of the financial cycle and the closely related cycle of physical accumulation in the form of technical innovation within the context of effective organizational responses.

Railroads and the Silver Lining

In the last part of the nineteenth century, railroads dominated the US economy in a way no other economic organization ever had or ever has again. They remained a formidable presence in the 1930s, although beset with challenges from several sides. What differentiated railroads from other parts of the private economy was the scale of their enterprise, particularly the size and value of the physical capital they owned, capital whose acquisition was financed largely by borrowing. Coming out of the 1920s, railroads had huge fixed nominal debt service obligations. They didn't necessarily have to worry about rolling over short term debt, since much of their borrowing was in the form of long term mortgages, but they still had to meet mandated payments. In the face of an economic downturn and wrenching changes in market opportunities associated with the growth of trucking and the automobile, railroads were the poster child for Irving Fisher's debt-deflation thesis. By 1935, railroads responsible for more than 30 percent of first track mileage were in receivership (Figure 1), and this remained so for the remainder of the Depression. But the problems for the sector as a whole were in a sense less those

of the roads in receivership, and more the challenges faced by those who weren't. The former were actually less cash strapped than the latter. Railroad organizations were under enormous stress during the Depression, and so their productivity performance over this period is all the more remarkable.

If we ignore variations in income shares – which are relatively stable over the over time, a TFP growth rate calculation is basically a function of three numbers: the rate of growth of labor input, the rate of growth of capital input, and the rate of growth of output. Kendrick's series for railroad output are drawn from Barger (1951) and are based on data for both freight and passenger traffic, with a larger weight on freight. It shows output 5.5 percent higher in 1941 than it was in 1929. Kendrick's labor input series are also from Barger and are identical to those that continue to be listed on the BEA website (NIPA Table 6.8A, line 39). Between 1929 and 1941, the number of employees declined 30.4 percent, employee hours 31.4 percent. Kendrick's railway capital series is taken from Ulmer (1960), and shows a 1941 decline of 5.5 percent between 1929 and 1941. Putting these altogether, Kendrick has railway TFP rising at 2.91 percent per year over the twelve years of the Depression.

It's not possible given currently available data to do better than Kendrick for output and labor input. But the BEA's revised Fixed Asset Tables do give us an opportunity to update capital input. Figure 2 brings together NIPA data on gross investment in railroad equipment and structures. Gross investment in railroad equipment peaks in 1923 and then moves fairly steadily downward to virtually nothing in 1933. It then revives somewhat, particularly after 1935 and the big increase in railroads in receivership. Investment in railroad structures peaks in 1926 but remains high through 1930 before

declining to a trough in 1933 and then recovering modestly in the remainder of the Depression, although not as sharply as equipment investment. Using the data underlying theses series, I calculate that between 1929 and 1941, the real net stock of railroad structures declined from $27 billion to $25.65 billion, and railroad equipment from $6.5 billion to $4.77 billion. Overall, then, the real net capital stock declined 9.2 percent over the twelve year period, while Kendrick has it declining only 5.5 percent. (Kendrick, 1961, Table G-III, p. 545). A more rapid decline in capital input (.69 percent per year rather than .47 percent per year) would boost TFP growth in railways between 1929 and 1941 from 2.91 to 2.97 percent per year.[3]

We can get further insight into trends in railroad accumulation by looking at detailed numbers on rolling stock (Figures 3-5; these data are in units, not dollars). The locomotive numbers show decumulation in 1922 and then again starting in 1925. The number of locomotives then shrinks continuously until 1941. Some of this reflects replacement of locomotives with larger, more powerful engines, but the overall trend unmistakeable. The total number of locomotives shrunk from 61,257 in 1929 to 44,375 in 1941. A small but growing number of replacement engines were diesel-electric; the count of such locomotives rose from 621 in 1929 to 895 in 1941 (1944 STATAB, Table 525, p. 473)., while the average tractive power of the remaining steam engines increased from 44,801 to 51,217 pounds. A small but increasing number of the replacement engines were diesel electric. Annual freight car data show continuous decumulation from 1920 through 1939, with the exception of 1924-26. Over the same period, aggregate freight car capacity in kilotons shrank from 105,411 to 85,682 (1937 STATAB,

[3]The difference between Kendrick's capital input decline rate of .47 and the rate of decline based on the latest BEA data (.69) is .22 percent per year, which, with a .25 weight on capital in the growth accounting equation, would add .055 percent per year to the sector's TFP growth rate.

Table 427, p. 372; 1944 STATABS, Table 523, p. 472). But the replacement cars were bigger; average capacity rose from 46.3 to 50.3 tons between 1929 and 1941. Passenger car decumulation is modest through 1930, then increases dramatically through 1933. There is some recovery to lower rates of decumulation, particularly after 1935, but the number of passenger cars does not grow again until 1941 (Figure 5). Numbers fell from 53,838 in 1929 to 38,344 in 1941. The number of railroad employees declines moderately in the 1920s, then precipitously in the 1930s (Figure 6). Bringing together all of these data on labor and capital inputs, we have a system undergoing wrenching rationalization, rationalization midwifed by the economic downturn and the threat or actuality of receivership.

Figures 7 and 9 provide data on freight car miles and millions of passenger miles. Despite a net stock of structures that had fallen 6 percent since its peak in 1931, in spite of a labor force that was 31 percent smaller than it had been in 1929, and in spite of the fact that the real stock of railroad capital was a full one third lower than it had been in 1929, revenue ton miles were 6 percent greater in 1941 than 1929.

The data on passenger miles show steadily declining output by this measure throughout the 1920s, testimony to the growing threat to passenger traffic posed by the automobile, and a sharp drop to 1933. But 1941 passenger miles were within 6 percent of carriage in 1929. It is clear that since more freight was carried with many fewer freight cars, a substantial portion of the railway sector's productivity gains came from increases in freight car capacity utilization rates, which generates big increases in capital productivity. The ability to carry more freight and about the name number of passengers with much reduced numbers of locomotives, freight cars and passenger cars also reduced

the demand for railway structures: maintenance sheds, sidings, roundhouses, etc., which was serendipitous since the financing for expanding the stock of structures was not areadily available. The U.S. railroad system was able in 1941 to carry more freight and almost as many passengers as it did in 1929 with substantially reduced inputs of labor and capital. Definitionally, that means big increases in both labor productivity and TFP. By the end of the Depression, the US rail system was in much better shape than it had been at the start of the First World War, and was able to cope with huge increases in both passenger and freight traffic during the Second World War. Figures 7-9 include data on output over the war years. If one measures from 1929 through 1942, using Kendrick's data, TFP in the sector grows by 4.48 percent per year.

Table 1 allows a closer examination of trends in and contributors to productivity increase. It calculates the percent change in a variety of input, output and physical productivity measures between 1919 and 1929, 1929 and 1941, and 1929 and 1942. It also reports the underlying data, as well as aggregate economic data for 1929, 1941, and 1942. 1942 is the first year of full scale war mobilization, and one can see in the aggregate data the partial crowding out of consumption and investment as a result of the doubling of government expenditure. Still, civilian unemployment averaged 4.7 percent for the year, and the distortions for the economy were not as extreme as in 1943 and 1944. Therefore, there is some merit in calculating productivity growth in railroads between 1929 and 1942 as well as 1941, since the output gap in 1942 is closer to what it was in percentage terms in 1929. Also, since we are examining physical productivity measures, the distortions in pricing and valuation associated with wartime are somewhat less of a concern.

What these data show is that, overall, in spite of or perhaps in part because of the trying times, railroad productivity growth was significantly stronger across the Depression years than it had been in the 1920s. The most important measure of physical productivity is revenue ton miles per freight car, which grew 28.1 percent between 1919 and 1929, 42.3 percent from 1929 to 1941, and 86.5 percent between 1929 and 1942. Let's look more closely at what underlay the Depression era increases. The total number of miles traversed by loaded freight cars in 1941 was approximately the same as it had been in 1929. The big driver of productivity improvement was that the number of cars had declined 25.6 percent. The average capacity of each car was somewhat greater – it had grown from 46.3 to 50.3 tons, making it easier to achieve a 6.1 percent increase in tons of revenue freight per loaded car. Overall, we can deduce that the average speed of each freight car, (a function of average time stopped and average speed while in motion) had increased, since if it had remained the same as it had been in 1929, the 25.6 percent decline in the number of cars would have reduced total freight car miles by a comparable percentage. We also know that the number of freight car loadings in thousands declined from 52,828 in 1929 to 42,352 in 1941; freight traveled on average a longer distance, reflecting the inroads of trucking in shorter hauls.

In contrast, between 1919 and 1929, the number of cars stayed about the same, but total miles traversed by freight cars rose. Note, however, that miles booked by emkpty cars increased much faster than loaded miles during the 1920s, whereas between 1929 and 1941, while the total number of loaded miles remained unchanged, unloaded miles dropped. This decline is another reflection of logistical improvement, in part made possible by the growth of Western states as centers of consumption as well as production.

An alternate measure of the physical productivity of freight haulage is ton miles per mile of first track. This grows more strongly in the 1920s than during the Depression years, although if one measures to 1942 the reverse is true. Ton miles per employee, a rough measure of labor productivity in freight haulage, grew 41.9 percent during the 1920s, but 55.1 percent during the Depression, 86.8 percent if one measures to 1942.

Passenger miles per passenger car declines 19.6 percent during the 1920s, but rises sharply across the Depression years – 32.6 percent measuring to 1941, 141.7 percent measuring to 1942. Finally, passenger miles per employee, which declined almost twelve percent during the 1920s, rose 37.9 percent across the Depression years, 126.3 percent measuring through 1942.

Conclusion

The Depression era history of the US rail system provides a compelling example of the operation of the adversity/hysteresis effect. Faced with tough times in the form of radically changing demand conditions, crushing debt burdens, and lack of access to more capital, railroad organizations changed their operating procedures, introduced new technologies, and reduced their trackage, rolling stock and employees, in most cases quite dramatically. In the face of these cuts, output nonetheless grew modestly to the beginning of the war and rapidly in it. It is true that the sector faced tough times in the quarter century following the war as it struggled with the continued erosion of its passenger business and the reality that trucking also threatened its long haul freight revenues. But it emerged by the last decades of the twentieth century in relatively good shape, once again displaying rapid productivity growth.

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Table 1
Percent Change in Inputs, Outputs, and Productivity, US Railroad Sector.

					Percent Change		
	1919	1929	1941	1942	1919-29	1929-41	1929-42
Inputs							
Employees	1,960,439	1,694,042	1,159,025	1,291,000	-13.6	-31.6	-24.8
Locomotives	68,977	61,257	44,375	44,671	-11.2	-27.6	-27.1
Freight Cars	2,426,889	2,323,683	1,732,673	1,773,735	-4.3	-25.5	-23.7
Passenger Cars	56,920	53,888	38,334	38,445	-5.3	-28.9	-28.7
Miles of first Track	263,707	262,546	245,240	242,744	-0.4	-6.6	-7.5
Outputs							
Revenue Ton Miles (millions)	367,161	450,189	477,576	640,992	22.6	6.1	42.4
Freight Car miles (loaded) (thousands)	14,273,422	18,169,012	18,171,979	21,535,673	27.3	0.0	18.5
Freight Car miles (unloaded) (thousands)	6,531,570	10,805,302	10,251,079	12,755,362	65.4	-5.1	18.0
Passenger Miles (millions)	40,838	31,165	29,406	53,747	-23.7	-5.6	72.5
Physical Productivity Measures							
Ton Miles per Freight Car	0.151	0.194	0.276	0.361	28.1	42.3	86.5
Tons of Revenue Freight per loaded car	25.72	24.78	26.28	29.76	-3.7	6.1	20.1
Average Miles per car per day	23.0	32.3	40.6	46.3	40.4	25.7	43.3
Average Freight Car capacity (tons)	41.9	46.3	50.3	50.5	10.5	8.6	9.1
Averrage Freight car speed (mph)	0.979	1.459	1.920	2.263	49.1	31.6	55.0
Number of freight car loadings (thousands)	41,832	52,828	42,352	42,771	26.3	-19.8	-19.0
Average haul, revenue freight (miles)	309	317	369	428	2.8	16.2	34.9
Ton Miles Per Mile of First Track	1.392	1.715	1.947	2.641	23.2	13.6	54.0
Passenger Miles per Passenger car	0.717	0.578	0.767	1.398	-19.4	32.6	141.7
Ton Miles per Employee	0.187	0.266	0.412	0.497	41.9	55.1	86.8
Passenger Miles per Employee	0.021	0.018	0.025	0.042	-11.7	37.9	126.3

Aggregate Economic Indicators					
Unemployment rate	3.2	9.9	4.7		
Real GDP (billions of chained 1937 dollars)	87.2	122.1	144.7	40.0	65.9
Real Gross Private Domestic Investment	12.2	17.6	9.3	44.3	-23.8
Real Government Consumption and Investment	9.2	25.6	60.3	178.3	555.4
Real Consumption	63.0	78.2	76.5	24.3	21.4

Sources: Statistical Abstract of the United States, 1937, 1944, 1947; NIPA Table 1.1.6A.

Figure 1
Mileage of Railroads Under Receivership

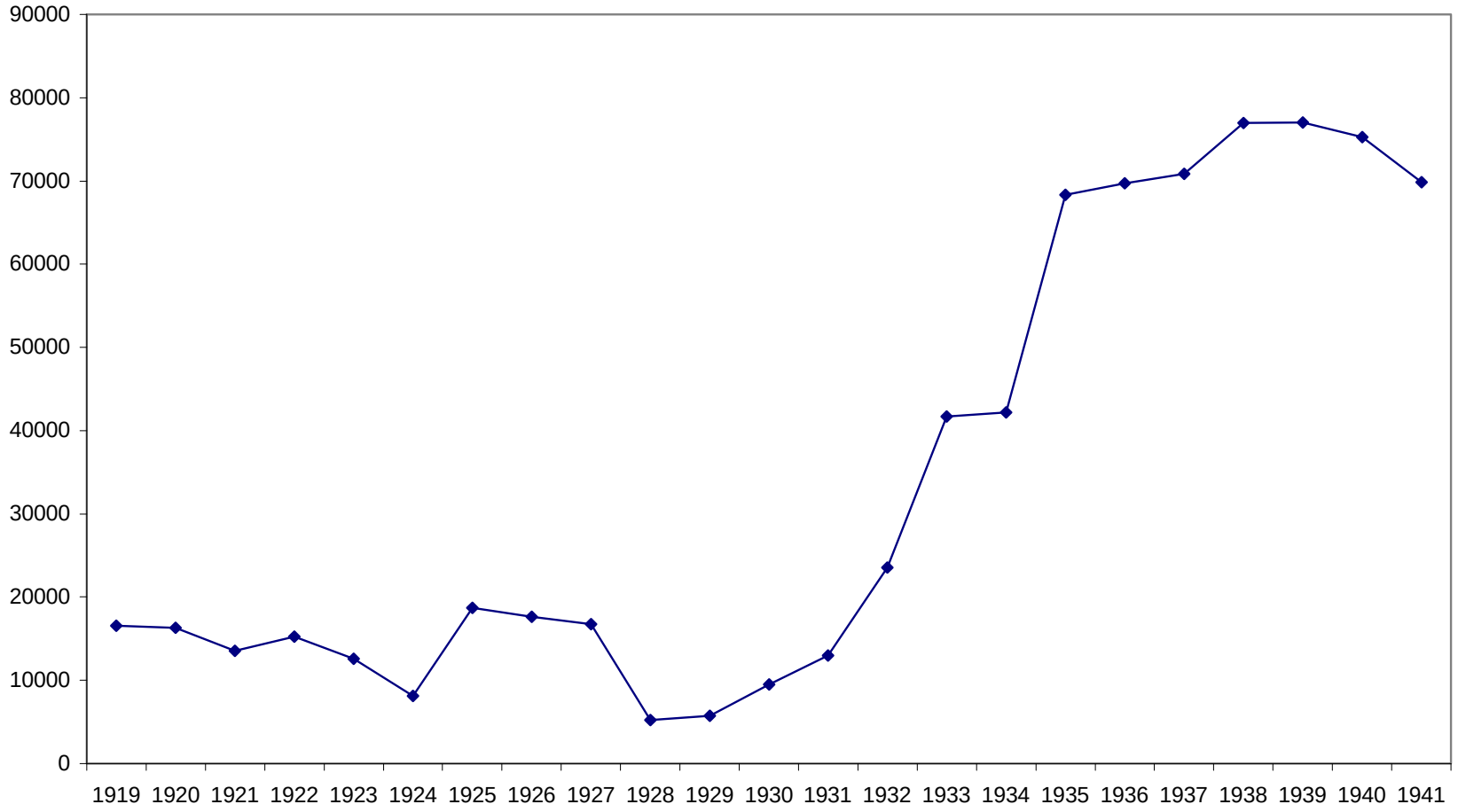

Figure 2
Gross Investment in Railroad Equipment and Structures

Figure 3
Locomotives Installed and Retired, 1919-41

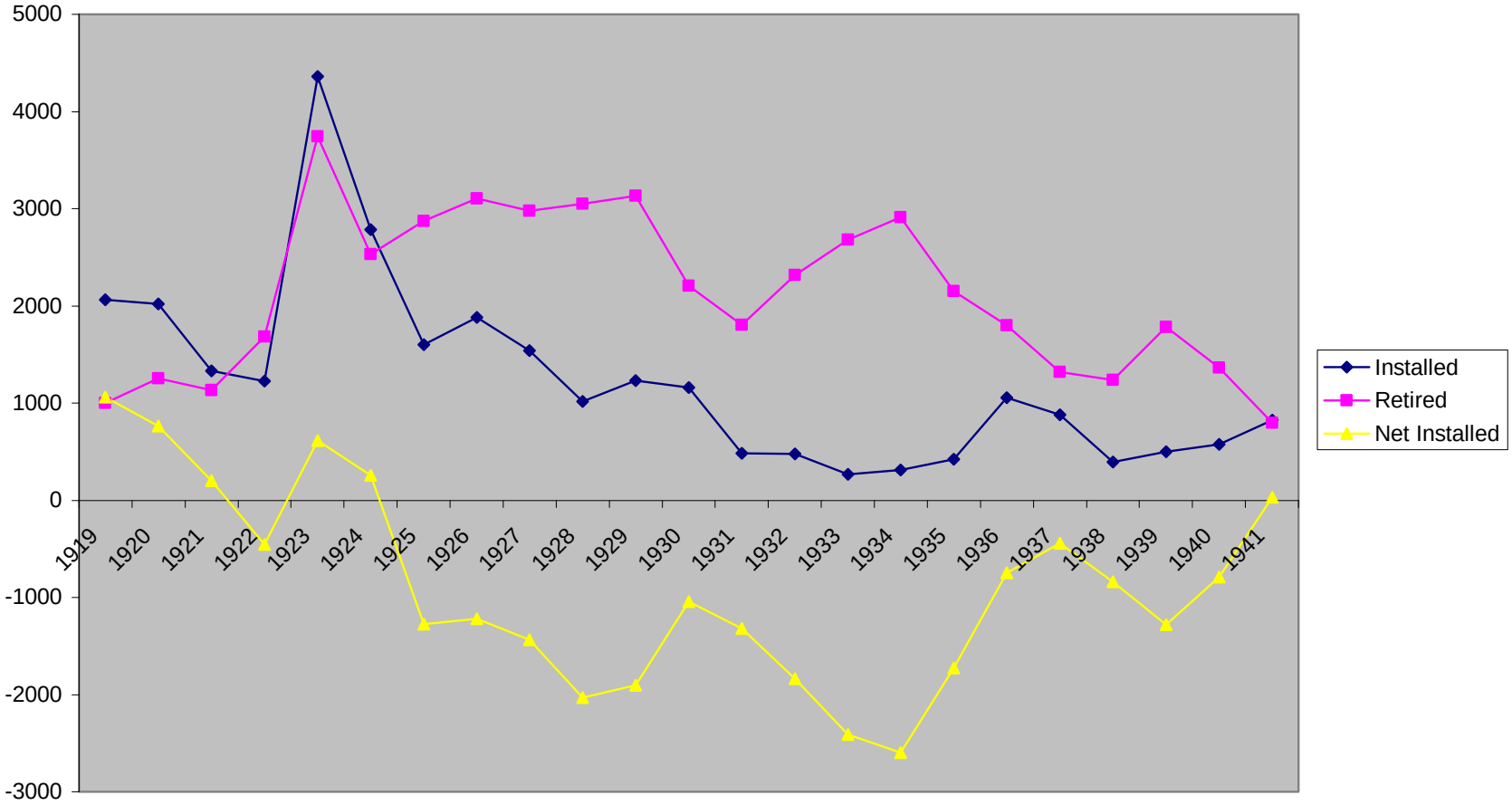

Figure 4
Freignt Cars Installed and Retired, 1919-41

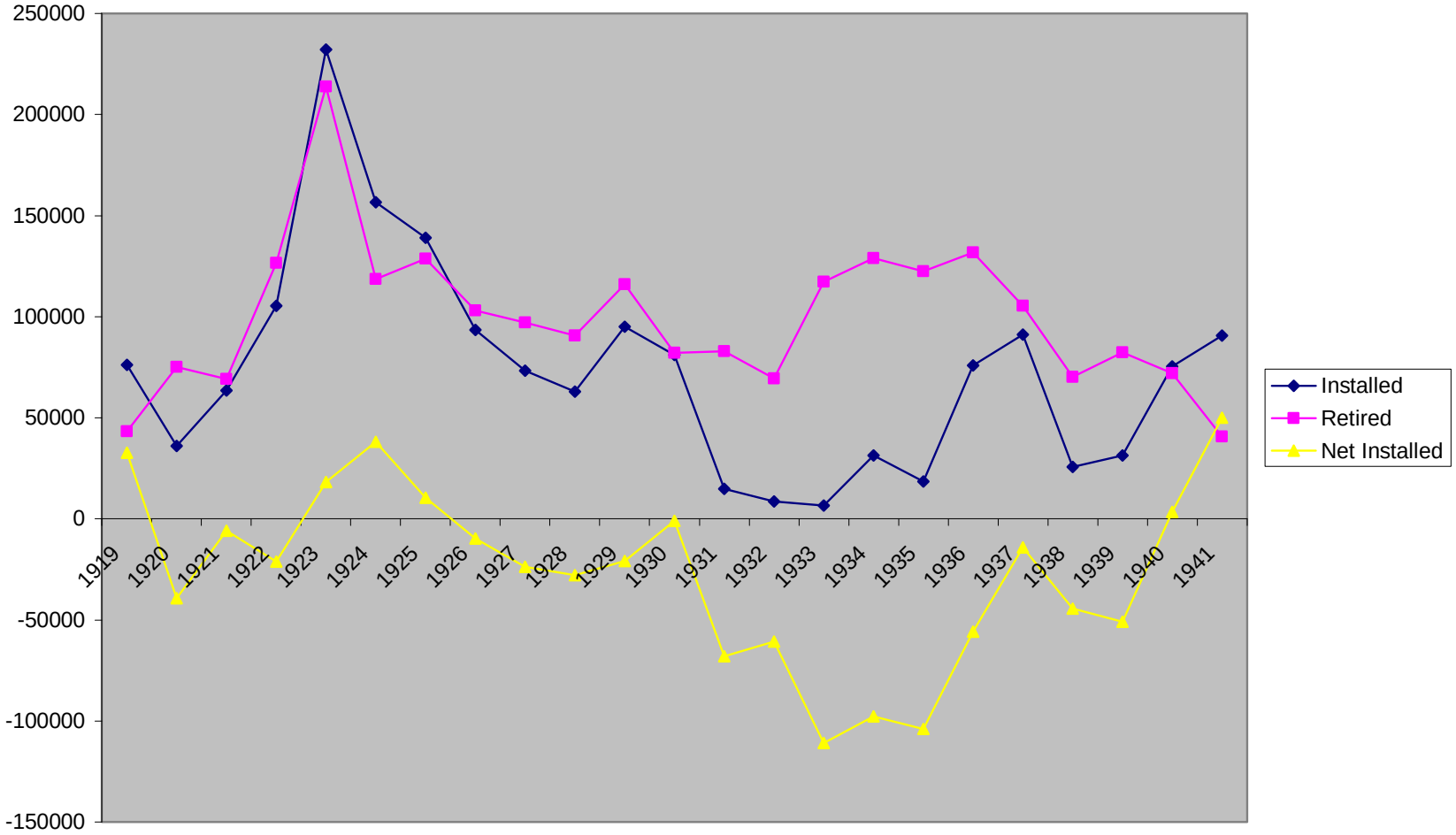

Figure 5
Railroad Passenger Cars Installed and Retired, 1919-41

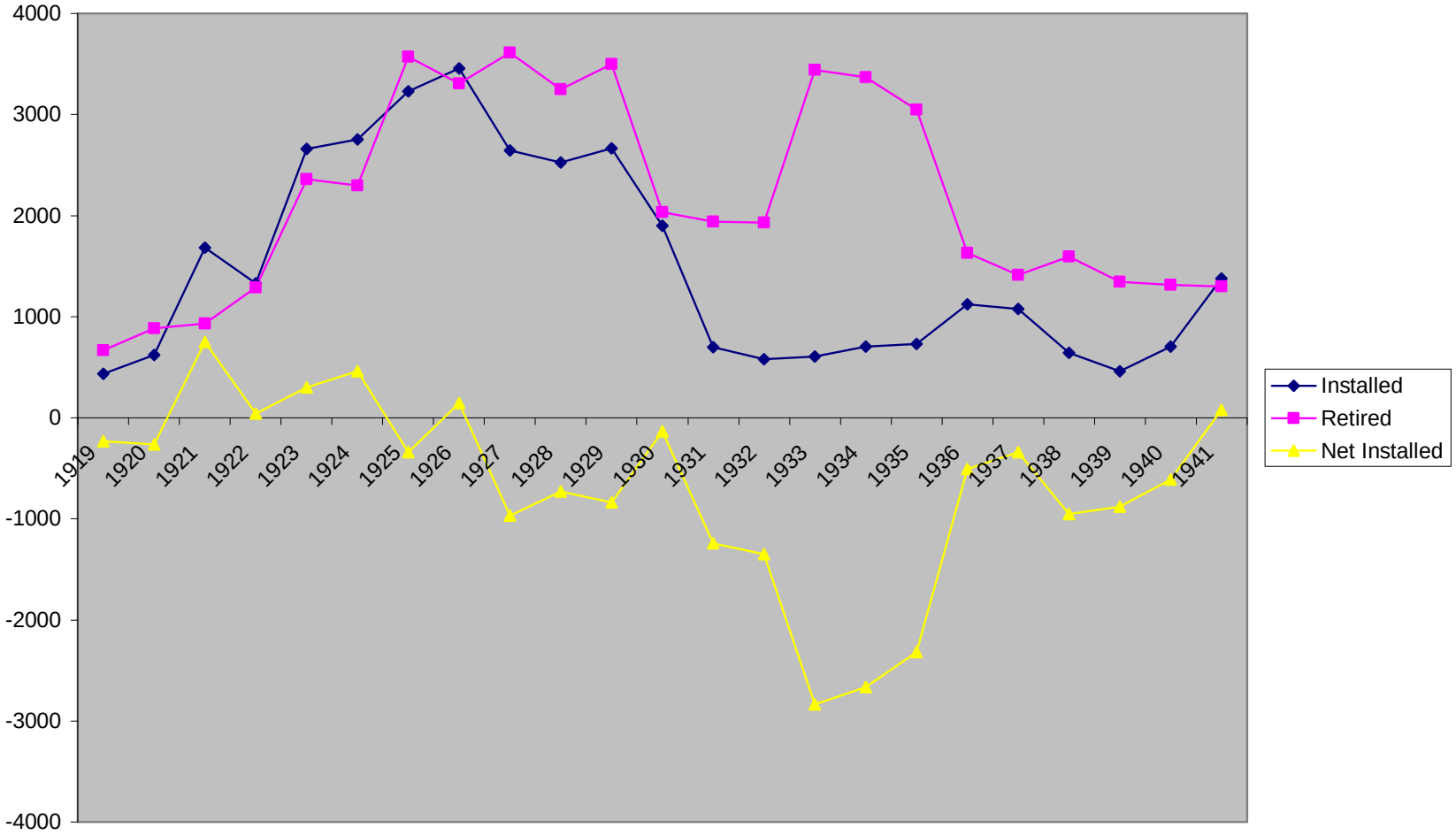

Figure 6
Railroad Employees, 1919-41

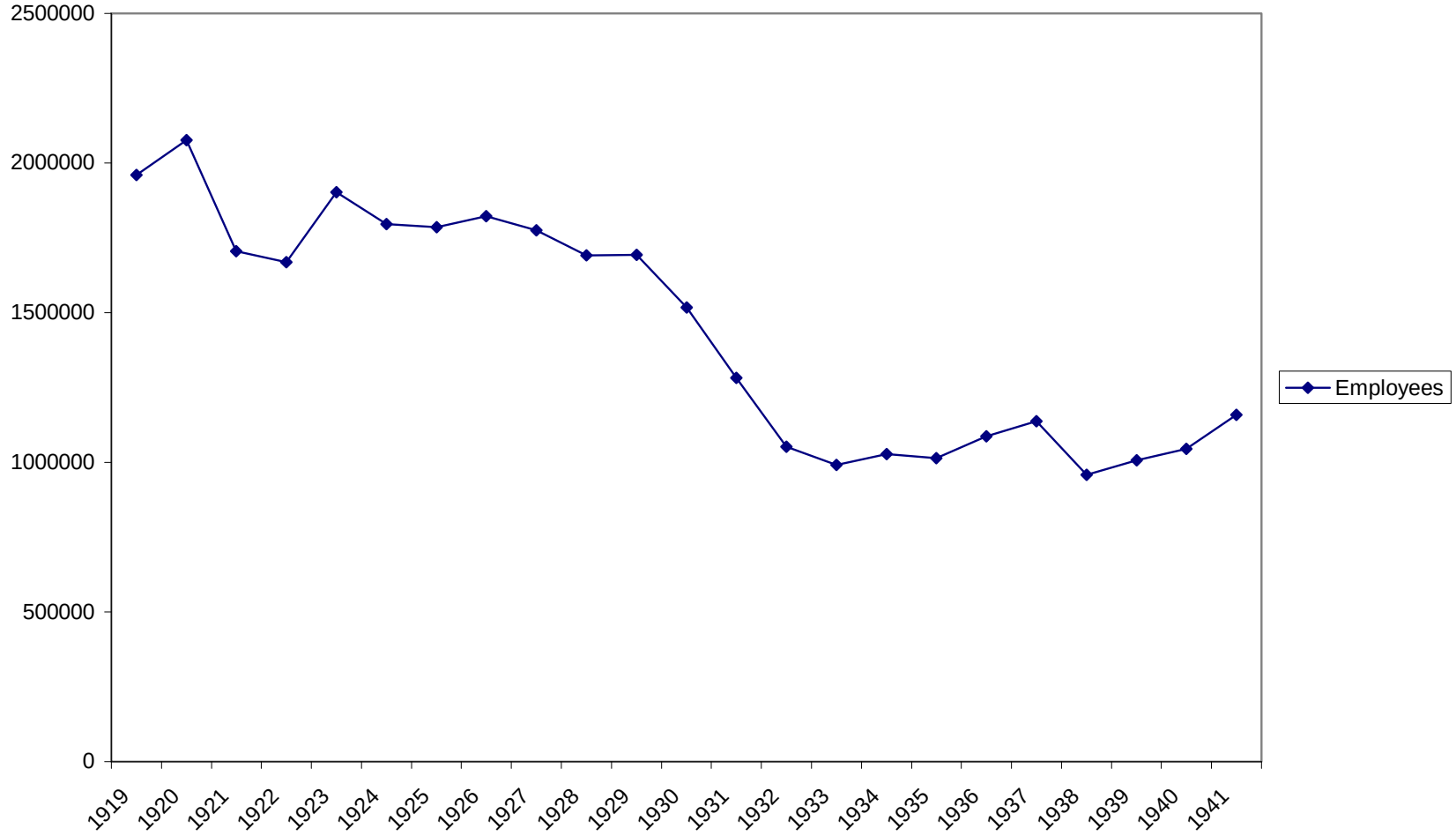

Figure 7
Railroad Freight Car miles, 1920-46

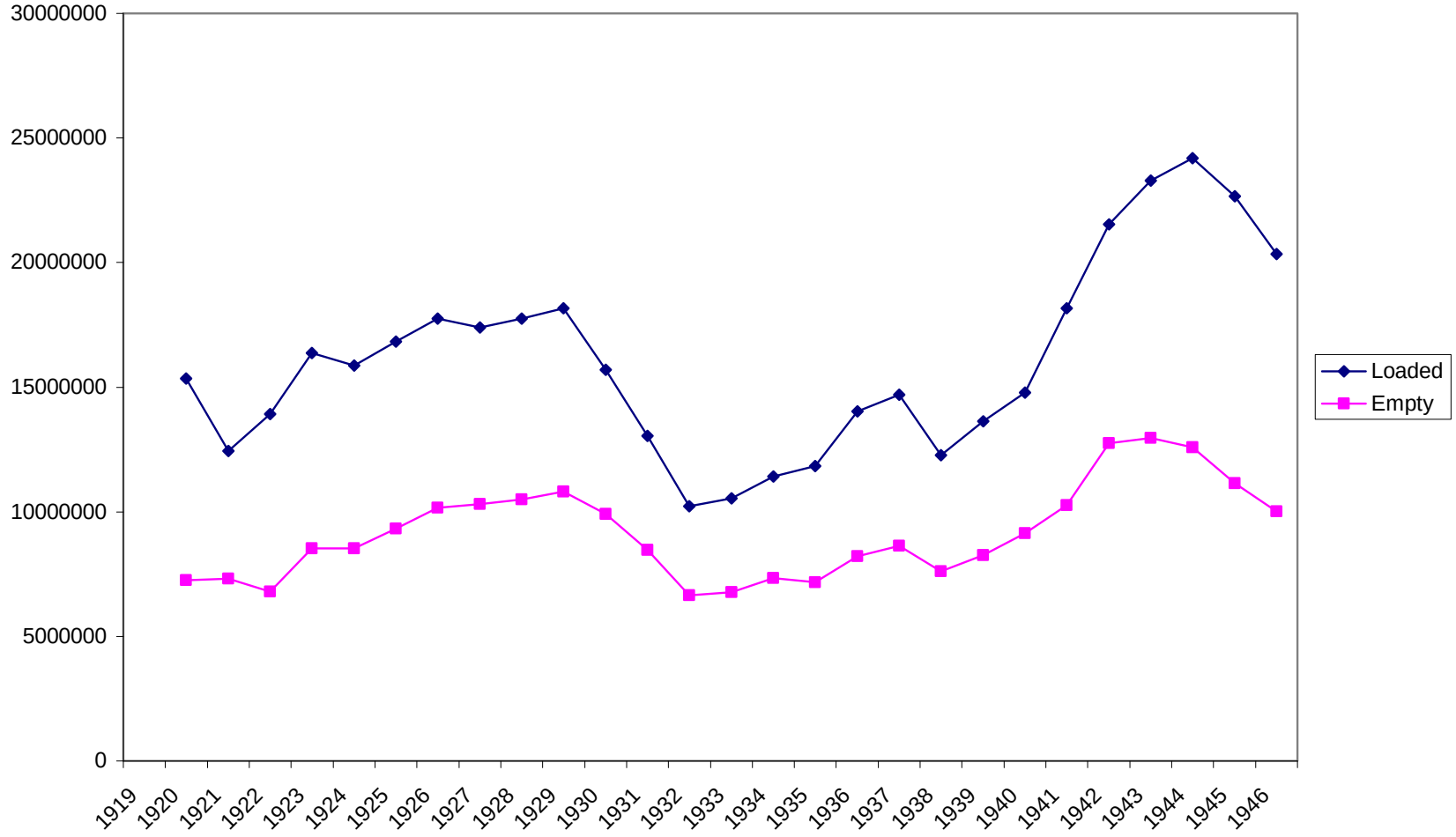

Figure 8
Revenue Freight Ton miles

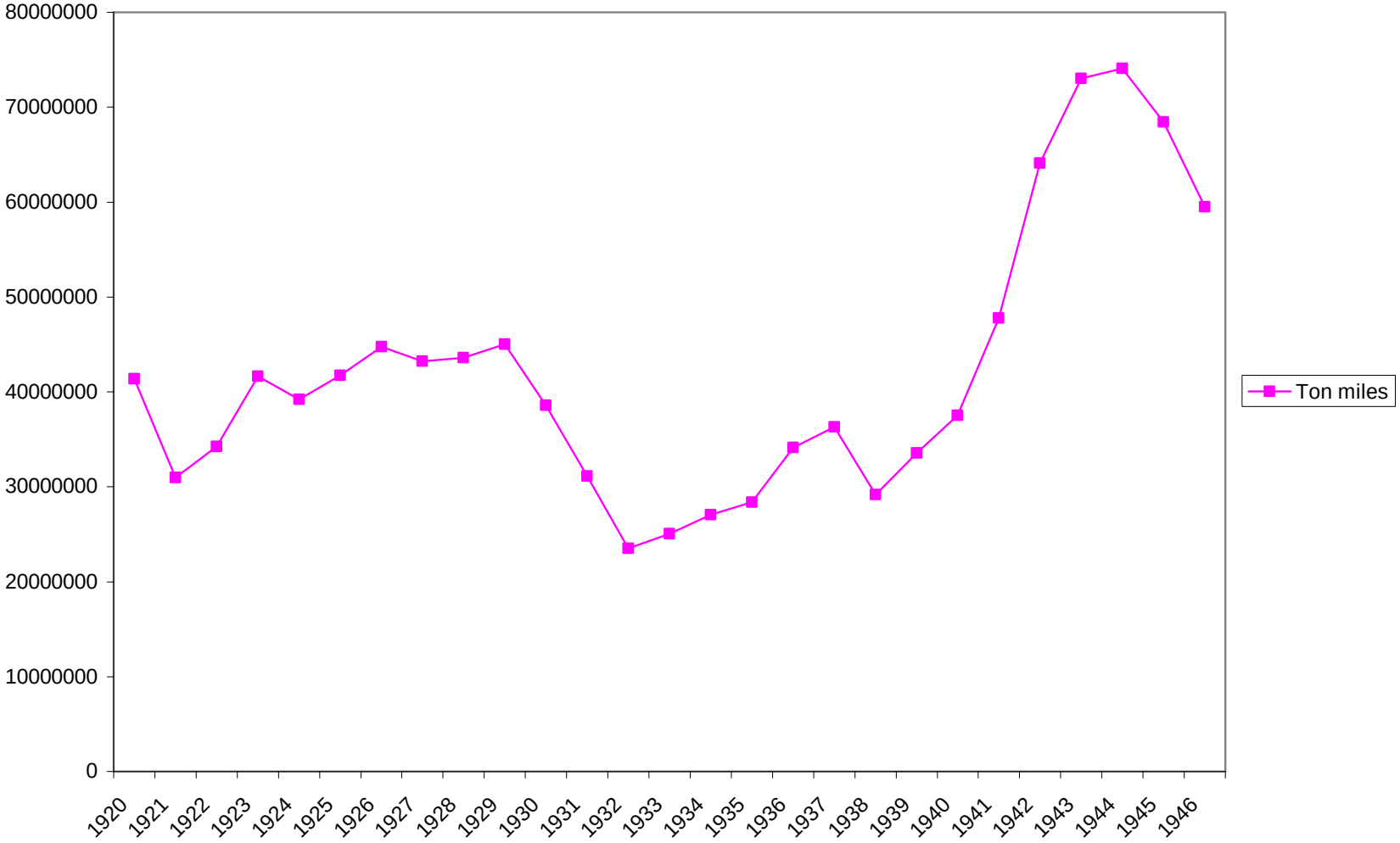

Figure 9
Railroad Passenger Miles, 1919-46