# The Civil War as a Catalyst of Technological Change in Agriculture

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What was the effect of the American Civil War on the development of the agricultural implement industry and on the mechanization of northern farms? Twenty years ago, for me to have asked this question other than rhetorically would have been a sure sign of professional incompetence. The answer was nothing less than a "historical truth" and was readily available in specialized monographs and general histories with only slight variations in the detail. With the appearance of Thomas Cochran's iconoclastic piece [6] in 1961 a well-established body of "facts" and time-honored conclusions were relegated to the realm of hypothesis. Although since Cochran's inquiry numerous articles and books have addressed the general issue of the war's impact on the agricultural implement industry and on farm mechanization, we are little closer today to resolving these issues than we were in 1961. The state of the debate is at best unsettled and the profession is split largely along disciplinary lines, with historians more often than not maintaining the traditional view and economists debunking it.

This paper analyzes the historical bases and analytical content of the arguments put forth by these two opposing groups. Doing so will offer considerable insight into the development of the agricultural implement industry and advance our understanding of the war's impact on that industry. To resolve this debate we must have a more precise specification of the issues and of the points of contention between the various antagonists. We shall see that neither story is entirely consistent with the historical evidence.

## THE TRADITIONAL VIEW AND THE REVISIONIST ATTACK

### The Traditional Argument

A common theme found throughout the pre-Cochran literature as well as in numerous, more recent works by historians argues

that the war gave a great impetus to the spread of agricultural machinery. The argument in its stylized form is straightforward and persuasive: the demand for troops depleted the countryside of young men which greatly increased the wages of farm labor. This gave farmers a tremendous incentive to adopt labor-saving machinery. A secondary factor is also at work in some accounts: the war caused agricultural prices to soar to unusual heights, thereby giving farmers the financial wherewithal to purchase machines [10, 27, and 29]. The combined effect of high wages and high prices for farm crops produced a severalfold increase in the sale of agricultural implements within the brief span of a few years, vast profits for equipment manufacturers, and a rapid expansion of the industry. The point to emphasize is that these changes were directly *caused* by the war; they did not just happen to occur at the same time.

An impressive array of data is brought to bear in support of this general theme; in fact, because these data are not always in agreement there is if anything an embarrassment of riches. Leo Rogin's work [27] is representative of the general trends shown elsewhere. He notes that more reapers and mowers were purchased during the war than during the entire prewar era dating back to 1833, and he cites various contemporary sources which claim outputs of 33,000 machines in 1862, 40,000 in 1863, and about 90,000 in 1864. By implication he indicates that the 1864 record was approached in 1865.[1]

## The Revisionists

Cochran's critique fairly chides some historians for using "random" statistics and for not showing trends which put the wartime sales into perspective. The figures he plucks from the historical grab bag, relying primarily on William T. Hutchison, show reaper and mower sales increased from a little less than 125,000 in the five years preceding the war to about 250,000 for the period 1861-65. Cochran concludes that this is a "quite ordinary increase for a young industry." He further argues that "while the business, without regard to the accidental coming of the war, was obviously in a stage of very rapid growth, the war years presented many difficulties and may actually have retarded the rate of increase" [6, pp. 170-71].

Stanley Engerman [9, pp. 195-98], relying heavily on Hutchison, notes that McCormick sold more machines in 1861 than in 1862, 1863, or 1864. He also points out that McCormick had an unsold stock of reapers after the harvest of 1864 equal to 40 percent of sales and that an 1864 survey of reaper and mower manufactures showed that very few had increased their annual output since 1861. Engerman further notes that the conclusion drawn from the McCormick sales record of depressed wartime conditions

is reinforced by the pattern of machinery sales in Iowa, where the decade's great increase followed the war. His summary statement is that "reaper sales had been growing rapidly before the war, and were higher after the war than during. Thus, it is not clear that the war years were an abnormal boom period for the industry." To put this conclusion into proper perspective, I should note that Engerman fails to note that the same survey which showed few firms had increased their output also purportedly shows that 87,000 machines were being produced!

Cochran's and Engerman's analyses of this issue, although relying exclusively on secondary sources and comprising no more than a few paragraphs, have profoundly shaped the view of many scholars. For example, Jeffrey G. Williamson [34, p. 638] cites the evidence on McCormick sales and farm machinery sales in Iowa as support of the conclusion, "In short, there seems to be no doubt that the Civil War decade in general, and the war years in particular, were ones of unusually poor growth performance." For another example, upon mentioning to Joe Reid that I was working on the diffusion of agricultural equipment during the Civil War he replied with uncharacteristic brevity, "What diffusion?" Among some economists the traditional view of rapid expansion has been revised to the antithetic view: the war was an era of depressed sales.

But what about the 250,000-odd machines which were purportedly sold during the war? What happened to the assertion that sales in 1864 reached as high as 100,000? Several prominent historians have asked these questions [11, 25, and 28], but for the most part the rebuttals have added little to the stories or data which were available when Cochran's article appeared.[2]

## A PRELIMINARY CRITIQUE OF THE LITERATURE

A few obvious criticisms of the literature are in order before I try to straighten out the general mess. First, apart from a few unconnected examples of a man buying a cultivator or a plow because of labor scarcity and an occasional reference to decennial data found in the US census, all the evidence used to conclude that there was or was not a boom in the agricultural implement business pertains to reapers and mowers. It turns out that this emphasis is to some extent justified, because reapers and mowers accounted for about one-half of the value of agricultural implement sales in 1860 and were by far the most important branch of the industry. But we should hesitate to generalize too freely, because these machines were among the most labor-saving and thus, given the special conditions of the war, may not be representative of other branches of the industry.

A second point of considerably greater importance concerns the propensity of some economists to generalize from the sales-

production experience of one firm (McCormick) without asking how representative that firm was or what happened to its market share in the relevant period. It is at least possible that McCormick's adverse sales performance during the war was the result of intra-industry shifts caused by changing design characteristics or a relative decline in the price of competitors' machines. In fact, it appears that McCormick's market share, measured in terms of the number of machines sold, fell precipitously during the war. Between 1856 and 1860 McCormick sold 20,015 machines. Guesses of total sales in this period cited in the literature range between 16 and 25 percent for McCormick. Assuming sales of 33,000 in 1862, 40,000 in 1863, and 80,000 in both 1864 and 1865 yields market shares of 14 percent (1862), 9 percent (1863), 6 percent (1864), and 4 percent (1865). Given that the aggregate sales data are questionable, I do not wish to attach a high degree of certainty to the market share estimates they produce but I do think they are suggestive of the general trend. This conclusion is buttressed by aggregate data from the 1870 census which indicate that, at that time, McCormick's share of the market was approximately 5 percent [20, 24, and 31]. An obvious conclusion, but one not widely appreciated is that McCormick, unquestionably the giant of the industry in the early 1850s, had several close rivals by the second half of that decade and was surpassed by several firms before the close of the war.[3]

We have seen that the conclusion some scholars have drawn from Engerman's short analysis is that sales stagnated and perhaps fell during the war. This is substantially different from Cochran's original position which was essentially that the sales *increase* was not unusual and might have been greater in the war's absence. I think it is fair to conclude that past generalizations based upon McCormick's output need to be reconsidered.[4]

Another very interesting question might be asked of those revisionist writers who suggest that the sale of agricultural machinery did not increase substantially during the war -- why not? As already noted, the main reason offered by historians for the claimed increase is the economist's number one, old reliable, standby argument for explaining the pattern of technological diffusion throughout the course of American development: it is nothing more than a relative factor price model. If some economists really believe that there was not a rapid increase in sales of labor-saving machines at a time when the wage rate of harvest laborers supposedly doubled according to some accounts, it seems that they would at least express some bewilderment over the apparent dilemma [15].

For illustrative purposes, let us for a moment assume that sales did not increase -- that the pattern of McCormick's sales was typical -- and ask what might have accounted for this observation. The most obvious explanation, but one I shall reject later, is that the price of the machines may have increased

sufficiently to counterbalance the effect of increasing labor costs. A related possibility also stemming from the supply side is that the war may have created production problems and increased uncertainty and risks which led producers to curtail output. In fact, Cochran refers to Hutchinson's discussion of wartime difficulties and suggests that they may have retarded the rate of growth. Such changes fundamentally affect firm costs and, should other things be equal, manifest themselves in price increases.

A number of factors affecting the demand might also have been at work. A very interesting point that is inconsistent with much of the received wisdom in the agricultural history literature and that runs contrary to what we have come to expect from other wartime experiences, is that the prices of agricultural goods were *not* in the main "high"! The false impression that prices were high stems from using nominal prices. Wayne D. Rasmussen [26, p. 579], for example, notes that between 1861 and 1865 "the wholesale prices of farm products as a whole virtually doubled." But when we look at movements in wholesale farm prices compared with those in other prices, farmers do not fare very well. Wesley Mitchell [22] concludes that "the farmers of the loyal states were among the unfortunate producers whose products rose in price less than the majority of other articles, and that from this standpoint they were losers rather than gainers by the paper currency." The editor of the *Genesee Farmer* offers some hint as to the real course of wheat prices in international markets. In August 1864 the best American red wheat which had sold for $2.00 (gold) a bushel in London in 1860 had recently been exchanged for about $1.30 (gold) a bushel [12]. As an aside, this drastic fall in the real or gold price of wheat at least in part explains the phenomenal exports during the wartime period.

Low agricultural prices must have adversely affected machine sales, other things being equal. Given the usual assumption of an inelastic demand for farm products, lower prices foretold lower incomes and, other things being equal, would lead to a postponement of purchase decisions. Paul David [7, pp. 10-13] correctly notes that it is the relative price of the inputs and not the price of the output which dominates neoclassical analysis of technological diffusion. He then develops a rationale for how high output prices can affect diffusion because the resulting increase in output requires greater quantities of inputs. Assuming that the supply of machines is more elastic than the supply of labor, farmers will substitute on the margin to machines. Although reasonable, this analysis probably misses the main point. Historically and today, farmers typically have bought machines in "good" years -- that is, when they had cash money -- and they postponed purchases in "bad" years. To explain the correlation between farm income and sales of machinery one need do no more than recognize that the neoclassical assumption of a perfect capital market fails to hold. Given that there were abnormal constraints on loans to farmers during

the war, the lack of liquidity caused by relatively low real farm prices could have seriously dampened sales.

The effect of wartime uncertainty on manufacturers has been discussed in the literature [18], but I have found no mention of the effect of uncertainty on farmers' decisions to buy agricultural machines. Surely wives and sons of men in uniform must have had second thoughts about undertaking a major capital expenditure. Likewise, young farmers must have been reluctant to incur new debts for fear they might be called to their nation's defense.

A third factor affecting the demand for reapers deserves careful attention. What really happened to rural wage rates? The historical literature is filled with testimony claiming "high" wages and extreme shortages of labor, but what evidence exists to support these claims? As with the case of the prices of farm products, the evidence consists of numerous unrelated quotations, and we can do little to attest to their representativeness or authenticity.[5] Juxtaposed against this evidence is Mitchell's tentative assessment based on fragmentary data that nominal farm wages increased only between 50 and 60 percent, which was less rapid than the wages of factory workers and much less rapid than the general price indexes and cost of living [21 and 22]. In short, he concludes real farm wages fell! I do not wish to attach too much confidence to Mitchell's data (he had a healthy skepticism), but even if these data significantly understate actual increases in farm wages, *they nonetheless suggest that the movement was not too "unusual" with respect to movements in other prices.*[6]

A final factor must be taken into account in analyzing the wartime demand for machines. To date, no one has asked what happened to the price of complementary inputs. No farmer ever substituted a reaper for workers; rather he substituted a reaper *and horses* for workers, and we know that the American Civil War was a horse-intensive affair. The carnage was staggering; between 1860 and 1866 the horse and mule population of the loyal states declined by about 350,000 animals. If we assume that the horse and mule populations had experienced the same rate of growth during the war that they exhibited in the decade of the 1850s, the actual population in 1866 was well over one million animals below what it would have been in the war's absence [33]. To put these figures into perspective, the loyal states ended the war with 8 percent fewer horses and mules than they had in 1860 and 21 percent fewer animals than they would have had assuming a continuation of the growth rate of the 1850s. These figures grossly understate the decline in the horse-mule stock available to the private sector, because the military siphoned off a large number of animals which survived to be counted in 1866.

These declines occurred when demand was enormous and must have resulted in substantial increases in animal prices. A

detailed analysis of horse prices and their effect on machine diffusion requires further research, but it is safe to speculate that explicitly considering this problem tempers somewhat the effect of rising wages. It is also fair to conclude that the release of animals at the war's end should have stimulated the adoption of horse-drawn machines.

I think the foregoing a la carte menu of ideas and analysis is sufficient to demonstrate some of the difficulties of trying to posit a causal relationship between the war and the growth of the agricultural machinery industry. I also think it is fair to assert that most previous works have failed to appreciate the complexity of the causal relationships at work. But to recognize that the issues are complex does not mean that we cannot obtain at least a partial answer to the question asked at the beginning of this paper: What was the effect of the war?

## WHAT THEORY BEST FITS THE FACTS?

We essentially have two viable competing theories, (1) The "traditionalist view" that the war caused a great leap in sales because of labor scarcity on the farm[7] and (2) Cochran's view that the jump in sales came in spite of the war and may have been higher in the war's absence.

The first theory emphasizes the primary importance of demand conditions stimulating industrial responses; though never explicitly developed, the second theory emphasizes the importance of changes stemming from the supply side of the market. To choose between these competing theories proves to be an embarrassingly simple task, because when coupled with other knowledge we have of the prices, the theories lead to dramatically different conclusions as to the course of machine prices.

The traditional story of a rapid outward shift in the demand for labor-saving machines strongly implies at least temporary increases in the prices of these machines. For this conclusion not to hold, the short-run supply curves of various types of machines would have to be very elastic (a situation we know to be false because of wartime scarcities of skilled workers, raw materials, transport, and so on), or the dynamic response in output coming from plant expansion and entry would have to be sufficiently rapid to nip potential price increases in the bud.

This latter possibility of rapid, outward shifts in supply, of course, is the heart of the second theory which I have attributed to Cochran and there is nothing in the traditional argument that predicts a supply response of this magnitude. To the contrary, many historians have at least implicitly denied such a possibility. Representative of this theme is Rasmussen's comment [25, p. 72] that "during the war years, the plants devoted to making farm machinery operated to capacity, but could not meet

the demand." It was, after all, the increase in prices which supposedly spurred the industry to expansion.

The implications of the second theory in the absence of any dramatic and independent shifts in demand are equally clear. Major technological breakthroughs, the expiration of patents opening the way for new entrants and increased competition, an expansion in individual firm capacity thereby capturing scale economies, moving along production learning curves, the development of specialized suppliers, and the cost savings stemming from vertical disintegration -- these constitute some of the sources for the massive reductions in price common in the evolution of many industries in their formative years. It is these types of changes which Cochran may have had in mind when he speculated that the growth might have taken place in spite of the war. The key point is that the second theory argues that the growth in sales occurs fundamentally because of changing supply conditions which drive down output (machine) prices.

The crucial question is now obvious to all -- what happened to the price of farm machinery? Fortunately (from the point of view of resolving this dispute), the answer is clear, at least in the case of reapers and mowers.

Evidence on the prices charged by several reaper and mower manufacturers shows that with minor exceptions there was little or no increase in the *nominal price of machines* between 1861 and 1864, and only modest price increases occurred in 1864 and 1865. Hutchison [14, p. 92] notes that McCormick sold at prewar prices until 1864, and then only increased prices by about 15 percent. Walter Wood's circulars indicate that he did not raise his prices until 1864. In 1864 he advertised the price of his self-made reaper at $165 which was about 14 percent higher than the 1861 price of $145. Given the increasing costs of production along with the fact that there were probably substantial quality improvements in self-rakers between 1861 and 1864 this price increase was modest indeed. Even so, Wood felt compelled to accompany the announced increase with a statement [35] that "all other makers of reaping and mowing machines have increased their prices for the next harvest; the very greatly enhanced cost of labor and material will compel me to do the same, but I will not do so to the extent that it will increase my profits."

A look at other price data found in advertisements reinforces the general picture obtained from looking at McCormick and Wood. For example, the advertised price of Union mowing machines only increased between 16 and 26 percent depending on the model between 1861 and 1865 [4 and 2]. The percentage increase in the prices of Buckeye mowers and reapers was apparently comparable [1 and 2].[8]

The next question is, when industry sales were expanding rapidly, why did manufacturers hold their prices relatively constant until 1864 and then only increase them modestly? Decreasing

or constant input costs could help account for the rigidity of output prices, but on this issue we have relatively good information: input costs rose sharply. Hutchinson [14, pp. 88-90] accurately documents that the prices McCormick paid for lumber more than doubled and those of pig iron and coal almost tripled between 1861 and the summer of 1864. In 1863 the federal government imposed a 5 percent tax on gross sales. Freight rates and terminal costs soared (between 1863 and 1864 freight rates on many eastern shipments doubled). Finally, labor cost increased significantly, for example, a strike in the spring of 1863 resulted in a 25 percent increase in the wages of molders. In December they struck again demanding an additional 12.5 percent increase [19].

There is no reason to suspect McCormick was atypical of other agricultural implement makers. We have wage data on a few other firms. Between 1861 and 1865 the wages paid by an agricultural implement firm in Massillon, Ohio, surveyed in the Weeks report, increased between 23 and 50 percent depending on the occupation. More generally, Mitchell suggests that money wages of unskilled laborers increased by about 69 percent between 1860 and 1865 while those of skilled craftsmen increased by about 53 percent [21 and 22]. From this brief, but probably representative sampling, it appears safe to conclude that input costs increased significantly.

These cost increases make the observed constancy of prices of reapers and mowers more perplexing. We are left with two major possible explanations:

(1) There could have been significant improvement in production efficiency (that is, in the efficiency with which the more expensive inputs were utilized) which might have resulted from either technological changes in the production of machines or from firms capturing scale economies. Major changes in either of these factors could have offset the cost increases just described. There is no mention of any new cost-reducing technological process and I think we can dismiss that possibility. The second possibility -- that of capturing scale economies -- is more interesting because at least conceptually it could have resulted as firms moved out steeply sloping long-run average cost curves *as a response to shifts in demand*. Such a story could be consistent with the traditional argument. A precise test of this possibility must await more complete data, but for reasons about to be stated I think it very unlikely that very much of the increase in input cost was counterbalanced by capturing scale economies in this period.

(2) The phenomena of rising input costs, an increasing volume of output, and of relatively constant output prices could have resulted from fundamental changes in the organization of the industry. On this issue we have abundant evidence of which the declining McCormick market share alluded to earlier is just the tip of the iceberg. There was a tremendous expansion in the

number of producers in the late 1850s and throughout the war years which along with the growth of existing firms increased the supply of machines, driving down their real price and cutting profit margins. The Census of 1860 lists 73 firms manufacturing reapers and mowers. By 1864 we have fairly reliable estimates showing between 187 and 203 firms [14, p. 97]. The Census of 1860 showed 22 firms in New York manufacturing reapers and mowers, by 1866 there were at least 61 firms making mowers (and presumably numerous others making reapers) in New York [30 and 8]. It is this tremendous expansion in the number of firms which leads me to discount the significance of scale economies as a source of output growth and cost reductions. This expansion in the number of firms was made possible by the expiration of several of McCormick's key patents in the 1850s. This and the development of strategic patents by numerous rivals (especially patents controlling what would become of the new growth areas of the business -- mowers and self-rakers) paved the way for rapid and easy entry, as various rivals undercut each other in granting licenses. The industry leader McCormick rapidly lost his relative market share partly because he failed to move into new areas. McCormick was very late in marketing a mower and slow to adopt a self-raker. His delay in perfecting and marketing a self-raking machine is a major reason for his poor showing during the Civil War era [14, pp. 366-81].

Many of the firms that were to emerge as giants by the war's end were founded only in the mid-1850s and they spent several years perfecting their products, building plants, and acquiring a reputation and the business acumen needed for success. The great Buckeye works of Ohio, for example, were built upon a machine the prototype of which was not constructed until 1855. Most of the machines built in the period 1852-57 by the individuals who created the Buckeye empire simply did not work, and the firm did not show a profit until 1858 [8, 13, 16, and 32]! By that point the die was cast for a major boom in sales.

The same general pattern appears to hold for a number of other major producers. The Osborne works in New York arrived on solid financial ground in 1858 with production jumping from 7 to 1,000 machines in two years. Adriance and Platt, who produced under Buckeye licenses, Cyrenus Wheeler, maker of the "Cayuga Chief Mower," and Walter Wood all overcame birth and growing pains in the mid-to-late 1850s and with the perfection of their products were undergoing or contemplating expansion of plant facilities by the coming of the war [8 and 32]. In the absence of the war the increased output of these and other new entrants would have driven nominal prices of machines down, causing farmers to substitute machines and horses for workers.

## CONCLUSION

The basic theoretical underpinning of my explanation for rapid diffusion of reapers and mowers starting in the early 1860s is fundamentally the same as that implied by the traditional literature: both are in the neoclassical tradition and essentially ask what happened to the price of capital relative to the price of labor. Ultimately, it is the movement in this ratio that counts. The distinction between the argument presented here and those found elsewhere lies in which of the two prices we focus on. The traditional literature has emphasized the increase in the wages of farm laborers. No doubt farm wages increased, but the movement in this variable was very "normal" in the sense that it did not differ greatly from what happened to most other wages and prices. On the other hand, in their attempt to explain the diffusion of machines, scholars have given little attention to the very "abnormal" lack of change in the price of those machines.

Explicitly focusing on changing supply conditions generates a significantly different historical scenario for we see that structural changes in the harvesting equipment industry were well in progress before the war. In the absence of the war these structural changes would have generated significant downward pressure on nominal prices and profits as competition and output increased. The falling nominal and real price of machines would have increased their rate of diffusion even without the war-induced increase in the nominal wages of farm workers. As events actually occurred, the nominal price of machines remained fairly stable, but their real price still fell as did the profit margins of manufacturers. It was this downward pressure on profits which prompted the several efforts to cartelize the industry and fix prices which occurred during the war.

What remains is briefly to ask to what extent these conclusions can be extended to other branches of the agricultural implement industry. On this subject the evidence is sparse, but a few observations are in order. If my emphasis on supply changes is correct in the case of harvesting equipment, then there is no a priori reason to expect output to have soared in other areas -- it could differ from activity to activity depending upon the state of industry development and the extent of labor saving. Evidence on plow manufacturing indicates that the war was not a prosperous period. In January 1864, 10 of the major manufacturers met in Chicago in an attempt to increase prices. They asserted that the cost of producing a plow had increased $1 in the past year and resolved to pass these costs on in the form of higher prices [5]. Although the evidence is scanty, this does not sound like the actions of a group of firms who were unable to keep up with demand.

NOTES

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1. Rogin offers another estimate which yields over 100,000 machines in 1864. Hutchison claims 250,000 machines were sold during the war, and he refers to contemporary estimates of 87,000 and about 100,000 for 1864 [14, p. 97]. Emerson Fite [10] cites other sources and places output at 20,000 in 1861, 35,000 in 1862, 40,000 in 1863, and 70,000 in 1864.

2. An important exception to the above statement is Rasmussen's citation [25, p. 77] of an unpublished manuscript showing that the number of reapers and mowers available in 1865 was not exceeded until 1874. Rasmussen was kind enough to send me a copy of the manuscript. This major conclusion rests on a large, unexplained, and wholely unreasonable change in the depreciation parameter used to estimate the number of machines in use.

Of course, given the plethora of sales estimates there are some disagreements as to what happened. Paul Gates, for example, finds annual sales tripled during the war from the prewar level whereas Cochran's figures only show a doubling.

3. The number of machines produced by Walter A. Wood of Hoosick Falls, New York, surpassed McCormick's output in the late 1850s or early 1860s (there are at least two sets of data for each firm). Wood's combined sales in 1864 and 1865 (years in which McCormick's sales are used to suggest "poor" industry performance) were approximately twice that of McCormick. Wood made and sold about 7,530 machines in 1864 and 8,460 in 1865 [36, p. 53; and 37, pp. 14-15]. McCormick sales were 5,396 and 3,869 in the two years.

4. The evidence on Iowa sales is also of little significance. Iowa was a young, rapidly growing state, the population of which nearly doubled in the 1860s and therefore hardly provides a fit testing ground.

5. Rasmussen [26, p. 581] notes that "the Union's military bounty system tempted a disproportionately large number of rural men into the army. The urban cities filled their draft quotas by paying bounties to farm men; the drafts then took more such men to fill the quotas of rural communities." Also see [11, pp. 232 and 234; 25, pp. 68 and 72; and 17, p. 190].

6. Of course, several qualifications must be raised. First, a massive adoption of labor-saving machinery would have held down wages. Second, the frequently cited accounts of women working in the fields suggest that the supply of farm labor was far more elastic than in normal times because of wartime emergency.

7. As I have shown, a third potential hypotheses that the war years were years of slow growth or even stagnation, can be traced to Engerman's incomplete reference to a document cited by Hutchinson. I have personally checked most of the contemporary sources claiming spectacular increases in annual reaper and mower sales and find the evidence most credible -- annual sales in 1864 were at least three and maybe more than five times the level of any single prewar year.

8. These are advertised prices and there is a good reason to suspect that actual sales prices fell below announced prices during the war years. In each of the war years I found cases of companies slashing their prices as they retreated from previously announced terms.

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