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Getting in the Scrap: the Salvage Drives of World War II

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Abstract

During World War II Americans were asked to salvage a long list of materials for the war effort including paper, tin, iron and steel, rubber, and even silk stockings and cooking fat. Stories about the salvage drives have become a staple in both popular and scholarly histories of the home front, and in film documentaries, because the drives appear to illustrate the potential importance of non-economic motives such as patriotism and community spirit. Here I reexamine the major drives, especially the iron and steel and rubber drives. Despite the propaganda that accompanied them, the drives were able to increase scrap collections only by relatively small margins above what would have been collected during prosperous peacetime periods. The impact of the familiar calculus of profit and loss, and the impact of the maneuvering of special interests for advantage, moreover, can be seen at every turn. It turns out that the scrap drives, and the propaganda and patriotism that accompanied them, had a far more limited impact on the economy than might be imagined from the enthusiastic portrayal of them in the historical literature. While the impact of the drives on the economy was limited, the impact of the drives on civilian morale, may well have been substantial.

Getting in the Scrap: The Salvage Drives of World War II

Economics is a very unsatisfactory science. But it would have to be much more unsatisfactory than it is if such an event as a war, however extensive and destructive, sufficed to upset its teaching. (Joseph Schumpeter 1954, 1146)

I. The Conventional View of the Salvage Drives

During World War II the public was called upon repeatedly to salvage for the war effort: tin, aluminum, iron and steel, paper, rubber, even cooking fat. Propaganda campaigns run by the Office of War Information stressed the importance of the drives. In peacetime it was just the family kitchen; now it was a combination "frontline bunker and rear-echelon miniature war plant." Explaining the conversion factors drove the point home. One pound of fat contained enough glycerin to make a pound of black powder, enough for six 75-mm shells. Twenty three hundred old nylon stockings contained enough nylon to make one parachute. Thirty thousand razor blades contained enough steel to make fifty 30-caliber machine guns. (Lingeman 1970, 254-55).

The salvage drives are mentioned frequently in popular histories of the war. Film documentaries about the home front and school textbooks seldom fail to mention them. The salvage drives also appear frequently in scholarly treatments. One of the best recent histories of the war is William L. O'Neill's A Democracy at War. Although, O'Neill notes some problems in the scrap

drives, he lavishes praise on the Nebraska scrap drive of 1942.¹

The most successful state drive yet, the Nebraska model was widely copied, demonstrating that the will was there and could be mobilized with inventive planning. If the weakness of democracy was inefficient government, the strength was volunteerism, especially when it exploited the national love of competition.

O'Neil's comment, I believe, suggests the reason that historians are so attracted to the drives. The stories seem to say that something happened that could only have happened through voluntary community action. Market incentives were not important, and government played only an enabling role. Community spirit was the key.

Such stories pose a familiar challenge to economic historians. The models that economic historians normally explain behavior as rational responses to incentives. But non-economists challenge this approach by maintaining that these models fail to take into account a wide variety of non-pecuniary variables such as community spirit. Wars provide a natural test. If non-pecuniary motives can override pecuniary motives at any time, then surely this must be true during wars -- especially World War II, when people were constantly being asked to lay aside their personal interests in the interest of patriotism.

Patriotism, of course, might have influenced efforts and decisions at many points in the war economy. We cannot

1 This drive, as O'Neill notes, made use of considerable incentives. Prizes worth up to \$2,000 in war bonds were given to individuals and organizations who collected the most scrap.

investigate all of them. But if there were any events in which patriotism was evoked on a large scale, it was in the scrap drives. They occurred in the darkest hours of the war, when victory appeared far from inevitable. The press and the newly created Office of War Information explicitly made efforts to invoke patriotic feelings. If patriotism was a potent magic that revoked ordinary economic constraints, then surely we should observe it in this case.

Below I will look in more detail at four drives: the old stocking drive, the fat salvage drive, the metal drives (principally iron and steel), and especially the rubber drive. The questions are simple. Why were voluntary drives used to supplement market mechanisms? How successful were the drives? And how were the drives influenced by the economic constraints faced by the participants? My purpose is not to denigrate the spirit of self-sacrifice that motivated these drives, or to deny that they had any effect. But, I do intend to challenge the idea that the scrap drives suggest that normal economic analysis needs to be jettisoned "for the duration."

II. Old Stockings²

Before the war silk came to the United States largely from Japan, with smaller amounts from China and other countries. It

² This section is based largely on Walton (1945). Walton was director of the Textile, Clothing, and Leather Division of the War Production Board.

had two important military uses: parachutes and powder bags. Its lightweight, strength, and the ease with which it can be folded and unfolded without leaving a crease made it ideal for parachutes. When the War began experiments were just underway to make parachutes out of nylon. Nylon proved superior and, as it turned out, almost all parachutes produced during the war were made of nylon. Silk was also used for the bags that held powder behind artillery shells, especially in large naval guns. Silk burned completely whereas bags made of other fibers left glowing embers behind. Eventually, ways were found to make satisfactory bags from cotton, wool, and rayon.

Japan limited its shipments of silk to the United States in 1941, making it difficult to accumulate stocks, and embargoed all shipments shortly before Pearl Harbor. With silk supplies from Japan embargoed, a salvage drive to bring in used silk (and nylon) stockings seemed the thing to do. Indeed, silk and nylon stocking drives arose spontaneously. One spontaneous drive in Dallas Texas yielded some 662 pounds of worn stockings. Unfortunately, when the war began there were no processes available for reclaiming used silk or nylon. Experts at the War Production Board felt that it was only a matter of time before such processes were developed. But until proof was available, the military would not accept delivery of used stockings. All that the War Production Board could do was write polite letters telling the collectors that they could not use the stockings. (Walton 1945, 177).

Eventually, methods were developed for recycling worn silk and nylon stockings. On November 15, 1942 the War Production Board launched an official drive which was continued until March 15, 1943, when the supply had largely dried up. The drive brought in an impressive amount of stockings, some 880,000 pounds, about one pair for every 2.7 women.

How seriously the War Production Board took the drive compared with its other responsibilities, however, is open to question. On the first day of the drive the textile division heard stories about women turning in used stockings and then buying new ones. (Walton 1945, 178). The textile division immediately issued a directive advising women to turn in only stockings that were completely worn out, so that there would be no increase in the demand for new stockings. Since at this time new stockings were being made mainly of cotton and rayon, it is clear that the purpose of the directive was to prevent the possibility that some consumers would face empty shelves for new non-nylon stockings. Obviously, had the textile division considered the used silk and nylon to be recovered crucial to the war effort, they would have asked consumers to turn in all stockings containing silk and nylon, whether usable or not.³

3 Indeed, in the months leading up to the drive the textile division had encouraged the mills to make stockings containing silk from inventories of opened bales. Had they strongly believed that silk was crucial to the war effort, and had they believed that ways would be found to recover silk from opened bales or from completed stockings, they could have commandeered all stocks in the hands of dealers.

III. Cooking Fat⁴

During the war women -- it was universally assumed that propaganda aimed at the home should be aimed at women -- were asked to save cooking fat. The fat was then exchanged at butcher shops for red ration points and cash. The propaganda explained that the fat so saved contributed to the war effort because fat was the source of glycerin, a key ingredient in explosives. As one poster put it "...fat makes glycerin. And glycerin makes explosives for us and our allies -- explosives to down Axis planes, stop their tanks, sink their ships." (Cohen 1991, 111)

In fact, the demand for glycerin derived from the demand for explosives had nothing to do with the fat salvage drive. Only a minute proportion of U.S. animal fat production was needed for this purpose (the multiplier effect!), and munitions makers could easily outbid rivals for this small amount.

Rather the fat salvage drive was organized and financed by the soap makers. Soap production was high during the war by prewar standards. (Russel 1947, 248). And fat supplies were also relatively abundant, especially later in the war. By January of 1944, lard was so abundant that the government was having storage difficulties. (Fantin 1947, 209). But price controls meant that there was excess demand for soap. Early in the war (organizational meetings for the drive began in April 1942) soap

⁴ This section is based on Russell (1947).

makers feared that if soap were rationed, then some of the consumers forced to cut their use of soap during the war would learn that they could do with less. Anything that could avoid the need to ration soap would help prevent the spoilage of postwar markets. Hence the plan organized by the soap makers, to offer consumers red points in exchange for fat.

From the beginning there was some opposition to the plan. The Office of Price Administration was concerned that the fat salvage plan would produce an excess supply of ration points, and would undermine the rationing program (Russell 1947, 239). Indeed, not all of the fat renderers favored the plan. The Eastern Melter's Association was opposed. Nevertheless, at a meeting on November 22, 1943 the Office of Price Administration agreed to pay two red points and 2 cents for each pound of fat. The program was announced in December 1943.

The advertising drive created by the American Fat Salvage Committee was financed by the soap makers. It was so aggressive in linking fat salvage to military uses, that Chester Bowles, the head of the Office of Price Administration, wrote to Lever Brothers complaining about the misleading nature of the campaign. (Russell 1947, 252). The campaign played no positive role in the mobilization of resources. However, it may have had a positive effect on the morale of people who could not otherwise find a way in their daily lives of contributing to the war effort.

IV. Metals

A variety of metals were collected during the war. One of the first drives was for aluminum. In July 1941 the Office of Production Management, in the midst of widespread concern about the adequacy of the supply of aluminum for the aircraft program, announced a two-week drive to collect aluminum cookware and other items. The response was unforgettable: coffeepots, frying pans, skillets, stew pots, cocktail shakers, ice-cube forms, artificial legs, cigar tubes, watch cases, and radio parts. "In Lubbock, Texas, a likeness of Adolph Hitler was placed in the middle of the courthouse square as a target for the pots and pans hurled by citizens." (Goodwin 1994, 260)

Unfortunately, it soon came to light that only virgin aluminum was suitable for aircraft. The pots and pans collected in the drive were made into -- pots and pans. Presumably, some of the families that participated enthusiastically in the aluminum drive were forced to buy new pots and pans made from the ones they had donated. (O'Neill 1992, 131; Goodwin 1994, 260-61).

The aluminum drive, like the others, undoubtedly helped shape public opinion and mobilize public spirit. According to Doris Kearns Goodwin, what Roosevelt had accomplished with the aluminum drive "was nothing less than an exhibition of the dormant energies of patriotic democracy." (Goodwin 1994, 261).

The impression that unprecedented amounts of scrap were collected is based on stories about the types of things

sacrificed to the war effort. In New York many towns donated the cannons on the town square, some dating back to the Civil War. And at Fort Ticonderoga, the Revolutionary War operation in which Henry Knox retrieved the cannons for the Continental Army was reenacted, and the cannon were donated to the scrap drive. (Hoopes 1977, 146-47). But such stories need to be viewed in context. Figure 1 shows iron and steel scrap purchased from American dealers for domestic consumption and for export. The plot can be described as a strong upward trend, punctuated by recessions. The figure does show a local peak in the 1942. But that peak is smaller than might be inferred from tales about wartime scrap drives. Purchases in 1942 were only 9.04 percent above the level of 1937 and only 3.94 percent above 1941. Part of scrap purchases in those years was for export, much of it for export to Japan. Purchases in 1943 were 6.63 percent above 1937, and 1.52 percent above 1941. The wartime peaks in turn were substantially exceeded in the early postwar years, although, it is true, postwar salvage was made somewhat easier because large amounts of scrap were available in the form of surplus military equipment, ships, and industrial plant. Overall, the war years do not stand out from other peak years. Indeed, the consumption of scrap iron and steel during the war was actually a bit below the peak-to-peak trend.

The iron and steel scrap drives, to some extent, merely offset the effect of price controls on scrap collection. It may seem surprising that scrap prices were controlled. If iron and

steel scrap were crucial to the war effort, why not use prices to get in as much as possible, even if this could be supplemented by voluntary drives? But the Office of Price Administration looked at it differently. In their view, the important point was that the price of scrap was a component of the price of steel, which was in turn a strategic price in the war economy. If scrap prices were allowed to rise it would "start an inflationary price spiral whose consequences would have been disastrous for the stabilization program" (Benes 1947, 8). As a result of this focus, scrap prices were set at levels that, in a number of ways, discouraged collection.

First, and most important, the real price of scrap was allowed to decline in the war years. This can be seen in figure 2. The consequence was that number of small dealers, who were normally an important part of the mechanism for collecting scrap, "diminished sharply" (Benes 1947, 5). They were drawn into the war industries where wages were allowed to rise substantially. Perhaps some movement in this direction was inevitable. Many peddlers and small dealers probably viewed the war as an opportune moment to make a change they had long contemplated. But the falling real price for scrap could not have helped.

The Office of Price Administration, moreover, had considerable difficulty formulating lists of official prices for an industry characterized by a multitude of dealers, products, and shipping costs. Early experiments with prices controlled at the point of delivery gave way over time to an elaborate basing

point system. In October 1944, a shortage of scrap loomed, and was met by eliminating many restrictions on where, what, and to whom dealers could sell. (Benes 1947, 19-30)

V. Rubber

The Rubber drive was the most important. Japanese expansion cutoff the United States, and all her Allies, from their sources of natural rubber in Southeast Asia -- sources that had supplied ninety percent of U.S. raw rubber before the war -- raising the specter that the United States would not have sufficient rubber to equip her fighting forces.

The gap was closed, as table 1 reveals, in a number of ways. (1) Running down the stock of raw rubber. Stocks had been built up by heavy imports in 1940 and 1941. The Rubber Reserve Corporation founded in June 1940 had purchased much of this rubber. Initially, according to Herbert Feis (1947), he and like minded state department officials, had pushed for a very aggressive buying program, but were thwarted by Jesse Jones of the Reconstruction Finance Corporation who set tight limits on what the Rubber Reserve could pay. Eventually, when the rubber companies found themselves desperately bidding against each other, and outbidding the Rubber Reserve, the decision was reached to make the Rubber Reserve the sole buyer.

(2) Increasing production of natural rubber in areas controlled by the Allies. Sri Lanka was the major remaining

producer, and its output increased substantially. Attempts were also made to increase production in Liberia, to buy wild rubber in Latin America, and even to plant rubber producing crops such as guayule in the United States. Together, however, these efforts -- as can be seen in the low levels of imports in 1942 through 1945 -- produced only limited supplies of new rubber.

(3) Building synthetic rubber plants. The synthetic rubber program proved a success, and was providing substantial supplies of rubber by the fourth quarter of 1943. The Reconstruction Finance Corporation financed it.

(4) Cutting back consumption. Conservation of rubber occurred in a variety of ways. The military changed its specifications to minimize the use of rubber. Civilian production was quickly limited by a series of orders from the War Production Board. Most important, civilian production of automobile tires was prohibited for the first nine months of 1942. (Wendt 1947, 216-17). It is tempting to view the prohibition of tire production, and related orders, as important in pushing the industry into production for the military. But whether it was more the push from limitation orders or the pull from highly profitable war contracts would be hard to determine. After all, official government orders provided a useful excuse for producers who wanted to break relations with long-term customers.

One thing is certain, profits of the tire companies rose substantially during the war. Net income of the tire companies rose from \$54 million in 1940 (the best previous year was \$51

million in 1927) to a wartime record of \$312 million in 1943. (U.S. Department of Commerce, Rubber, 1950, 9). Evidently, there was ample incentive to convert to war production.

(5) Increasing production and consumption of reclaim. As can be seen in the last column of Table 1, consumption of reclaim was close to 40 percent of total consumption in the key years 1942 and 1943.

As it turned out the situation never became desperate, and the United States finished 1943 and 1944 with adequate stocks of rubber on hand. Nevertheless, the sense of urgency at the beginning of the war was understandable. When the war began no one knew how much rubber we would need each year, how long the war would last, or when and if the synthetic rubber program would be successful. The last line of the table, *1943, is drawn on the assumption that the synthetic rubber program was able to deliver only 50 percent more rubber in 1943 than 1942, rather than the increase by a factor of 10 that actually occurred. On this assumption, the stock of rubber on hand would have been exhausted.⁵

The normal flow of scrap rubber to the reclaimers fell precipitously after Pearl Harbor. Owners of scrap, and scrap dealers were holding on to scrap on the reasonable speculation that prices would soon rise. An agreement was quickly reached by

⁵ There was also the fear of sabotage. On October 11, 1941 a fire at a Firestone plant in Fall River Massachusetts -- naturally attributed to sabotage given the temper of the times -- destroyed what was estimated as 12 percent of the U.S. stockpile of rubber.

the reclaimers, by various government agencies, and by the petroleum industry, to keep the reclaimers supplied by embarking on a high profile scrap drive. The drive lasted from June 15 to July 10, 1942. It was kicked off by one of Roosevelt's fireside chats, and conducted throughout with much fanfare. The purpose of the drive was, undoubtedly, to bring in the scrap necessary to keep reclaimers going. It probably also had a propaganda purpose: by communicating to the public the urgency of the rubber shortage, the President paved the way for more restrictive measures such as gasoline rationing. (Goodwin 1994, 357).

As in the other drives the response was eye-catching: old tires, hot water bottles, rubber bands, and rubber duckies were sacrificed. Government officials vied to show their enthusiasm. Harold Ickes, the Petroleum Coordinator, denounced "hoarders" and in a well-publicized contretemps ordered that the floor mats in the Interior Department be scrapped. Unfortunately, he was later forced to admit that they weren't his to donate.

The drive is said to have produced approximately 400,000 long tons of scrap, and although some criticisms were made of the quality of the scrap procured, the industry took pride in the voluntary cooperation of its dealers, and of the resulting donations to charity. (Petroleum Industry War Council, 1943).

Rubber was bought at a penny a pound (\$20 per short ton) by filling stations. The Oil companies were in turn reimbursed at the rate of \$25 per ton by the Rubber Reserve Corporation. At the

same time the major reclaimers entered into an agreement with the Rubber Reserve to process the scrap with all costs reimbursed by the Rubber Reserve. Any "profits" they made were to be given to charity.

A penny per pound may sound like a token price. In fact, by historical standards it was a high *point-of-origin* price for scrap rubber. Although exact figures aren't available, one authority put the range of scrap prices between 1915 and 1940 at \$15 to \$30 per ton *delivered-at-Akron*, with the typical price around \$20 per short ton. (Ball 1947, 150).

One reason for setting a high point-of-origin price for scrap may simply have been a recognition that even in wartime incentives matter. An editorial in *Time Magazine* for June 8, 1942 noted that the Aluminum drive had been a mess partly because the junk dealers were not involved. And it pointed out that junk dealers were small businessmen who could not afford to donate their time to the drive. *Time* argued that the price of scrap rubber ought to be allowed to rise as high as \$50 or \$100 dollar per ton.⁶

When the drive ended it was thought likely that further rubber drives would be undertaken, but this did not happen. The Rubber Reserve maintained its buying price at \$25 per short ton until May 1943 when it was lowered to \$15 per short ton. This somewhat surprising decision suggests that by then scrap rubber

⁶ Quoted in Wolf (1943, pp. 56-7).

was no longer in short supply. On January 1, 1944 the industry was returned to private hands.⁷

The interest of the reclaimers and their customers in promoting a scrap drive was straightforward: more was better. The interest of the oil companies was indirect. Gasoline was abundant in most of the country, especially the Southwest, by prewar standards, and there was little reason on that account to ration. The exception was part of the Northeast where supplies brought by sea had been interrupted by German submarine activity. It was widely believed, however, that gasoline rationing (and low driving speeds) was crucial for conserving tires. The Baruch (1942) report on the rubber situation, issued shortly after the drive, but reflecting the consensus in Washington at the time of the drive, pushed for nationwide gasoline rationing and a 35 mile per hour speed limit to conserve tires. Thus, by promoting scrap rubber collection the oil companies hoped to increase the supply of rubber for civilian tires and limit the extent of gasoline rationing.

The most ambiguous position was that of the major scrap brokers. One reason for their willingness to become instruments of the government, undoubtedly, was the desire to escape being labeled war profiteers. The agreement signed between the Rubber

⁷ No one expected motorists to turn in new tires, even at a penny a pound. New, unmounted tires in the hands of the public were treated separately: it was required that they be transferred to the government and they were paid for through the "Idle Tire Purchase Program."

Reserve Corporation and the scrap brokers emphasized reimbursement for costs. And a history of the industry published by one of the major brokers in 1943 described the deal as being on an "out-and-out no profit basis" (Wolf 1943, 58). The goal of avoiding the charge of profiteering was only partially met -- the terms of the agreement with the government came in for criticism in the press -- but probably provided an incentive for entering the reimbursement arrangements. There may also have been some concern that the scrap collected in the drive would turn out to be low quality (the floor mats from the Interior Department) and costly to sort.

The decision to control prices of scrap rubber, and to rely on voluntary cooperation backed up by heavy subsidies, is also consistent with the broader theory of inflation, discussed in the preceding section, that price increases in bottleneck sectors tend to multiply and get out of control.

The rubber drive and subsequent purchases by the government brought in a great deal of scrap, and production and consumption of reclaim was high during the war. But as with iron and steel, the wartime experience needs to be put in perspective. Figure 3 plots consumption of reclaimed rubber from 1919 to 1954. Consumption was high during the war, as might be expected in a boom, but the peak is less than would be expected on the basis of stories about the rubber drive. Consumption was above 1928, the peak year in the 1920s, by 13 percent in 1941, 14 percent in 1942, and 31 percent in 1943. A comparison with the early postwar

years also suggests that the wartime performance was closer to the peacetime norm than might be inferred from breathless stories about wartime scrap drives.⁸ The 1943 peak was less than 2 percent above the first postwar peak in 1947; and it was 4 percent below the level reached in 1950 and 17 percent below the level reached in 1951 the first postwar peak, although the latter years were also war years.⁹ The wartime collections, as shown in figure 3, barely poke their way above the peak-to-peak trend.

Consumption of reclaim, which is the only series available for the interwar years, differs from production because of imports, exports, and additions to and subtractions from stocks. The practice in the reclaim industry, however, was to maintain relatively low inventories of unprocessed and processed scrap.¹⁰ Imports and exports were also relatively small, so relying mainly on consumption figures should not lead us far astray. Production figures are available from 1940 on. In 1946, the first postwar production peak, production of reclaim was 2.8 percent below

⁸ The postwar industry was, of course, somewhat different from the prewar industry. Much of the material available for reclaim now consisted of synthetic rubber, and the scrap heap was relatively depleted because wartime additions were at a low level.

⁹ The Korean War began suddenly in June 1950 when North Korea invaded South Korea. Concern about the rubber situation was, of course, much less because synthetic rubber was now a reality, and because natural rubber producing areas were not immediately in danger.

¹⁰ During 1942-1945 stocks of reclaim on hand at the end of the year averaged under 2 months consumption. Imports and exports were negligible.

production in 1943, the wartime peak. The Rubber Reserve Company, which purchased scrap and sold it to reclaimers during the war, reported the results of its operations in 1945. (U.S. Rubber Reserve Company, 1945, 57). All told it purchased 990,944 long tons of scrap and sold 828,288 to reclaimers. Thus, only about 12 percent failed to go through the reclaiming mills and much of this was low quality.

As figure 3 suggests, the best historical precedent for the rubber scrap drive in World War II is the drive in the mid-1920s, traditionally associated with the Stevenson Rubber Restriction Plan. The Plan, which became British law on November 1, 1922, was intended to boost raw rubber prices by restricting the output of British plantations in Malaya and Ceylon. It followed a period of low rubber prices which growers had tried to counteract unsuccessfully with voluntary plans. Initially, to judge by raw rubber prices, the Plan had mixed results. The Plan imposed a prohibitive tax when planters exported more than 60 percent of the amount sold in the year ending October 31, 1920. The allowable percent could be raised or lowered by 5 percent based on a scale tied to the London price of crude rubber. In the first years of operation prices sagged and the amount that could be exported before prohibitive taxation kicked in was lowered. But in 1925 heavy demand for rubber, produced by the introduction of the rubber-intensive balloon tire, ran into a supply restricted (at least to some degree) by the Stevenson Plan and

the result was the rapid increase of raw rubber prices.¹¹

Patriotism was invoked in the United States during the period of high rubber prices in the 1920s, so we don't have a patriotism-free comparison. Harvey Firestone reacted violently to the Stevenson Plan, and his company's advertisements proclaimed that "America Should Produce its Own Rubber." Firestone lobbied his fellow Ohioan, Warren Harding, for government support for American rubber plantations in the Western Hemisphere. Enthusiasm for action waned, however, when raw rubber prices retreated in 1922 and 1923. But the rapid increase of prices in 1925 led to new calls for action. In December 1925 Secretary of Commerce Hoover appealed to the public and to the manufacturers for cooperation in beating back high rubber prices through conservation and the creation of independent American supplies. Inevitably, a Congressional investigation was organized of "The Means and Methods of Control of Production and Export of Crude Rubber." When rubber prices broke in February 1926, Hoover took credit.¹²

It seems reasonable to suppose that the patriotic appeals of Hoover and other leaders helped motivate participants in the scrap drive. Nevertheless, it seems unlikely that patriotism in

¹¹ The Stevenson Plan is described in McFadyean (1944, 24-35).

¹² Wolf and Wolf (1936, 229-232) attribute the ultimate failure of the Stevenson Plan, which was terminated on November 1, 1928, to the effectiveness of the scrap drive, smuggling, and most important, the rapid growth of output in the Netherlands East Indies.

the 1920s could have been felt on the same scale as in the War because there was no threat to the nation's safety. Indeed, many people viewed Hoover's actions simply as grandstanding designed to improve his prospects for the White House.

The period of high consumption of reclaim associated with the Stevenson Restriction was shorter than the comparable period in World War II. It is conceivable, therefore, that World War II consumption levels were higher in the sense that they used a larger fraction of the available stock of discarded rubber -- the "scrap heap." Unfortunately, there are no reliable estimates of the size of the scrap heap. Estimates made at the beginning of the war differed widely. Figure 4 shows consumption of reclaim in each year as a percentage of my estimate of the scrap heap. The assumptions were that (1) rubber products were normally scrapped after three years, (2) that 75 percent of the original rubber was available for reclaim in the first year after scrapping, and (3) that any rubber not reclaimed deteriorated another 25 percent each year that it remained in the scrap heap. Figure 4 also shows an alternative, which assumes that normal scrapping did not occur from 1942 to 1944. On these assumptions the consumption of scrap during the war was on the same order as occurred during the period of high consumption of reclaim associated with the Stevenson Restriction.

Admittedly, any attempt to infer the size of the "scrap heap" is speculative. I tried a variety of measures, based on different assumptions about how the scrap heap was accumulated,

and the results were similar. The simple fact is that production from raw rubber in the late 1930s was much higher and the use of reclaim was much lower than in the early 1920s. So deflating by any measure of the scrap heap that depends on recent production from imported rubber will make consumption during the war even more similar to consumption during the Stevenson restriction than on the assumptions underlying figure 4.

A further indication that wartime consumption of reclaim was not out of line with what might have been expected in peacetime, is the capacity of the reclaimers. The Baruch report placed the capacity of the reclaimers in 1942, assuming intense utilization, at 350 thousand long tons. The Report, in line with its general policy of pushing every source to the maximum, called for a 20 percent increase in the capacity, and production of 400 thousand long tons in 1943. These projections were not met. But the important point for our purposes is that the amount of reclaim actually produced was within the existing capacity of the prewar industry. The wartime use of scrap, to put it differently, seems to have been consistent with industry expectations in the absence of the war.

The peak-to-peak trend line shown in figure 3, is perhaps the simplest way to show what would have happened in a peacetime boom. To get a (possibly) more realistic alternative I regressed consumption of reclaim on industrial production and the consumption of raw rubber (all measured as natural logarithms) and then forecasted wartime consumption of scrap based on the

wartime values of these variables. Industrial production was included as a proxy for demand. It is not ideal because the structure of demand changed dramatically during the war. But it appears to be the best alternative because it is likely to capture some of the tilt toward the industrial sector that occurred during the war. I didn't include prices; because measured prices were distorted by controls.

Figure 5 plots the price of reclaim relative to the price of natural rubber and the consumption of reclaim relative to consumption of natural rubber, both set equal to 100 in 1929. The prewar years show a normal relationship. Increases in the price of reclaim relative to the price of natural rubber produce decreases in the consumption of reclaim relative to consumption of natural rubber. Note particularly, the Stevenson restriction period, when the relative price of reclaim fell and its use intensified. During the war, however, reported prices of natural rubber (the Rubber Reserve's selling price) remain low relative to the price of reclaim, yet the use of reclaim soars. To some extent this relative price relationship is real, a reflection of the controls placed on rubber during the war, although the reported price of natural rubber may not reflect prices of raw rubber if resold.

The forecast assumes that price responses to real determinants of markets were "normal" during the war years. This is the assumption we want to make because we want to know what would have happened if there had been a similar shortage of raw

rubber in a world that had to rely on price incentives rather than patriotism to bring in the scrap.

The regression, estimated over the years 1919-1941, was

$$(1) \quad \text{RECLAIM} = 2.91 + 1.26\text{IP} + 0.40\text{RUBBER} \\ (1.25) \quad (3.51) \quad (1.68)$$

R^2 (adj.) .74

DW .40

where RECLAIM = the amount of reclaim consumed

IP = Industrial Production

RUBBER = the amount of natural rubber consumed

All variables were measured in natural logarithms. This regression has the honor of being the first that I ran. I tried a number of other specifications, including first differences. While it was fairly easy to find specifications that fit the prewar data better, and which produced more satisfactory Durbin-Watson statistics, almost all of these regressions forecasted improbably high or improbably low consumption of reclaim during the war.

In any event, figure 6 shows the amount predicted by equation (1), along with the amount predicted by the peak-to-peak trend, and the actual amounts consumed. The similarity between the wartime levels and the peak-to-peak trend emphasizes how moderate the wartime peak was. The predicted values from equation (1) exceed actual consumption from 1942 through 1944,

falling below only in 1945. We should not make too much of this in light of the high variance of predicted values from plausible specifications, but it does suggest that wartime consumption was well within the bounds of what might have been expected on the basis of prewar experience.

VI. What Can we Learn from the Salvage Drives?

The point of these stories is not that the salvage drives had no effect on, or were a hindrance to the war effort. For one thing, the psychological and political effects of the drives may have been important, even though these effects are difficult to specify and measure. The drives gave Americans on the home front a concrete way to display their support for the war, and may have solidified support for the war.

The economic effects of the drives, however, have been exaggerated. To be sure, the iron and steel drive and rubber drive probably made additional supplies available. But the additional amounts were of a much smaller order of magnitude than popular stories about wartime drives would lead one to believe.

Historians often describe the scrap drives as if the mobilization of large amounts of scrap was unique to the war. This was far from being the case. Scrap collection was an ancient, honorable, and efficient business that functioned in peace as well as war. The amount of iron and steel salvaged in 1942 was only 9 percent above the amount salvaged in 1937 the

prewar peak. The wartime rubber drive was an enlarged version of the drive that occurred in the late 1920s as a result of a sharp run-up in natural rubber prices. By 1950, moreover, more iron and steel scrap and more rubber scrap were being processed than during the peak war years. The scrap drives did not push scrap collections to spectacular heights.

The patriotism that surrounded the drives, moreover, did not erase the impact of conventional economic incentives. The fat drive was unnecessary, the product of special interests seeking a way around price controls and rationing. The lack of adequate price incentives confused the iron and steel scrap drive and made it less effective than it otherwise would have been. The rubber drive was more effective because this lesson was learned, and a high point-of-origin price for scrap was established.

Rather than demonstrating the importance of non-pecuniary motives and non-market means of production, the salvage drives demonstrate the limited ability of patriotism and community spirit to overcome technical constraints, or the tendency of people to respond to economic incentives.

Figure 1

Purchases of Iron and Steel Scrap
Gross Tons, 1935-1953

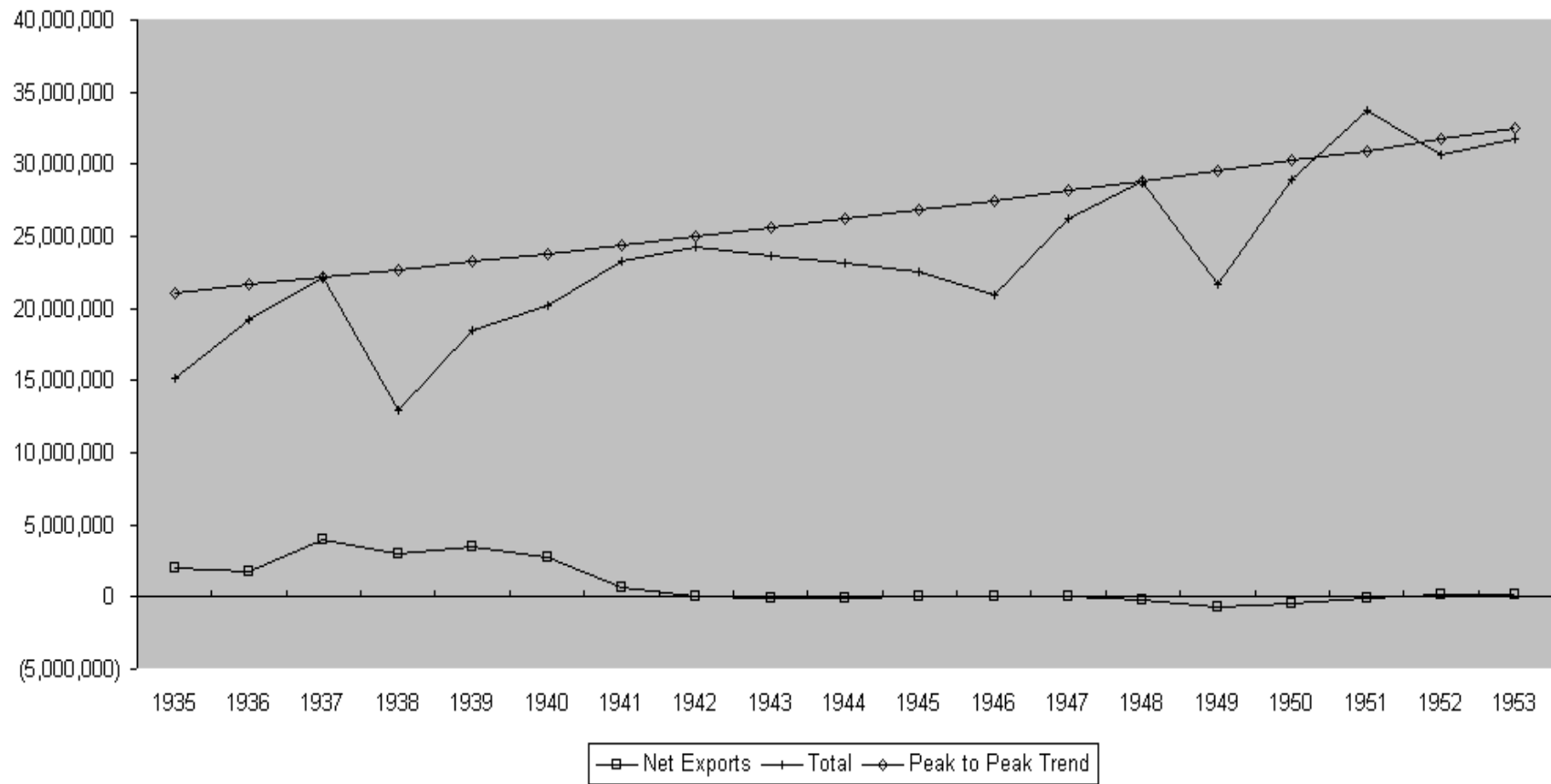


Figure 2
Steel Scrap Prices
1929-1953

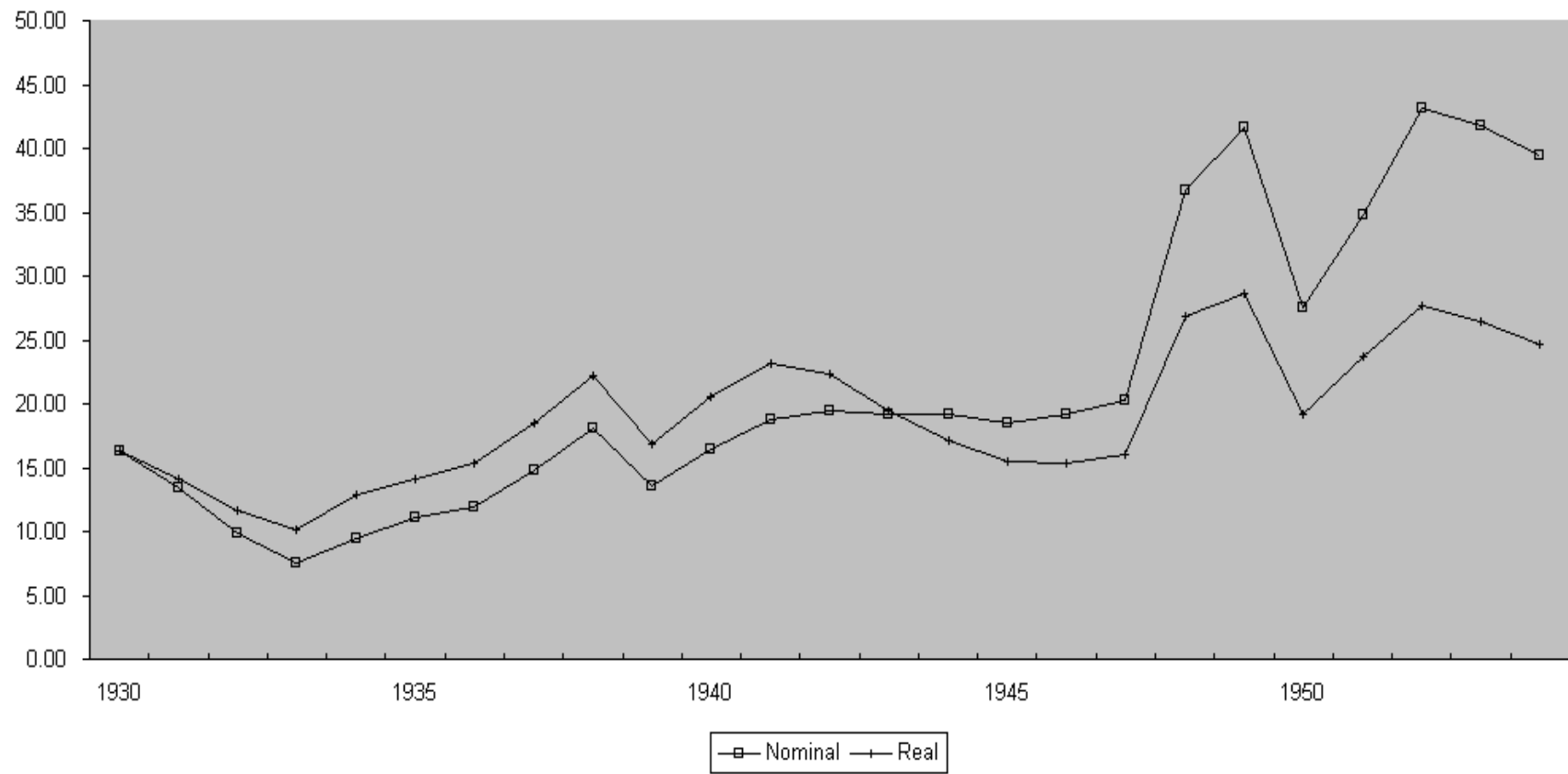


Figure 3
Consumption of Reclaimed Rubber
Long Tons, 1919-1954

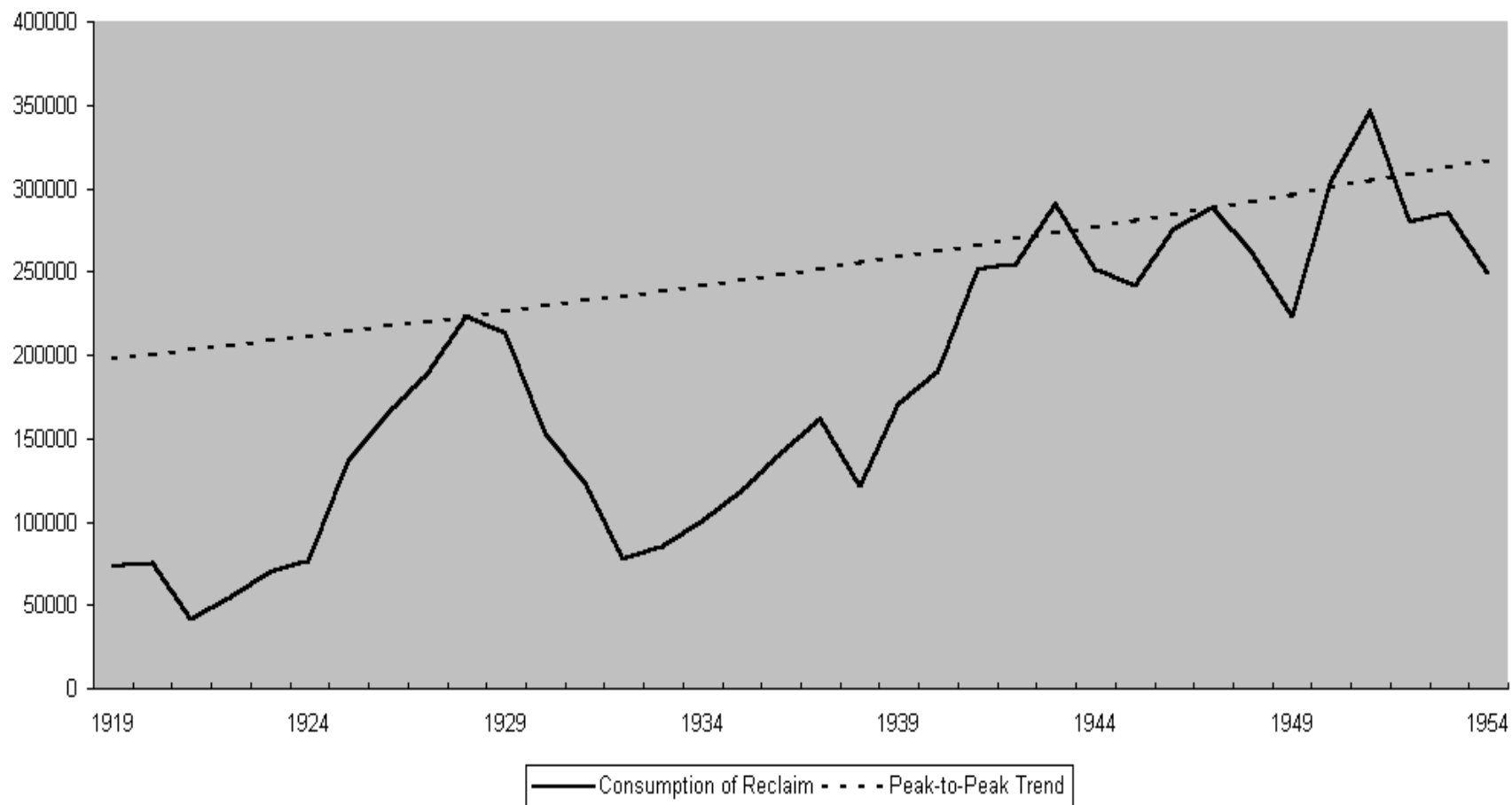


Figure 4

Consumption of Reclaim
Relative to the Scrap Heap, 1919-54

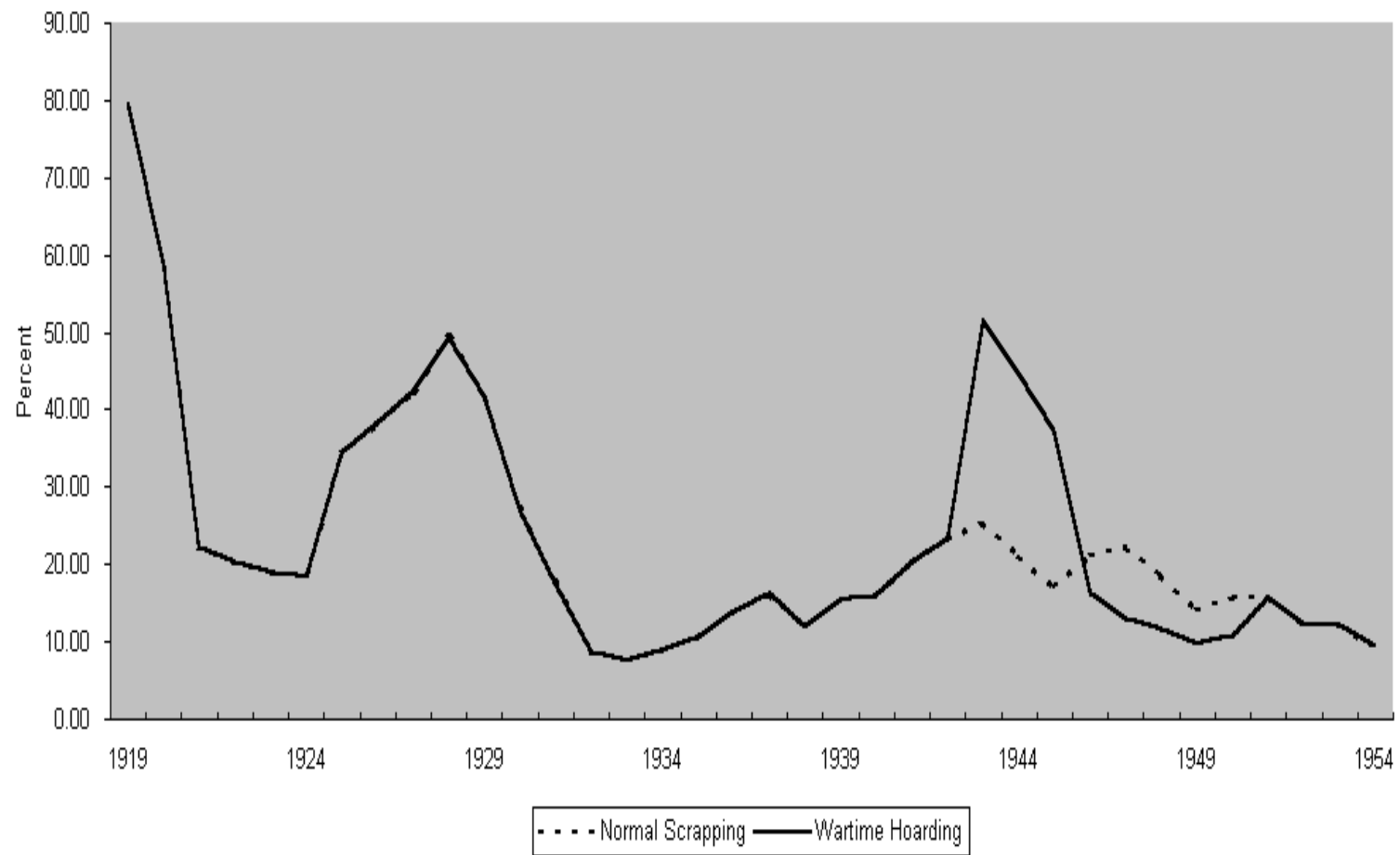


Figure 5
Relative Price and Consumption of Reclaim

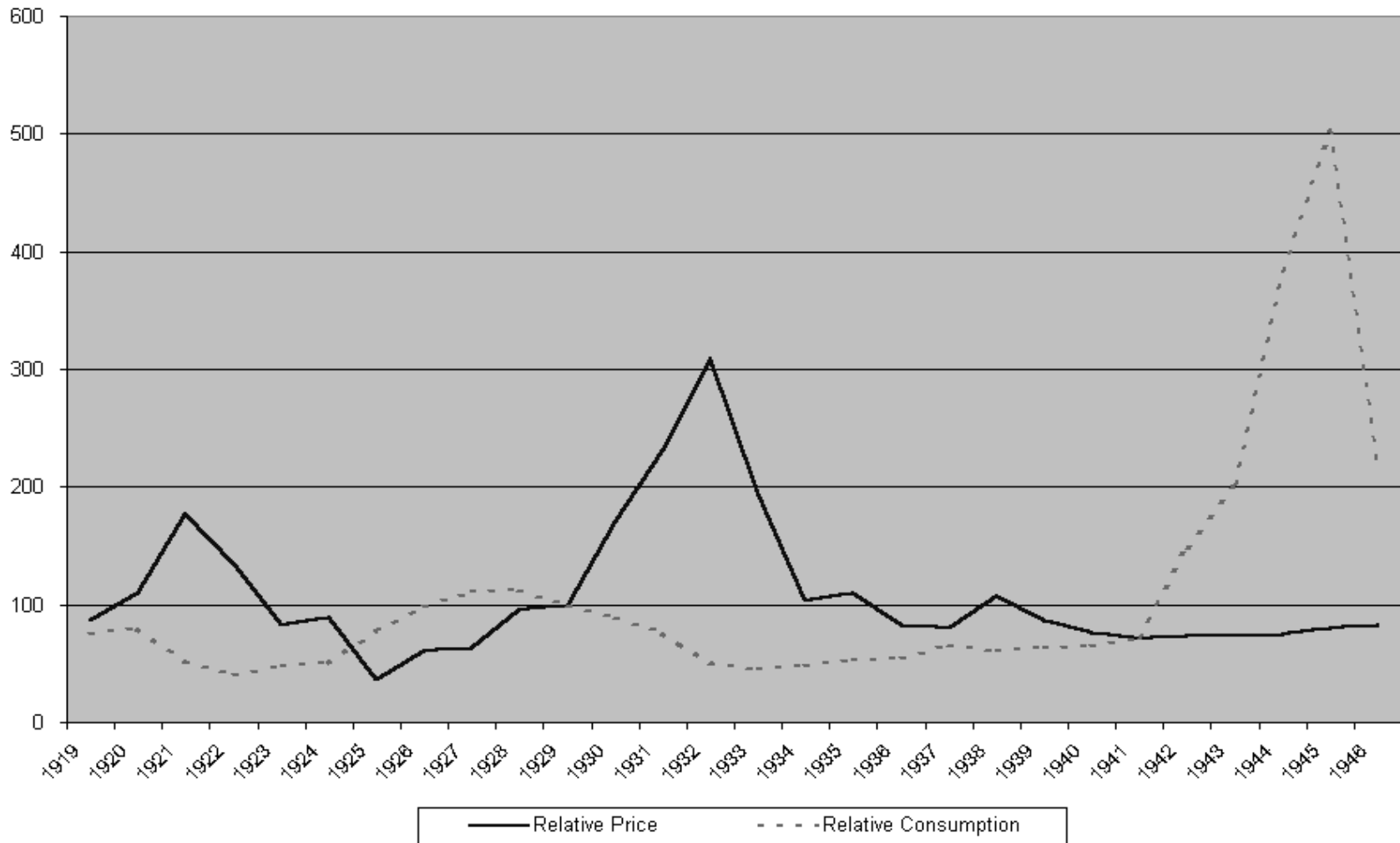


Figure 6

Consumption of Reclaimed Rubber
Actual and Predicted, 1942-1945

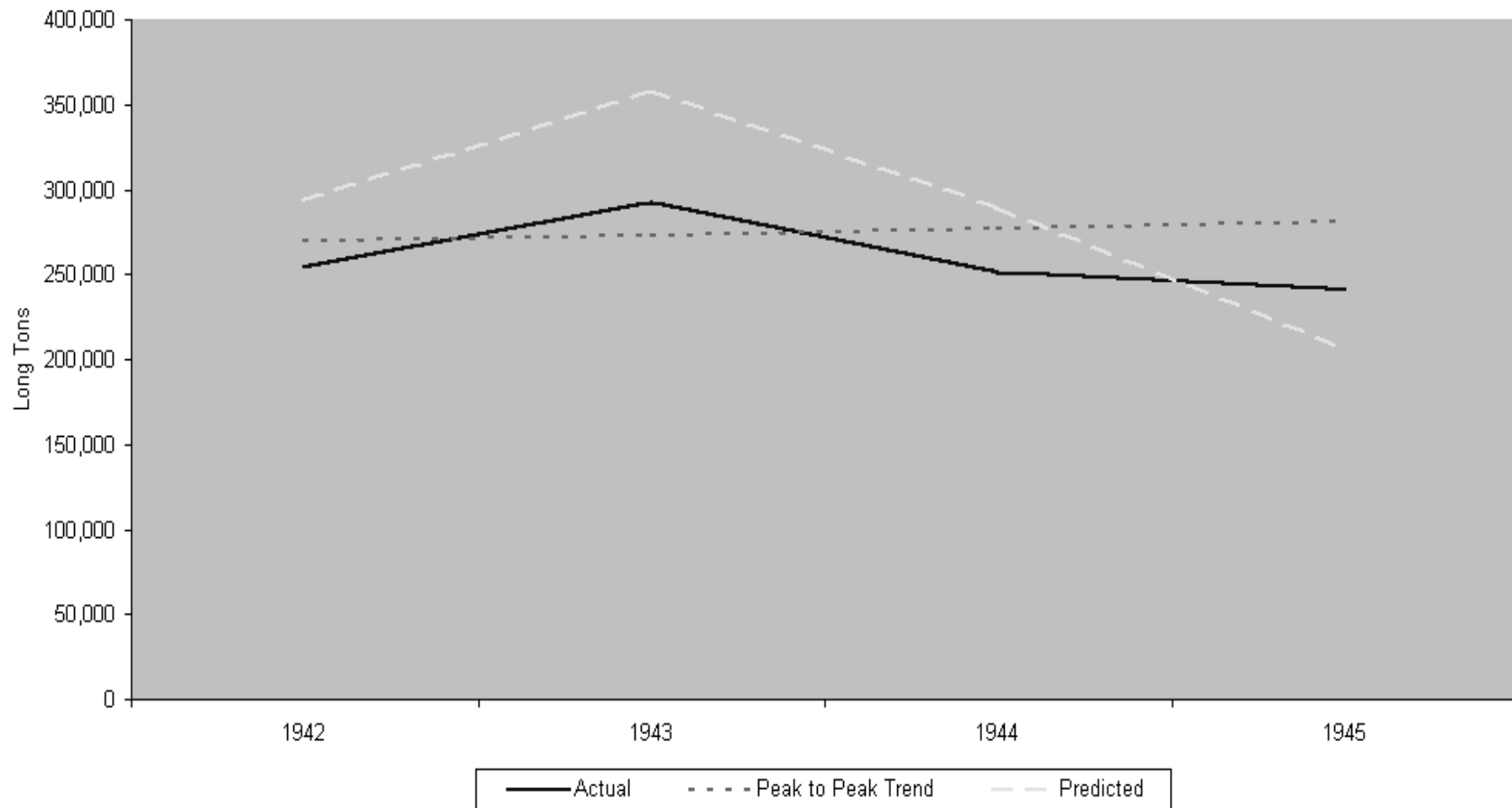


Table 1

The U.S. Rubber Budget in World War II

	Imports Natural Rubber	Cons. Natural Rubber	End of Year Stocks Natural Rubber ^a	Consumption Reclaim	Cons. Synthetic Rubber
1935	467	492	312 (7.6) ^b	118 (19%) ^c	0.2
1936	487	575	223 (4.7)	142 (20)	0.3
1937	598	544	262 (5.8)	162 (23)	0.5
1938	409	438	231 (6.3)	121 (22)	1.0
1939	497	592	125 (2.5)	170 (22)	1.9
1940	815	649	289 (5.3)	190 (23)	2.9
1941	1024	775	533 (8.3)	251 (24)	6.3
1942	277	377	422 (13.4)	255 (39)	17.6
1943	52	318	139 (5.3)	291 (37)	170.9
1944	107	144	96 (8.0)	251 (26)	566.6
1945	139	105	45 (5.1)	241 (23)	693.5
*1943	52	462	-6	291	26.4

Source: Feis (1947, 311).

^aThe change in end of year stocks can differ from imports less consumption because of reexports and for other reasons.

^bStock in months of consumption at the current rate.

^cConsumption of reclaim as a percent of the total.

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Table A1 Iron and Steel Scrap

	Consumption (Long Tons)		Price No. 1 Heavy Melting Steel
	In House	Purchased	
1935	13,346,752	13,068,578	11.85
1936	18,901,389	17,456,744	14.83
1937	19,871,033	18,135,239	18.03
1938	11,321,341	10,023,593	13.54
1939	17,519,550	14,914,857	16.39
1940	22,364,030	17,394,597	18.76
1941	30,272,035	22,599,622	19.50
1942	29,579,797	24,228,374	19.17
1943	31,283,116	23,762,379	19.17
1944	31,631,437	23,145,723	18.55
1945	27,643,486	22,527,126	19.15
1946	23,334,073	20,848,167	20.28
1947	28,195,000	26,148,000	36.65
1948	28,946,000	29,057,000	41.66
1949	26,041,000	22,475,000	27.56
1950	32,095,000	29,402,000	34.75
1951	34,693,521	33,813,709	43.15
1952	31,104,280	30,523,508	41.79
1953	37,411,159	31,614,817	39.52

Source: Barringer (1954), 133, 135.

Table A2 Reclaimed Rubber

	Consumption of Rubber in Long Tons			Price of Rubber Cents Per Pound	
	Reclaimed	Natural	Synthetic	Natural	Reclaimed
1919	73500	215000	0	48.7	16.2
1920	75300	206000	0	36.3	15.5
1921	41400	177800	0	16.4	11.3
1922	54500	301500	0	17.5	9.1
1923	69500	319400	0	29.5	9.6
1924	76100	328800	0	26.2	9.0
1925	137100	388500	0	72.5	10.1
1926	164500	366200	0	48.5	11.7
1927	189500	373000	0	37.7	9.4
1928	223000	437000	0	22.5	8.3
1929	212700	467400	0	20.6	8.0
1930	153500	376000	0	12.0	6.8
1931	123000	355200	0	6.2	5.5
1932	77500	336700	0	3.5	4.1
1933	85000	412400	0	6.0	4.5
1934	100900	462500	0	13.9	5.2
1935	117500	491500	200	13.4	5.3
1936	141500	575000	300	16.4	5.3
1937	162000	543600	500	19.4	6.1
1938	120800	438000	1000	14.6	6.1
1939	170000	592000	1900	15.6	6.0

1940	190200	648500	2900	20.1	6.0
1941	251231	775000	6300	22.4	6.3
1942	254820	376800	17600	22.5	6.5
1943	291082	317600	170900	22.5	6.5
1944	251083	144100	566600	22.5	6.6
1945	241036	105400	693500	22.5	7.0
1946	275400	277600	761700	22.5	7.3
1947	288395	562661	559666	20.8	8.0
1948	261113	627332	430618	22.0	NA ^a
1949	222679	574522	397139	17.6	NA
1950	303733	720268	512579	41.2	NA
1951	346121	454015	748650	57.7	NA
1952	280002	453846	787454	33.4	NA
1953	285050	553473	771806	24.2	NA
1954	249049	596285	620223	23.6	NA

Sources: Consumption 1919-1946 (Ball 1947), 204-05; 1947-1954, U.S. Department of Commerce, Rubber, Sixth Annual Report (Washington D.C.: GPO, 1954), 21, table 13. Prices 1919-1946 (Ball 1947), 206-07; 1947-54 (natural only), U.S. Department of Commerce, Rubber, Seventh Annual Report (Washington D.C.: GPO, 1955), 11, table 4.

^aAccording to the U.S. National Production Authority, Materials Survey: Rubber (Washington D.C.: GPO, 1950), X-4, the price of first grade tire reclaim rose from 8 cents for 1947, "to 9 cents in June 1950, and to 10 1/2 cents in September 1950, where it remained during the first half of 1951."